Ethics Education and Its Relationship to Undergraduate Construction Students’ Professional Ethical Sensitivity

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ABSTRACT

The construction industry is inundated with many ethical problems that have supported its negative stigma as an unethical and corrupt industry. This inundation instigates the requirements of ethics instruction by accrediting bodies of construction education with the art of teaching this ‘secondary’ topic left up to construction educators. Literature offers suggestions; however, there is not much understood regarding pedagogical ‘best practice’ to ensure students are ethically sensitive (aware) to ethical issues related to the construction industry. This research attempts to move toward an understanding of construction ethics education’s influence on students’ ethical sensitivity. Two research strands were employed. The first strand included the development of a broad collection of ethics pedagogical techniques used in construction education (independent variable), via the administration of a how ethics is taught in construction survey (HETC) to both faculty and students of purposefully selected construction programs. The second strand included the development and administration of a Test for Ethical Sensitivity in Construction (TESC) to evaluate construction students’ ability to recognize ethical issues that are specific to the construction industry (dependent variable). Results of the first strand illustrate a wide range of pedagogical techniques available to teach ethics in construction programs to assist and inspire the improvement of construction ethics education. Results of the second strand illustrate various degrees of difficulty students had recognizing ethical issues of the TESC and how this related to ethical content coverage in construction programs’ curricula. In addition, regarding participants of this study, there were significant differences found in student level of ethical sensitivity based on program of enrollment; however, there were no significant differences found based on student recollection of the placement of ethics in their curriculum, professional experience, age, or gender. It appears that ethics education has some influence on the professional ethical sensitivity of construction students; however, more research is necessary to confirm the degree of influence. Additional research is necessary to identify the most current and critical ethical issues of the construction industry to develop an auxiliary form of the TESC while controlling for other variables such as co-curricular and personal experiences.
DEDICATION

This work is dedicated to my parents, Kenneth and Geraldine Sands. Without your love and support, this work would have never been possible.
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I must express my sincere gratitude to my advisor and doctoral chair Dr. Annie Pearce for her support and dedication to this research. I am grateful to her for allowing me to take on research that meets my passion above any other consideration. She has maintained poise and patience with me throughout the entire doctoral process. She has opened up her schedule for me, has always kept me calm, and has made me the scholar I am today. She has given me direction, knowledge, and counsel from day one. She has always made me feel as though I am the most important student with the time and care she provides, and each of her students feels the same way. For all of her hard work, and for whom she is, I am grateful.

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ATTRIBUTION OF AUTHORS

This dissertation contains five self-contained chapters that were published or are prepared for an immediate submission to peer-reviewed journals. This attribution page introduces the contribution of the authors to each of the chapters herein. In all chapters, Kenneth Sands performed the predominant design decisions, primary contributions, primary data collection, primary decisions on data analysis, significant data analysis, and interpretation of the results presented in this document. Author contributions for each paper are as follows:

Chapter 2: Kenneth Sands prepared the paper, developed the majority of the concept, and performed the literature review, data collection, analysis, and interpretation of the results. Annie R. Pearce assisted in the concept development of the paper, performed critical and constructive review of the paper and, its structure, and ensured paper quality for submission.

Chapter 3: Kenneth Sands prepared the paper, developed the majority of the concept, and performed the literature review, administration of the think-aloud protocol, analysis of the think-aloud sessions, and interpretation of the results. Denise R. Simmons suggested the development technique for usability testing (i.e., think-aloud protocols), provided concept development of the paper, performed critical and constructive review of the paper and, its structure, and ensured paper quality.

Chapter 4: Kenneth Sands prepared the paper, developed the majority of the concept, developed the Test for Ethical Sensitivity in Construction (TESC), performed the literature review, data collection, some of the initial data analysis of the pilot study, and all the interpretation of the results. Annie R. Pearce cooperatively developed the concept for the TESC, provided significant assistance to the development of the TESC, and performed additional critical review and copy-editing. Jian Huang performed statistical analysis on the pilot data for this study. Victoria Mouras and Christine Fiori assisted in the collection of pilot data for this study. Victoria Mouras, Christine Fiori, and Denise R. Simmons, assisted with concept and test development for the TESC. All co-authors performed critical and constructive review of the paper, and ensured paper quality.
Chapter 5: Kenneth Sands prepared the paper, developed the majority of the concept, performed the literature review, data collection, analysis, and all interpretation of the results. Annie R. Pearce cooperatively developed the concept, provided significant assistance to the development of the HETC survey, provided assistance interpreting the results, and performed additional critical review and copy-editing. Denise R. Simmons provided methodological assistance for this paper. Victoria Mouras assisted the collection of data for this study. Victoria Mouras, Christine Fiori, and Denise Simmons, assisted with concept and development of the HETC. All co-authors performed critical and constructive review of the paper, and ensured paper quality.

Chapter 6: Kenneth Sands prepared the paper, developed the majority of the concept, performed the literature review, data collection, analysis, and all interpretation of the results. Annie R. Pearce cooperatively developed the concept, provided significant assistance with the interpretation of results, and performed additional critical review and copy-editing. Denise R. Simmons provided methodological assistance for this paper. Victoria Mouras assisted the collection of data for this study. Christine Fiori, Victoria Mouras, and Denise R. Simmons, assisted with the concept. All co-authors performed critical and constructive review of the paper, and ensured paper quality.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>ATTRIBUTION OF AUTHORS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiv</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>3</td>
</tr>
<tr>
<td>Purpose Statement</td>
<td>4</td>
</tr>
<tr>
<td>Conceptual Frameworks</td>
<td>4</td>
</tr>
<tr>
<td>Research Objectives &amp; Significant Tasks</td>
<td>5</td>
</tr>
<tr>
<td>Approach</td>
<td>6</td>
</tr>
<tr>
<td>References</td>
<td>10</td>
</tr>
<tr>
<td>2 TOWARD A FRAMEWORK FOR CONSTRUCTION ETHICS EDUCATION:</td>
<td>12</td>
</tr>
<tr>
<td>A META-FRAMEWORK OF CONSTRUCTION ETHICS EDUCATION TOPICS</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>13</td>
</tr>
<tr>
<td>Nature of Ethics in the Construction Industry</td>
<td>13</td>
</tr>
<tr>
<td>Ethics and Morality as a Concept</td>
<td>14</td>
</tr>
<tr>
<td>Ethics and the Profession</td>
<td>14</td>
</tr>
<tr>
<td>Purpose Statement</td>
<td>15</td>
</tr>
<tr>
<td>Construction Ethics Education</td>
<td>15</td>
</tr>
<tr>
<td>Ethical Issues per Construction Ethics Education Research</td>
<td>16</td>
</tr>
<tr>
<td>Moving Forward</td>
<td>16</td>
</tr>
<tr>
<td>Research Design</td>
<td>17</td>
</tr>
<tr>
<td>Theoretical framing</td>
<td>17</td>
</tr>
<tr>
<td>Methodology</td>
<td>18</td>
</tr>
<tr>
<td>Sampling</td>
<td>18</td>
</tr>
<tr>
<td>Analysis</td>
<td>18</td>
</tr>
<tr>
<td>Content-Based Meta-Framework</td>
<td>20</td>
</tr>
<tr>
<td>Discussion</td>
<td>21</td>
</tr>
<tr>
<td>Findings</td>
<td>21</td>
</tr>
<tr>
<td>Conclusion</td>
<td>22</td>
</tr>
<tr>
<td>Final Thought &amp; Future Research</td>
<td>22</td>
</tr>
<tr>
<td>References</td>
<td>23</td>
</tr>
</tbody>
</table>
## 3 UTILIZING THINK-ALOUD PROTOCOLS TO ASSESS THE USABILITY OF A TEST FOR ETHICAL SENSITIVITY IN CONSTRUCTION

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and Motivation</td>
<td>27</td>
</tr>
<tr>
<td>Operationalizing Ethical Sensitivity to Test Student Ethical Sensitivity</td>
<td>28</td>
</tr>
<tr>
<td>Problem Statement/Aim</td>
<td>29</td>
</tr>
<tr>
<td>Literature Review</td>
<td>29</td>
</tr>
<tr>
<td>Conceptualizing the Think-Aloud</td>
<td>29</td>
</tr>
<tr>
<td>Usability Testing and the Think-Aloud of the TESC</td>
<td>30</td>
</tr>
<tr>
<td>Operationalizing the Think-Aloud in Research</td>
<td>31</td>
</tr>
<tr>
<td>Exemplar Think-Alouds in Engineering Education</td>
<td>31</td>
</tr>
<tr>
<td>The Think-Aloud Protocol</td>
<td>32</td>
</tr>
<tr>
<td>Methodology</td>
<td>34</td>
</tr>
<tr>
<td>Situating and Using the Think-Aloud Protocol</td>
<td>34</td>
</tr>
<tr>
<td>Participants</td>
<td>34</td>
</tr>
<tr>
<td>Recruitment</td>
<td>35</td>
</tr>
<tr>
<td>Administration of the TESC Think-Aloud Sessions</td>
<td>35</td>
</tr>
<tr>
<td>Setting(s)</td>
<td>35</td>
</tr>
<tr>
<td>Instruction(s)</td>
<td>36</td>
</tr>
<tr>
<td>Warming Up</td>
<td>36</td>
</tr>
<tr>
<td>Behavior of Observer</td>
<td>36</td>
</tr>
<tr>
<td>Recording</td>
<td>36</td>
</tr>
<tr>
<td>Transcription of the Protocol</td>
<td>36</td>
</tr>
<tr>
<td>Revision and Feedback</td>
<td>36</td>
</tr>
<tr>
<td>Results</td>
<td>37</td>
</tr>
<tr>
<td>Time to Complete</td>
<td>38</td>
</tr>
<tr>
<td>Post-Test Questionnaire Responses</td>
<td>38</td>
</tr>
<tr>
<td>P1 Pre-Pilot Feedback</td>
<td>39</td>
</tr>
<tr>
<td>Discussion</td>
<td>39</td>
</tr>
<tr>
<td>Usefulness</td>
<td>39</td>
</tr>
<tr>
<td>Efficiency</td>
<td>40</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>40</td>
</tr>
<tr>
<td>Learnability</td>
<td>41</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>41</td>
</tr>
<tr>
<td>Unintended Affective Response</td>
<td>41</td>
</tr>
<tr>
<td>Conclusion and Future Work</td>
<td>42</td>
</tr>
<tr>
<td>References</td>
<td>42</td>
</tr>
</tbody>
</table>

## 4 TOWARD A TECHNIQUE OF EVALUATING STUDENT ETHICAL SENSITIVITY TO ISSUES OF THE CONSTRUCTION INDUSTRY

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>47</td>
</tr>
<tr>
<td>Attempts to Curb Unethical Behavior</td>
<td>47</td>
</tr>
<tr>
<td>Academe Influenced</td>
<td>49</td>
</tr>
<tr>
<td>The Problem</td>
<td>50</td>
</tr>
<tr>
<td>The Purpose</td>
<td>50</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Ethical Sensitivity</td>
<td>51</td>
</tr>
<tr>
<td>Ethics Evaluation in Construction Education</td>
<td>52</td>
</tr>
<tr>
<td>Alternative Techniques of Testing Ethical Sensitivity</td>
<td>52</td>
</tr>
<tr>
<td>A Note on Instrumentation Quality in Ethical Sensitivity Testing</td>
<td>54</td>
</tr>
<tr>
<td>TESC Development</td>
<td>55</td>
</tr>
<tr>
<td>TESC Conceptualization</td>
<td>55</td>
</tr>
<tr>
<td>TESC Construction</td>
<td>56</td>
</tr>
<tr>
<td>Descriptors</td>
<td>58</td>
</tr>
<tr>
<td>Content Validity</td>
<td>58</td>
</tr>
<tr>
<td>Usability Testing for the TESC</td>
<td>59</td>
</tr>
<tr>
<td>Piloting the TESC</td>
<td>60</td>
</tr>
<tr>
<td>Population of Interest</td>
<td>60</td>
</tr>
<tr>
<td>Rating, Inter-rater Reliability, and Rater Strain</td>
<td>60</td>
</tr>
<tr>
<td>Initial Pilot Investigation</td>
<td>62</td>
</tr>
<tr>
<td>Discussion of Pilot Results</td>
<td>64</td>
</tr>
<tr>
<td>Conclusions</td>
<td>66</td>
</tr>
<tr>
<td>Limitations</td>
<td>66</td>
</tr>
<tr>
<td>Future Work</td>
<td>67</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>68</td>
</tr>
<tr>
<td>References</td>
<td>68</td>
</tr>
</tbody>
</table>

5 ETHICS PEDAGOGY IN UNDERGRADUATE CONSTRUCTION CURRICULA: A MIXED-METHODS APPROACH 73

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>74</td>
</tr>
<tr>
<td>Problem &amp; Purpose</td>
<td>74</td>
</tr>
<tr>
<td>Methodology</td>
<td>76</td>
</tr>
<tr>
<td>Conceptual Framework</td>
<td>77</td>
</tr>
<tr>
<td>Literature and Curriculum Guides Review</td>
<td>77</td>
</tr>
<tr>
<td>Key Findings (Qualitative Strand)</td>
<td>78</td>
</tr>
<tr>
<td>Content of Subject Matter (c)</td>
<td>78</td>
</tr>
<tr>
<td>Modes of Transaction (d)</td>
<td>79</td>
</tr>
<tr>
<td>Complementary Review for Components (c) and (d)</td>
<td>80</td>
</tr>
<tr>
<td>Evaluation (e)</td>
<td>80</td>
</tr>
<tr>
<td>Construction Ethics Education Literature Review</td>
<td>81</td>
</tr>
<tr>
<td>How Ethics is Taught in Construction (HETC) Survey</td>
<td>84</td>
</tr>
<tr>
<td>HETC Survey</td>
<td>84</td>
</tr>
<tr>
<td>Administration of the HETC</td>
<td>85</td>
</tr>
<tr>
<td>Analysis</td>
<td>89</td>
</tr>
<tr>
<td>Key Findings (Quantitative Strand)</td>
<td>89</td>
</tr>
<tr>
<td>Discussion</td>
<td>95</td>
</tr>
<tr>
<td>Conclusion</td>
<td>96</td>
</tr>
<tr>
<td>Limitations</td>
<td>97</td>
</tr>
<tr>
<td>Future Work</td>
<td>97</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>98</td>
</tr>
<tr>
<td>References</td>
<td>98</td>
</tr>
</tbody>
</table>
Significant Tasks in Response to RQ1 ................................................................. 144
Significant Tasks in Response to RQ2 ................................................................. 144
Significant Tasks in Response to RQ3 ................................................................. 144
Summary of Significant Findings ...................................................................... 145
Significant Findings in Response to RQ1 .......................................................... 145
Significant Findings in Response to RQ2 .......................................................... 145
Significant Findings in Response to RQ3 .......................................................... 146
Discussion and Significance of this Dissertation ............................................. 147
Limitations ........................................................................................................... 148
Of the TESC ........................................................................................................ 148
Of Comparing Ethics Education to Student Ethical Sensitivity ...................... 148
Recommendations for Future Research ............................................................. 149
For the TESC ....................................................................................................... 149
For Comparing Ethics Education to Student Ethical Sensitivity ...................... 149
For Research in Other Construction Education Domains ............................ 149
Reflection ............................................................................................................. 150
Extended Discussion .......................................................................................... 150
Lessons Learned ............................................................................................... 151
Implications for Practice .................................................................................. 152
Moving Forward ................................................................................................. 152
References .......................................................................................................... 154

APPENDIX B: Ethics Education In Various Construction Programs (Sampling Frame) .... 155

APPENDIX C: The Test for Ethical Sensitivity in Construction (TESC) Pre-Pilot Test Version ................................................................. 166

APPENDIX D: The Test For Ethical Sensitivity In Construction (TESC) Final Version .... 170

APPENDIX E: The How Ethics Is Taught In Construction Faculty Survey (HETC-FS) .... 176
LIST OF FIGURES

Figure 1.1. Manuscript Relationship Schematic of Dissertation .............................................9

Figure 3.1. The Test Development Process .............................................................................34

Figure 3.2. Think-Aloud Protocol in Context to the Development of the TESC
(Derived from Trenor and colleagues) ..................................................................................34

Figure 4.1. TESC Development Process
(Sands & Simmons, 2014; Trenor et al., 2011) .................................................................55

Figure 4.2. Respondent Construct Mapping for TESC ..........................................................56

Figure 5.1. Exploratory Sequential Design of this Study
(Creswell & Plano Clark, 2011) .........................................................................................76

Figure 5.2. Eash’s (1991) five components of the curriculum .............................................77

Figure 5.3. Question 1; Curriculum Setting ($d_i$) ................................................................92

Figure 5.4. Question 2; Media ($d_{ii}$) ..................................................................................92

Figure 5.5. Question 3; Learning Environment ($d_{iv}$) ..........................................................93

Figure 5.6. Question 4; Teaching Styles ($d_{iii}$) .................................................................93

Figure 5.7. Question 5; Evaluation ($e$) ...............................................................................94

Figure 5.8. Question 6; (c) Content ......................................................................................94

Figure 6.1. Data Distribution with Box-and-Whisker Plot of TESC Test Scores ...............125

Figure 6.2. Box-and-Whisker Plots with Mean Lines Comparing
TESC Results of Participants based on Program of Enrollment ...............................127

Figure 6.3. Box-and-Whisker Plots with Mean Lines for
Comparing Test Scores of Participants by Curriculum Settings .............................129

Figure 6.4. Box-and-Whisker Plots with Mean Lines to
Compare Test Scores of Participants by Different Levels of Experience ..............130

Figure 6.5. Box-and-Whisker Plots with Mean Lines to
Compare Test Scores of Participants by Gender .........................................................131

Figure 6.6. Box-and-Whisker Plots with Mean Lines to
Compare Test Scores of Participants by Age ...............................................................132
LIST OF TABLES

Table 1.1. Main Research Objectives & Significant Tasks Performed.................................6
Table 2.1. Ethics Topics Provides Construction Ethics Education Research ........................16
Table 2.2. Meta-Framework of Societal Construction Ethics Education...........................20
Table 2.3. Meta-Framework of Professional Construction Ethics Education.......................21
Table 3.1. Usability Components Relative to the TESC ...................................................31
Table 3.2. Summary of Practical Procedures in Obtaining Think-Aloud Protocols ............33
Table 3.3. Participant Demographics ..............................................................................35
Table 3.4. Example Usability Issues Revealed by Think-Alouds .....................................37
Table 3.5. Results of Post-Think-Aloud Questionnaire ..................................................38
Table 3.6. P1 Pre-Pilot Feedback ....................................................................................39
Table 4.1. Available Ethical Sensitivity Tests ..................................................................53
Table 4.2. Embedded issues of the TESC ......................................................................57
Table 4.3. Sample Keywords/Phrases/Statements (and synonymous themes) used for Rating the TESC ...............................................................61
Table 4.4. Initial Item Analysis of the TESC .................................................................63
Table 5.1. Literature on Construction Ethics Education; expanded from Sands & Pearce (2014) ...........................................................82
Table 5.2. Sample Construction Programs’ Initial Summary Data....................................86
Table 5.3. Student Respondent Descriptive Data (n=174) .............................................87
Table 5.4. Faculty Respondent Summary Data .................................................................88
Table 6.1. Participant Programs’ Summary Data (Sands et al. 2014b) ...............................117
Table 6.2. Participant Programs’ Student Descriptive Data (n=173) (Sands et al. 2014b)....119
Table 6.3. Ethics Topic Coverage in Each Participant Program ......................................120
Table 6.4. Difficulty Assessment Levels .........................................................................121
Table 6.5. TESC Participant Difficulty Assessment .................................................................122

Table 6.6. Difficulty Assessment for Participants by Program of Enrollment ......................124

Table 6.7. Average Rank Placement of Participants by Program of Enrollment ..................127

Table 6.8. Steel-Dwass Multiple Comparisons Method for All Pairs
              Comparisons between Programs ..................................................................................128

Table 6.9. Average Rank Placement of Participants by Recollection of Ethics Inclusion .....128

Table 6.10. Average Rank Placement of Participants by Experience .................................129

Table 6.11. Average Rank Placement of Participants by Gender ........................................130

Table 6.12. Average Rank Placement of Participants by Age .............................................131
CHAPTER 1

Introduction

The construction industry has a significant influence on the U.S. economy (Abudayyeh et al. 2000; Ahn et al. 2012). According to the U.S. Bureau of Labor Statistics (BLS) (2014), the construction industry engages in building and engineering projects, and consists of three subsectors: construction of buildings, heavy and civil engineering construction, and specialty trade contractors. The construction industry involves many stakeholders and must treat each stakeholder fairly. However, the construction industry is plagued with unethical behavior (behavior that is misaligned with professional codes of ethics and accepted standards of practice) that affects these stakeholders in various ways. So much so, it is reported to be more corrupt than any other sector of the international economy (Transparency International 2005). Ethics is the set of guiding principles and the rules of conduct of a particular group, or organization that governs the actions of individuals in that group or organization (Fellows 2003). For this study, the governing group is the construction industry. Unethical conduct takes place at every phase of a construction project and it creates detrimental impacts both internal and external to the construction organization behaving unethically. Alternatively, positive gains are shown to be associated with ethical conduct and thus, it behooves construction organizations to behave in an ethical manner (Adnan et al. 2012; Archer and Verster 2011; Poon 2004).

A few recent examples from Engineering News Record (ENR) illustrate the extent of unethical conduct in the construction industry.

- Post (2012) illustrates the ethical issue of bullying and abuse by owner’s representatives and highlights how these representatives hurt the construction process from being too aggressive with contractors.
- Richey et al. (2012) illustrates the ethical issue of sexual harassment in the workplace. This article discusses cases of male-male and male-female sexual harassment cases in the US construction industry.
- Ichniowski (2013) illustrates the ethical issue of fraud, reporting that Caddell Construction Co. had to pay a $2 million penalty to settle criminal fraud charges, because it made false statements to the Department of Defense concerning another small, economically disadvantaged firm to which Caddell Construction Co. was supposed to be a mentor.
Judy (2013) reports a case that involved the U.S. Department of Veteran Affairs (VA). VA warned the construction company Brasfield & Gorrie, that its $300 million hospital contract will be terminated because of its, “failure to diligently pursue work, have sufficient workforce on-site to meet the extended contract completion date of summer 2013, and deficiency in the quality of work” (p. 14). This report highlights the ethical issue of poor performance and low quality of work by a construction company.

Gregerson (2013) illustrates another case of fraud by reporting that the EB-5 visa program, which allows foreign investors U.S. citizenship for substantial investment in the U.S., was exploited to perpetuate, “a large-scale investment scheme to exploit a federal visa program as a means to defraud investors seeking strong returns and a legal path to U.S. residency” (p. 9). The project’s developer is accused of fraudulently selling more than $145 million in securities and $11 million in fees to foreign investors.

The preceding examples from ENR highlight ethical cases that are of the U.S. construction industry. There are many other cases globally, and addressing the various issues of unethical conduct in the construction industry seems to be a difficult task. Various entities have undertaken numerous attempts to decrease unethical conduct in the construction industry. There have been attempts to curb unethical conduct by owners/clients and contractors. One such effort on the owner’s side has been the implementation of the Federal Acquisition Regulation (FAR) (GSA 2013). Subpart 3.10-Contractor Code of Business Ethics and Conduct of the FAR states, “government contractors must conduct themselves with the highest degree of integrity and honesty” and notes that unethical conduct can result in suspension or debarment from work.

Industry has also attempted to curb unethical conduct by its practitioners. Notable organizations such as the Construction Management Association of America (CMAA), the American Society of Civil Engineers (ASCE), the American Subcontractors Association (ASA), the Project Management Institute (PMI), the Associated Builders and Contractors (ABC) and the American Society of Professional Estimators (ASPE) all have a code of ethics (guidelines of professional conduct), which they expect their members to adhere to.
Additionally, an organization called the Construction Industry Ethics and Compliance Initiative (CIECI) which is a not for profit, private association, that brings together U.S. construction companies that are committed to the highest level of ethics and conduct compliance with the law to increase the ethical conduct of the industry, frequently share best practices to address ethics and compliance risks. Additionally, they have published a program blueprint for organizations for “creating and maintaining an effective ethics and business conduct program” (CIECI 2013).

Construction organizations are aware of the impacts ethical decisions have on their organization and highly regard this competency among the graduates they hire in ethical issues, defined as the conditions where there are alternatives of right and wrong decisions according to the profession of the construction industry (for the purpose of this study), of construction (Ahn et al. 2012). Additionally, accredited construction programs must teach ethics to their students. Accrediting agencies such as the American Council for Construction Education (ACCE) and the Accrediting Board of Engineering Technology (ABET) ensure the provision of ethics education in construction curricula with the agency of the construction programs that are being accredited.

**Problem Statement**

Construction programs must include some form of ethics education to satisfy both industry and accreditation requirements; however, no benchmark has been identified in construction education literature that addresses whether or not ethics instruction in construction education produces more ethically competent construction students. There is no guideline to teaching ethics in construction programs, and construction programs have a multitude of options to satisfy the construction industry and accreditation requirements. In order to understand ethics education in construction programs and its impact on construction students, there needs to be monitoring for continuous improvement on the relationship between them.
Purpose Statement

The discussion on ethics pedagogy and student knowledge and competency of construction ethics has begun in construction education research. This study seeks to continue this discussion by moving toward an understanding of the relationship(s) between construction ethics education in accredited construction programs and the impact of ethics education on the ethical sensitivity (the ability of an individual to recognize ethical issues of the construction industry) of construction students by answering the following questions:

RQ1: How is ethics taught in construction programs?
RQ2: What is the ethical sensitivity of undergraduate construction students regarding ethical issues of the construction industry?
RQ3: What is the relationship between ethics pedagogy and the ethical sensitivity of construction students regarding ethical issues of the construction industry?

The independent variable of this study is ethics education, and the dependent variable of this study is undergraduate construction students’ ethical sensitivity to professional ethical issues of the construction industry.

Conceptual Frameworks

This research employs two major conceptual frameworks. In reference to the independent variable ethics education, three components of Eash’s (1991) curriculum components framework are operationalized to gain a general understanding of ethics pedagogy in construction education, namely content, modes of transaction, and evaluation. In addition, this framework is used to develop a survey on how ethics is taught in construction curriculum. This survey is used to gain a deeper understanding of ethics pedagogy of participating construction programs.

To investigate the dependent variable of ethical sensitivity of construction students, the first component (moral sensitivity) of Rest’s (1994) four-component framework of ethical
decision-making or the course of action when faced with an ethical dilemma (for the purpose of this study), is operationalized to develop a means of testing ethical sensitivity of construction students. For this study, ethical sensitivity is defined as the ability of an individual to recognize ethical issues of the construction industry.

As the dependent variable for this study, Rest’s first component (ethical sensitivity) of the four-component model was chosen because it is the foundation for much research that tries to understand student ability to recognize ethical issues, and it is an established model for ethical decision-making when measuring ethical sensitivity. In addition, this component aligns with the purpose of this study, attempting to understand student ability to recognize ethical issues and not behavior. Rest (1994) suggests that someone may fail to act in an ethical way because, it just did not occur to that person that what he or she were doing (or could do) would affect others. Construction education may not be able to help students make a judgment on what to do, but it can help students understand what is unethical in the construction industry, and why.

**Research Objectives & Significant Tasks**

The over-arching goal of this research is to understand the relationship between ethics pedagogy and its influence on ethical sensitivity of construction students. Three objectives were addressed via performance of research tasks (see Table 1.1) in order to move toward an understanding of:

1. How ethics is taught in construction programs (ethics pedagogy),
2. The ethical sensitivity of construction students, and
3. The relationship between ethics pedagogy and the ethical sensitivity of construction students.
Table 1.1. Main Research Objectives & Significant Tasks Performed

<table>
<thead>
<tr>
<th>Objective #</th>
<th>Main Objectives</th>
<th>Significant Tasks Performed</th>
<th>Chapter(s) Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To move toward an understanding of how ethics is taught in construction programs</td>
<td>1.1 Reviewed curriculum flowcharts and program guides of construction programs for sample selection</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2 Reviewed accreditation and syllabi documents on ethics of participating construction programs</td>
<td>2 &amp; 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3 Developed how ethics is taught in construction (HETC) survey for faculty and students</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4 Administered HETC survey to undergraduate students and faculty to assist understanding on how ethics is taught in construction programs</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.5 Analyzed and reported findings on how ethics is taught construction programs</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>To move toward an understanding of the ethical sensitivity of construction students</td>
<td>2.1 Developed Test for Ethical Sensitivity in Construction (TESC)</td>
<td>2, 3, &amp; 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2 Tested the ethical sensitivity of undergraduate students of participating construction programs</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>To move toward an understanding of the relationship between ethics education and the ethical sensitivity of construction students</td>
<td>3.1 Compared the results of how ethics is taught in construction programs with student ethical sensitivity</td>
<td>6</td>
</tr>
</tbody>
</table>

Approach

The overall methodological approach of this research is mixed-methods. This approach allowed for the use of both qualitative and quantitative methods to address the research questions. The main population of the research is construction students; however, senior students (in the last year of their degree program) were targeted because they are more likely to have experienced more ethics pedagogy.

This dissertation follows a manuscript format, which includes a collection of stand-alone conference papers and journal ready manuscripts that will be submitted to peer-reviewed journals. Each manuscript contains a section that addresses the individual approaches used in that particular segment of the study. Each manuscript represents individual chapters. Each chapter is an essential component of this dissertation and some information necessarily repeats among chapters.
**Figure 1.1 – Manuscript Relationship Schematic of Dissertation:** Provides a schematic for manuscript interrelatedness and the following summarizes the dissertation’s organizations with a review of each chapter.

**Chapter 1 – Introduction:** Discusses the general area of research, problem statement, purpose statement, conceptual frameworks, research objectives, significant tasks performed, and the general approach used for this research.

**Chapter 2 - Toward a framework for construction ethics education: A meta-framework of construction ethics education topics:** This literature review manuscript presents the results of a qualitative content analysis of 65 non-educational research papers that closely relate themes of construction and ethical issues of the profession. Findings of this work highlight 101 unique ethical issues (topics) categorized into two emergent ethical themes (modules): professional issues and societal issues. The results of this paper assisted the development of the Test for Ethical Sensitivity in Construction (TESC) (chapter 4) and the survey on how ethics is taught in construction (chapter 5). Chapter 2 was presented and published in the proceedings of the 2014 Construction Research Congress.

**Chapter 3 - Utilizing think-aloud protocols to assess the usability of a Test for Ethical Sensitivity in Construction:** This methodological manuscript details the process taken to administer think-aloud sessions, develop think-aloud protocols, and discuss how the results assisted refinement of the TESC. The think-aloud sessions helped to improve the overall usability of the TESC, which is elemental to the test development process of the TESC discussed in chapter 4. Chapter 3 was presented and published in the proceedings of the 121st American Society of Engineering Education’s annual conference and exposition, 2014.

**Chapter 4 - Toward a technique of evaluating student ethical sensitivity to issues of the construction industry:** This test development manuscript discusses the details of the process to develop a Test for Ethical Sensitivity in Construction (TESC). The TESC is a technique to test the ethical sensitivity of construction students to ethical issues of the construction industry via qualitative responses.
**Chapter 5 - Ethics pedagogy in undergraduate construction curricula: A mixed-methods approach:** This manuscript discusses the approach taken to understand ethics education in construction programs and the development of a *How Ethics is Taught in Construction (HETC)* survey. This study uses both qualitative and quantitative means to gain a broad understanding of the content coverage, modes of transaction, and evaluation methods used in construction ethics education.

**Chapter 6 - Toward an understanding of ethics education’s influence on the ethical sensitivity of construction students:** This manuscript discusses the influence of construction ethics education on the ethical sensitivity of students enrolled in five different construction programs of study. This study illustrates how the HETC survey results, curriculum documents reviewed, and the TESC results was used to understand the influence of construction ethics education on the ethical sensitivity of construction students, to ethical issues of the construction industry.

**Chapter 7 - Conclusion:** This chapter summarizes the study, discusses key findings and conclusions of the dissertation. Recommendations for future research on construction ethics education are made. Limitations of this study are also discussed.
MANUSCRIPT 1 – CHAPTER 2
Toward a framework for construction ethics education: A meta-framework of construction ethics education topics [Literature Review & Content Analysis]

MANUSCRIPT 2 – CHAPTER 3
Utilizing think-aloud protocols to assess the usability of a test for ethical sensitivity in construction [Usability Testing for TESC]

MANUSCRIPT 3 – CHAPTER 4
Toward a technique of evaluating student ethical sensitivity to issues of the construction industry [TESC Test Development: Dependent Variable]

MANUSCRIPT 4 – CHAPTER 5
Ethics pedagogy in undergraduate construction curricula: A mixed-methods approach [Independent Variable]

MANUSCRIPT 5 – CHAPTER 6
Toward an understanding of ethics education’s influence on the ethical sensitivity of construction students

Figure 1.1. Manuscript Relationship Schematic of Dissertation

TESC = Test for Ethical Sensitivity in Construction
HETC = How Ethics is Taught in Construction
References


CHAPTER 2

Toward a framework for construction ethics education:
A meta-framework of construction ethics education topics

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Published in Proceedings of the 2014 Construction Research Congress, May 19-21, 2014, Atlanta, GA. Permission granted by the American Society of Civil Engineers (ASCE) to reproduce this work (August 2014).

Abstract: Research suggests that certain practices of the construction industry have left the construction profession with an unethical stigma. In order to curb such behavior, construction programs should provide students with an awareness of unethical practices of the profession as the first step towards ethical decision-making. The intent of this study is to suggest a topic-based meta-framework for teaching ethics to construction students, highlighting what non-educational construction research considers ethical topics. This study uses qualitative textual analysis to extract ethical topics from non-educational research from 65 research papers that closely relates themes of construction and ethical issues of the profession. Emergent themes (modules) based on topic extraction groups into two categories of ethical issues in construction practice professional issues and societal issues. It is the authors’ hopes that the list of ethical topics and modules developed are a source of inspiration for those educators honored with the duty to instruct.

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Introduction

Nature of Ethics in the Construction Industry

Unethical practices of the construction industry are so prevalent that Transparency International (2005) reveals that the construction industry is more corrupt than any other sector of the international economy. Furthermore, a study that surveyed unethical practices of the construction industry states, “the construction industry, in general, is tainted by prevalent acts that are considered unethical,” adding that it is “tainted by illegal acts (FMI, 2004).”

The construction industry is considered one of the most susceptible to unethical practices, which can take place at every phase of a construction project, i.e., during planning and design, pre-qualification, tender [bidding], project execution, and operation and maintenance (Adnan et al. 2012). Such practices can result in unnecessary, unsuitable, overly complex, delayed, and/or overpriced construction projects (Adnan et al. 2012). Factors that make the construction sector so prone to unethical behavior can include: competition for contracts, bureaucracy for obtaining official approval and permits, project uniqueness which makes price comparison difficult, opportunities for delays and overruns, and that most work is concealed with external finishes and cladding (Archer and Verster, 2011; Transparency International 2005). However, behaving unethically does not come without risk.

The internal effects of unethical practice on a construction organization can have lasting impacts detrimental to construction organizations such as “wasted tender expenses, tendering uncertainty, increased project costs, economic damage, blackmail, criminal prosecutions, fines, blacklisting and reputational risk” (Adnan et al. 2012). This assertion fans the flame of the belief that the construction industry is one that is dangerous, ‘macho’, and opportunistic (Fellows 2003).

Alternatively, increasing awareness to ethical issues and the ethical practice of a construction organization may increase financial returns to organizations, e.g., from repeat business and increased client level of trust (Poon 2004). Considering the negative impacts of unethical behavior and positive impacts that ethical behavior can have on a construction organization, it is important that each member of an organization be aware of ethical issues that may arise in practice, especially neophytes of the profession who may be susceptible to the manipulation of ‘common practice.’
Ethics and Morality as a Concept

Ethics, relative to morals (personal values that drive ethical behavior) and moral science, can be defined by the moral principles or system of a particular school of thought. It can also be thought of as the moral principles by which any particular person is guided; the rules of conduct recognized in a particular profession or area of human life; or the system of moral values by which the rights and wrongs of behavior are judged (Fellows 2003).

An alternative definition asserts that ethics is a branch of philosophy for the study and understanding of morality, moral principles, and the moral decision-making process, in particular the varieties of thinking by which human conduct is guided and may be appraised. Ethics refers to a code or set of principles by which people live (Fan and Fox 2009), whereas morality is not a simple set of rules, but a complex struggle of conflicting patterns of values.

Alternatively, ethics deals with the good and bad or right and wrong in human conduct (Ray et al. 1999). It is very hard to define a standard way to become a “good” person. The standards of ethics tend to change in different environments and different times. You can claim that you do something ethical in one situation, but it may be unethical in another. Therefore, one who battles over the conflict of right and wrong is a philosopher of ethics (Fan and Fox 2009), even students. For the purpose of this paper, adopting Fellow’s (2003) definition, ethics are associated with the rules of conduct recognized in a particular profession or area of human life.

Ethics and the Profession

From its philosophical foundation, and beyond individual ethical philosophy, the general concepts of ethics are applicable in business. Business exists not solely to suit certain individuals, but it serves society and meets collective and individual needs of society and the environment in general (Vee and Skittmore 2003), even in the business of construction.

The unique nature of the construction industry lends itself to cross many ethical branches. Some of these various branches include environmental ethics (King 2008), professional ethics (Abdul-Rahman et. al 2010), rule ethics, social and social contract ethics (Dabson et al. 2007), and business ethics (Ho 2010) among others. The variety in ethical philosophy can help students understand the foundation of ethical theory, but the instruction of philosophy may not provide all the information students will need to be aware of construction related ethical dilemmas.
Purpose Statement

The purpose of this exploratory qualitative research study is to extract the array of ethical topics related to the construction industry, and to contribute to the conversation and body of knowledge on global construction ethics education, with an added aim of inspiring educators honored with the duty to influence student morality.

Construction Ethics Education

The purpose of higher education in the field of construction is to prepare future practitioners for the construction professional environment; however, it is just as important that students possess the knowledge of their moral obligations to society (Robertson 1987). Unfortunately, “ethics education of young professionals within the built environment is perhaps not recognized as fundamentally important and thus receives less attention than it should [in construction curricula]” (Archer and Verster 2011). This belief is misaligned with a study by Ahn et al. (2012) where 14 key competencies of construction graduates are ranked by U.S. construction organizations, in which competency in ethical issues was ranked the highest by construction organizations. Supporting this, Scalza (2008) affirms that our students graduating into this 21st century global market must understand ethics in the construction industry, and Kang et al. (2006) highlights that [construction] organizations, particularly those operating internationally, are increasingly recognizing the importance of ethics to their workplace and business dealings.

With the insight of Ahn et al.’s (2012) study and the assertions by Scalza (2008) and Kang et al. (2006), construction educators need to have a source outlining the ethical issues that face the construction industry. This source needs to help educators make students aware of ethical issues they may encounter in the profession, toward the betterment of the construction organization at large. The task to make students aware of construction related ethical issues is “particularly difficult given the traditional mindset of technically trained professionals who may view social impact and ethical issues as ancillary topics compared to foundational material” (Sinha et al. 2007). Various construction researchers have focused on adding to the construction ethics education body of knowledge, not only providing ways to include ethics in construction curriculum, but also attempting to present important topics.
Ethical Issues per Construction Ethics Education Research

A collection of prior literature that grounds itself in construction ethics education introduces various ways to teach ethics in a construction curriculum. Included in the research are various topics that may be part of a construction program, as part of its ethics education (see Table 2.1).

**Table 2.1. Ethics Topics Provides Construction Ethics Education Research**

<table>
<thead>
<tr>
<th>Reference(s)</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degn and Miller 2003; Ohrn 2002; Scalza 2008</td>
<td>Bid Shopping</td>
</tr>
<tr>
<td>Ohrn 2002;</td>
<td>Bid Peddling; Front-End Loading; Payment Delays; Modification of Lab Results</td>
</tr>
<tr>
<td>Scalza 2008;</td>
<td>Bid Rigging/Collusion/Price Fixing; Owners Duty to Act in Good Faith; Work Schedule Games Tied to Payment Schedule; Change Order Games; Licensure; Privileged Info</td>
</tr>
<tr>
<td>Scalza 2008; Tepper 1994</td>
<td>Safety</td>
</tr>
<tr>
<td>Darwish et al. 2010; Darwish et al. 2011;</td>
<td>Sustainability</td>
</tr>
<tr>
<td>Killingsworth 1992; Ohrn 2002; Robertson 1987; Slattery 2006</td>
<td>Codes of Ethical Conduct/ Practice</td>
</tr>
<tr>
<td>Sinha 2007</td>
<td>Construction Law and Contracts; Legal Systems &amp; Maxims of Law; Societal Values and Morality; Professional Practice and Employer Obligations</td>
</tr>
<tr>
<td>Mulligan 1991;</td>
<td>Hazardous Waste/Pollution</td>
</tr>
<tr>
<td>Mulligan 1991; Kang et al. 2006</td>
<td>Culture/Multi-Culturalism</td>
</tr>
<tr>
<td>Scalza 2008;</td>
<td>Professional Ethics in General</td>
</tr>
<tr>
<td>Jackson and Murphy 1998;</td>
<td>Honesty/Integrity/Falsification of Documents; Negligence;</td>
</tr>
<tr>
<td>King et al. 2008</td>
<td>Adherence to Building Codes and Regulations</td>
</tr>
</tbody>
</table>

**Moving Forward**

The various ethical topics presented in Table 2.1 are not consolidated into such a source for construction ethics education research that may be found useful for educators. Thus, following the steps of construction ethics implementation by Killingsworth (1992), researchers must first “canvas industry and faculty to identify appropriate ethical topics and standards.” To address this, the authors seek to answer the question: what are the global ethical topics included
in non-instructional/educational ethics research, which can serve as topics to teach ethics in a construction curriculum?

Answering this question will address the first stage to canvassing the industry by investigating research studies that relate to construction industry ethical issues on a non-educational/instructional basis. An additional effort will be necessary to survey faculty and industry partners to identify appropriate ethical topics and standards.

Research Design

Theoretical Framing

The theoretical framework for the broader study is based on Rest’s (1984) four-component ethical decision-making (defined as the course of action when faced with an ethical dilemma for the purpose of this study) model that draws heavily on theories of cognitive moral development (CMD) and includes:

- **Moral Sensitivity** – interpreting the situation as being moral
- **Moral Judgment** – deciding which course of action is morally right
- **Moral Intent** – prioritizing moral values over other values and
- **Moral Behavior** – executing and implementing the moral intention

This study focuses on the *moral sensitivity* component of Rest’s (1984) model. Moral sensitivity in essence involves “imaginatively constructing possible scenarios, and knowing cause-consequence chain of events in the real world; it involves empathy and role-taking skills” (Rest 1994). This paper serves as the first step toward the attempt to increase students’ ability at moral imagination and recognition. Rest (1994) suggests that someone may fail to act in an ethical way because it just did not occur to that person that what he or she were doing (or could do) would affect others. Construction education may not be able to help students make a judgment on what to do, but it can help students understand what is unethical in the construction industry, and why.
Methodology

The research methodology employs Glaser and Strauss’ grounded theory approach and its
textual analysis subset to identify and extract key topics of ethics in the construction (Glaser and
Strauss 2009). The use of this methodology allows for the presentation of a three-tier framework
exemplifying three of the four stages of grounded theory research methodology, including open
coding (topic extraction), conceptual grouping (module development), and broader category
emergence.

Sampling

The sample for this research study was obtained by identifying non-
educational/instructional ethics research papers that are specifically tied to themes of
construction and ethical issues of the profession. The sample was garnered systematically from
database searches of construction related journals, and additionally via Google Scholar using the
keywords: construction, industry, ethic, and moral. Of this search, 91 scholarly articles were
identified. Of the scholarly papers, 26 were screened from the analysis because of papers’
inability to closely relate the construction industry to its ethical issues. Additionally, papers were
screened from the analysis if they were not obtained from a reliable source such as a peer-
reviewed journal, or a conference proceeding. Thus, 65 non-educational/instructional research
papers were used for this study.

The papers used for analysis present topics that span the globe. Studies on ethical topics
in the construction industry came from the majority of continental regions. This ensures global
representation of construction industry related ethical topics. The papers presented issues of the
construction industry from research papers around the world. These papers highlight the impacts
of unethical behavior in the construction industry through various forms of ethical perception
studies, ethical ranking studies, case studies, and discussions

Analysis

The authors used Atlas.ti, a Computer-Assisted Qualitative Data Analysis Software
(CAQDAS) in order to code for descriptors, i.e., type and regional orientation of the study, and
ethical topics. First level open-coding was performed for descriptors, then for ethical topics
(extraction). Topics extracted were coded once per research paper, as numerical occurrence was irrelevant to the study.

Initial codes/extracted topics were consolidated and reduced to thematic codes (modules) that were of similar context (Creswell 2012; Miles and Huberman 1994) via subjective reasoning. The qualitative analysis ended at the third (categorical) phase of the grounded theory process.
Content-Based Meta-Framework

The content-based meta-framework posited to add to the larger framework of teaching ethics to construction students is based on construction related issues that should be covered in a construction curriculum, i.e., a profession-specific framework. The meta-framework lists the major categories, concepts, and topics that lend themselves to inclusion in construction curricula via two categories of topics: societal (see Table 2.2) and professional (see Table 2.3).

Table 2.2. Meta-Framework of Societal Construction Ethics Education

<table>
<thead>
<tr>
<th>Category</th>
<th>Module</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Responsibility</td>
<td>Benevolence; Consideration of Public Welfare; Waste of Public Resources; Deterioration of Public Economy;</td>
<td></td>
</tr>
<tr>
<td>Social Environment</td>
<td>Minority, Race, &amp; Gender Discrimination; Harassment (in general e.g., sexual or otherwise); Derogatory Name Calling; Disrespectful Behavior; Racist Graffiti; Racist Jokes; Rumors; Cultural Norms &amp; Divides;</td>
<td></td>
</tr>
<tr>
<td>Sustainability &amp; The Environment</td>
<td>Carbon Footprint; Degradation of Urban, Suburban, and Rural, Ecological Sustainability; Energy Efficiency; Water Use; Environmental Protection; Pollution; Global Warming; Ethical Construction Products; Recycling; Toxic Waste Dumping; The Triple Bottom Line of Business;</td>
<td></td>
</tr>
<tr>
<td>Safety &amp; Health</td>
<td>Occupational Health; Injury and Fatalities (direct and indirect result of immediate practice); Dangerous Working Conditions; Safe Products;</td>
<td></td>
</tr>
<tr>
<td>Human Resources</td>
<td>Child Labor; Employee Substance Abuse; Employee Use of Company Resources for Personal Gain; Illegal Migrant Work; Internal Fraud by Employees; Unfair Labor Practices</td>
<td></td>
</tr>
</tbody>
</table>
Table 2.3. Meta-Framework of Professional Construction Ethics Education

<table>
<thead>
<tr>
<th>Category</th>
<th>Module</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional</td>
<td>Project Administration</td>
<td>Absenteeism; Abuse of Client Resources; Corner Cutting; Defective Works; Use of Inferior Material/Equipment (Poor Quality Control); Front-End Loading; Improper Inspections (overlooking defects in work by jurisdiction); Negligence; Poor Documentation; Project Abandonment; Under Delivery of Work; Use of Unqualified Subcontractors/Suppliers; Use of Specialist Knowledge to Mislead Client;</td>
</tr>
<tr>
<td></td>
<td>Procurement</td>
<td>Biased Bid/Tender Evaluation System; Bid Cutting; Bid Rigging/Collusion (Price Fixing); Price Gouging; Bid Peddling; Bid Shopping; Compensation of Bid/Tender Cost; Cover Pricing; Bid Withdrawal; Deceptive Advertisements; Use of Joint Ventures to Increase Satisfaction of Prequalification Requirements; Over-Promising; Unfair Competition; Unfair Contract Terms with Subcontractors;</td>
</tr>
<tr>
<td></td>
<td>Owner Influenced</td>
<td>Bid/Tender Acceptance after Closing Date; Wasted Bid/Tender Expenses from Owner/Contractor Abuse of Services; Rejection of Low Qualified Bid; Reverse Auctions; Unfair Contract Terms with Contractor;</td>
</tr>
<tr>
<td></td>
<td>Legal/Legislative</td>
<td>Asset Misappropriation; Theft; Embezzlement; Compliance with Law; Criminal Activities/Law &amp; Prosecutions; Federal Antitrust Laws; Construction Quality Assurance Act;</td>
</tr>
<tr>
<td></td>
<td>Fraud</td>
<td>No/Low Competence of Work/Falsification of Experience; Overstating Capacity;</td>
</tr>
<tr>
<td></td>
<td>Financial Corruption</td>
<td>Payment Game; Change Order Game; Claims Games; Fictitious Invoices (Payment Application/Certificates of Payment); Hidden Fees and Commissions; Over-Claiming Expense; Overcharging;</td>
</tr>
<tr>
<td></td>
<td>General Corruption</td>
<td>Blackmail; Bribery; Client Entertaining/Improper Relations with Client; Coercion &amp; Threats; Kickbacks; Conflicts of Interest/Improper Political and Community Involvement; Non-Transparency; Political Lobbying; Reciprocity; Greed; Self-Centrism; Trade Secrets;</td>
</tr>
<tr>
<td></td>
<td>Remediation</td>
<td>Whistleblowing; Maintaining Ethical Standards; Ethical Corporate Culture; Quality Driven Agenda; Trust Based Partnering; ‘Uberrimae Fidei’; Honesty</td>
</tr>
</tbody>
</table>

Discussion

Findings

The study yields a variety of unethical problems that may be experienced by future construction practitioners, which can be societal or professional in nature. Societal topics are those that impact society, whether it is internal to the company (i.e., human resources) or external (i.e., environmental considerations). Professional topics are those that can or may be experienced because of organizational behavior, such as during the course of business. Each category breaks down into various associated thematic codes/modules and even further into topics.
The five societal modules include social responsibility, social environment, sustainability, safety and health, and human resources. Exemplar topics of these modules include benevolence, discrimination, pollution, occupational health, and child labor use. Additionally, eight modules of professional practice emerge that include unethical topics of project administration, procurement, owner influenced behavior, legal/legislative issues, general corruption, fraud, finance, and remediation of professional ethical issues. Exemplar topics out of which modules develop include negligence, bid shopping, rejection of low qualified bid, asset misappropriation, falsification of experience, payment games, bribery, and whistleblowing.

Conclusion

Construction education must make students aware of ethical issues of the construction industry. To behave ethically, students must possess the ability to recognize ethical issues. Educators are not certain of employment designation and global location of future practitioners. It is important to make students aware of global ethical issues in all construction employment capacities.

A plethora of topics have been identified that can equally qualify as topics in ethics for a construction curriculum, ranging from absenteeism to unfair labor practices. Important to this study is the emergence of the various modules (themes), as each individual topic of these modules cannot be covered to saturation in a tight curriculum. These modules highlight concepts useful to course development as a checklist to educators who share the opinion that construction ethics education is continuous and should be spread throughout various courses in curriculum.

Final Thought & Future Research

The authors anticipate that this study will provide inspiration for construction educators. The study intends to be a benchmark toward the development of a framework of construction ethics education in the professional environment. The difficulty lies in answering, how to implement these topics in a construction curriculum, and with what depth and time should topics be presented? Additionally, what pedagogical techniques are best to present these topics?

Further investigation is necessary to answer these questions. Additionally, the identification of the unique aspects of stakeholder consideration, additional ways to curb unethical behavior in construction practice, ethical leadership in the construction industry, and
general ethical philosophy are necessary studies to follow and add to this framework. Lastly, the most critical and current issues of the industry needs to be determined. One way may be to survey industry professionals regarding their experiences with the ethical issues found herein.

References


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CHAPTER 3

Utilizing think-aloud protocols to assess the usability of a test for ethical sensitivity in construction

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Abstract: Unethical conduct in the construction industry has been so prevalent that research has revealed it is one of the most-corrupt industries in international business. Additionally, accredited construction programs are expected to provide professional ethics instruction to its students to meet the standards established by the profession. However, no assessment tool measuring a student’s ethical sensitivity to professional issues in construction exists to determine whether this instruction improves student recognition of ethical issues of the construction industry. The purpose of this paper is to outline the use of think-aloud protocols in assessing the usability of a test instrument, the Test for Ethical Sensitivity in Construction (TESC). This paper details the process taken to develop and administer think-alouds. This paper also discusses the results of the think-alouds administered and how the results assisted refinement of the TESC. The think-aloud sessions helped researchers improve the usability of the TESC, making revisions that accounted for mechanical or structural and cognitive issues of the instrument. It was found that think-aloud sessions improved the TESC by helping to improve terminology, remove extraneous information, understand the length of time required to complete the TESC, and improve the scoring rubric.

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Introduction and Motivation

Unethical conduct in the construction industry is so prevalent that a non-governmental organization that monitors and publicizes corporate and political corruption in international development, discloses that the construction industry is more corrupt than any other sector\(^1\). The FMI Corporation performed a survey for the Construction Management Association of America (CMMA) and reports, “the construction industry, in general, is tainted by prevalent acts that are considered unethical,” adding that it is “tainted by illegal acts”\(^2\).

As part of the effort to curb unethical behavior, mandates of construction accrediting bodies have instituted requirements for literacy of ethics in the curriculum. The American Council for Construction Education (ACCE) requires ethics integration in construction curriculum (at least one semester hour). The ACCE also states:

In addition, oral presentation, business writing, and ethics must be integrated throughout the construction-specific curriculum. Example courses in this division include: Human relations, psychology, sociology, social science, literature, history, philosophy, art, language, political science, and other appropriate courses.\(^4\)

Additionally, the Accreditation Board for Engineering and Technology (ABET) has ethics education requirements for construction programs. In the 2012-2013 ABET criteria for accrediting engineering programs, two students’ outcomes of the list labeled (a) through (k) relate directly to ethics education and states that students should possess:

\[(c)\] an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability and

\[(f)\] an understanding of professional and ethical responsibility.\(^5\)

Accredited construction programs must include some form of ethical component to satisfy both the construction industry and accreditation requirements; however, no benchmark has been identified in construction education literature that addresses whether ethics instruction in construction education actually produces more ethically sensitive professionals. Furthermore, there is no standard to teaching ethics in construction education and programs have a multitude of options to satisfy the construction industry and accreditation requirements. In order to address this, we must investigate ethical competencies of construction students. In order to assess the
competencies of construction students, an instrument was developed to measure the minimum competency in ethical conduct, i.e., the ethical sensitivity of construction students.

Ethical sensitivity is derived from Rest’s four component model of cognitive moral development which includes: *moral sensitivity*, moral judgment, moral intent, and moral behavior. Component one, moral sensitivity, involves “imaginatively constructing possible scenarios, and knowing cause-consequence chain of events in the real world; it involves empathy and role-taking skills”⁶. For the purpose of this paper, ethics are associated with the rules of conduct recognized in a particular profession or area of human life and morals are associated with personal values that drive ethical behavior⁷. Adopting Rest’s moral sensitivity (personal) component and placing it in an ethical context (professional group based) specifically for the construction industry, for the purpose of this paper, the term ethical sensitivity shall refer to the ability of an individual to recognize ethical issues of the construction industry.

**Operationalizing Ethical Sensitivity to Test Student Ethical Sensitivity**

To investigate the ethical sensitivity of construction students, a test was developed called the Test for Ethical Sensitivity in Construction (TESC). This test is modeled after Clarkebum’s Test for Ethical Sensitivity in Science (TESS), which takes an open-ended questionnaire response approach to investigate the ethical sensitivity of university science students⁸. Such a test allows for qualitative spontaneous recognition of ethical issues that cannot be observed with check box methods of ethical sensitivity investigation.

The TESC is an eight-vignette qualitative response test for students in the construction industry with an original intended time of completion of 20 minutes. The TESC situates students in a mental avatar with the following original scenario:

*You recently graduated and have been hired as a project engineer for Solid Construction, an established medium-sized commercial construction company in the US. As an entry-level employee, you must participate in a rotation program so that you are involved in various company operations.*

The original eight-vignette test was developed from ethical concepts that are known issues in the construction industry. The test embedded 14 issues of the construction industry into the eight vignettes (i.e., 14 pilot test items). The 14 issues were: claims games, collusion, bid shopping, bid peddling, theft, abuse of client resources, unfair labor allocation through overtime,
labor issues, front-loading, payment games, low competence of work performance, improper client relations, use of joint ventures to increase satisfaction of pre-qualification requirements, and bid rigging.

Response generation of the TESC requires students to read and reflect on the vignette and provide three statements or questions regarding each vignette. It is expected that within three statements or questions, a student would be able to identify the issue, or write statements or questions that showed a level of discomfort with the issues embedded in the vignette. Student response rating is based on a three level scoring rubric, indicating the level of student ability to recognize an issue:

- Score of 0 = Inability to recognize issue
- Score of 1 = Unable to name issue but demonstrates unfavorable response to issue
- Score of 2 = Ability to recognize issue by name or thoroughly demonstrates unfavorable response to issue with explanation

**Problem Statement/Aim**

As a new instrument, the TESC requires refinement, review, and pilot testing. Certain unknowns of a new instrument need to be addressed. Is the TESC clear? How long will it take to administer the TESC? Essentially, instrument developers need to know the usability of the TESC prior to pilot testing. The aim of this paper is to answer these questions using the verbal report (i.e., think-aloud protocols) and to discuss benefits of testing the usability of an instrument.

**Literature Review**

**Conceptualizing the Think-Aloud**

The think-aloud is a type of verbal report method where useful research data is obtained via elicitation of test taker vocalization of self-generated ‘symbols’ while he/she performs a given task. The data elicitation method is referred to as ‘thinking aloud’ or ‘concurrent verbalization.’ This vocalization occurs at three different levels, vocalization of covert articulatory or oral encodings, description/explication of the thought content, and explanation of the thought processes or thoughts. The written transcripts of the verbalizations are called think-aloud protocols.

Adding to this, the think-aloud is an approach to cognitive assessment of a test taker, whereby test administrators are able to observe the thought processes of the test taker while
performing a task (e.g., completing a test). It has been posed as a qualitative research tool designed to highlight test takers’ thought processes during the administration of a test. Additionally, think-alouds can yield valuable insights concerning perception, interpretation, and responses to test items\(^\text{12}\) (p. 274).

**Usability Testing and the Think-Aloud of the TESC**

Assurance of instrument rigor should involve tests of usability. The most widely accepted definition of usability is from the International Organization for Standardization (ISO 9241-11), which defines it as, “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”\(^\text{13}\) (p.1).

By another definition, usability is the ability of a user of a product to do what he or she wants to do with the instrument the way he or she expects to do it without hindrance, hesitation, or questions\(^\text{14}\) (p.4). For this paper, usability is the ability of test takers to complete the TESC as intended by the researchers with ease and efficiency. Satisfaction of the components of usability is important to rigorous data collection and results of actual TESC administration post piloting the TESC. Think-alouds are widely used for usability testing in various fields\(^\text{15}\) (p. 339) and are an essential element in achieving good results from small changes\(^\text{16}\). Barnum situates think-alouds for usability testing and identifies the key elements of a think-aloud protocol in usability tests as having the following:

1) *Defining the user profile*
2) *Creating task-based scenarios*
3) *Using think-aloud processes*
4) *Making changes and testing again*\(^\text{16}\)

To be usable, an instrument must possess the ability of being useful, efficient, effective, learnable and satisfying \(^\text{14,16,17}\). For the TESC, relevant components of usability require satisfaction prior to piloting. Table 3.1 summarizes each component of usability in general and how it relates to the TESC. As related to the TESC, each of these key elements will be discussed in another section.
Table 3.1. Usability Components Relative to the TESC\textsuperscript{14}

<table>
<thead>
<tr>
<th>Component of Usability</th>
<th>In General</th>
<th>The TESC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usefulness</strong></td>
<td>Degree to which a product enables a user to achieve their goal/willingness to use the product/ease of use</td>
<td>The ease in which students complete the TESC</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>The quickness with which the user can accomplish their goal</td>
<td>The time in which the students complete the TESC</td>
</tr>
<tr>
<td><strong>Effectiveness</strong></td>
<td>The extent to which the product behaves in the way users expect it to</td>
<td>The construct validity of the TESC</td>
</tr>
<tr>
<td><strong>Learnability</strong></td>
<td>As part of effectiveness, refers to the user’s ability to operate the system at some level of competence after training</td>
<td>Essentially, it is expected that training involves ethics education and thus the TESC should not require additional education to complete since the TESC is structured as a short answer test that students should be accustomed to</td>
</tr>
<tr>
<td><strong>Satisfaction</strong></td>
<td>User’s perception, feelings, and opinions of the product, usually captured through both written and oral questions</td>
<td>The follow-up survey post-TESC think-aloud provides satisfaction data</td>
</tr>
</tbody>
</table>

**Operationalizing the Think-Aloud in Research**

There are different procedures of the think-aloud that use various protocols to gain certain results; however, they tend to follow a general approach\textsuperscript{12} (p. 274). This general approach has been used in a variety of disciplines for a variety of purposes. The think-aloud has been used in adjustment studies\textsuperscript{20,21}, clinical intervention\textsuperscript{23,24}, translational process research\textsuperscript{25,26}, cognitive psychology\textsuperscript{10,12}, and library studies\textsuperscript{15} as well as a host of other research studies.

**Exemplar Think-Alouds in Engineering Education**

In engineering education, various studies used think-aloud processes. A study by Atman and Bursic utilized the think-aloud protocol as a tool to document the processes engineering students use to approach design problems. The study was administered to two freshman engineering students and differences in approach to completing a design problem were documented. The study concluded that verbal protocol analysis (i.e., think-alouds) is a powerful tool for design process assessment.\textsuperscript{26}

Additionally, a study by Trenor and colleagues argues that the advantage of the think-aloud is to provide evidence that survey items are interpreted by participants as the test administrator intended, i.e., cognitive validity or construct validity. This study posed a cognitive
validation model for use by engineering education researchers in survey design. Operationalizing the model, this study used ten participants across three iterations of think-alouds to see how they respond to taking a web-based survey identifying and quantifying engineering undergraduates’ access to and activation of social capital in making decisions about entering and persisting in engineering. It was found that issues of the survey ranged from grammatical errors to “serious cognitive mismatches,” which caused issues with interpretation and responses.\(^9\)

**The Think-Aloud Protocol**

Think-alouds range in type based on its intended use. There is no archetype protocol for conducting think-aloud sessions. Literature provides general points of consideration for hosting a think-aloud session which can keep the session in line with the intended purpose. Some guiding principles include telling the participant to voice confusion and to assure that the participant knows that the instrument is being evaluated and not the participant. Additionally, literature suggests that if a participant struggles with the test, the researcher should probe with particular questions to help fully understand the thought processes of the participant\(^9,27,28\). However, the protocol used for this study is minimally intrusive and does not probe participants with questions during the think-aloud sessions.

Adding to these key principles, Van Someren and colleagues outline the practical procedures in obtaining think-aloud protocol data as summarized in Table 3.2\(^29\).
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting</strong></td>
<td>• Ensure subject is at ease, room is quiet, water is available&lt;br&gt;• Focus should be on tasks with limited interference by experimenter for influence&lt;br&gt;• Explain the purpose of research, protection/confidentiality of data, and that the interest is in the way problems are completed (the instrument) and not the ability of the test taker</td>
</tr>
<tr>
<td><strong>Instructions</strong></td>
<td>• Give instructions about the task, i.e., perform the task and say out loud what comes to your mind&lt;br&gt;• Avoid elicitation of opinions, i.e., asking the participant to tell you what they think&lt;br&gt;• Avoid making the instructions too long</td>
</tr>
<tr>
<td><strong>Warming Up</strong></td>
<td>• Allow participant time to practice thinking aloud&lt;br&gt;  o Assists in getting participant to verbalize thoughts and get comfortable with the task</td>
</tr>
<tr>
<td><strong>Behavior of the</strong></td>
<td>• Experimenter should be restrained&lt;br&gt;• Interfere ONLY when participant stops talking&lt;br&gt;• If interference is required, experimenter should at most say: ‘Keep on Talking’</td>
</tr>
<tr>
<td><strong>Experimenter Prompting</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Recording</strong></td>
<td>• Think-alouds are typically recorded&lt;br&gt;• Check and recheck your instrument prior to starting session&lt;br&gt;• Inconspicuously check your instrument periodically to ensure that it works</td>
</tr>
<tr>
<td><strong>Transcription of the</strong></td>
<td>• Transcribe the session as verbatim as possible and code from transcription, not directly from audio tape&lt;br&gt;• Everything in the session should be typed out (even interruptions as they influence results)&lt;br&gt;• Note recognizable pauses and unusual silences in transcription by using dote, i.e., ‘I guess…the answer’&lt;br&gt;• Avoid unwarranted interpretation</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Review</strong></td>
<td>• When possible, reviewing protocol with participant can provide very useful information, especially when protocols are difficult to interpret&lt;br&gt;  o If review will be done, do it as soon as possible after the think-aloud session</td>
</tr>
</tbody>
</table>

*Table 3.2. Summary of Practical Procedures in Obtaining Think-Aloud Protocols*
Methodology

Situating and Using the Think-Aloud Protocol

The creation of a test is the “product of the thoughtful and sound application of established principles of test development,”\textsuperscript{12} and the test development process involves five fundamental stages as outlined in Figure 3.1.

![Figure 3.1. The Test Development Process\textsuperscript{12}](image)

Additionally, Trenor and colleagues summarize literature and present a model for the instrument development process that highlights the concept of survey instrument cognitive validation. This model, in conjunction with the test development process, inspired the TESC instrument development process employed by this study (see Figure 3.2).

Participants

For the think-aloud sessions, three student participants were purposefully selected. The small representative sample size that was selected for the think-alouds is similar to other qualitative methods, seeking rich, in-depth data from a small sample\textsuperscript{30} (p.432). Additionally, research has found that the first three participants generally detect the most-severe problems of usability, while additional participants are less likely to detect additional issues, and running fewer sessions saves time and money\textsuperscript{9,31}.

![Figure 3.2. Think-Aloud Protocol in Context to the Development of the TESC](image)

(Derived from Trenor and colleagues\textsuperscript{9})
Recruitment

Student participants were initially recruited without promise of compensation; however, gift cards for lunch were provided at the end of the session for the participants’ time and contribution to the study ($15 Panera Bread Gift Cards). The main consideration for recruitment was the student enrollment and class standing in a construction/construction engineering program. Special consideration was made to ensure two students were seniors, because the intended population of interest for the TESC is senior students who are expected to have thorough knowledge of construction ethics based on program requirements (see Table 3.3 for participant demographics).

Table 3.3. Participant Demographics

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Participant 1 (P1)</th>
<th>Participant 2 (P2)</th>
<th>Participant 3 (P2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program of Study</td>
<td>Construction Engineering</td>
<td>Building Construction</td>
<td>Building Construction</td>
</tr>
<tr>
<td>Student Standing</td>
<td>Senior</td>
<td>Junior (4th Year)</td>
<td>Senior</td>
</tr>
<tr>
<td>Age</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
</tbody>
</table>

Administration of the TESC Think-Aloud Sessions

Following the practical procedures of the model as provided by Van Someren and colleagues, with slight modifications, the following sections describe and discuss the TESC think-aloud procedures:

Setting(s)

The physical settings for hosting the think-aloud sessions were quiet spaces for recording with conditions conducive for test taking. To ensure participants’ comfort, statements of purpose, their rights and administrator behavior were explained. Participants were advised that this was a test of the instrument and not of their ability. They were also advised that if they felt uncomfortable, they could discontinue the session at any time. The participants were encouraged to ask questions during the think-aloud, but warned that the administrator would not answer questions.

Additionally, participants were warned that the administrator would be checking the time frequently, and this should not be misconstrued as being rude, but rather simply to collect data. Lastly, participants were warned about prompts when there is a lull in the session. Instead of verbally prompting participants to keep talking, participants were advised that taps on the desk (with example tapping) would be an indicator for them to keep talking.
Instruction(s)

Participants were verbally instructed to say aloud whatever came to their mind during the process of performing the TESC. Due to the nature of the TESC, the participants were asked to express any questions or concerns about the instrument during the session but were told that the administrator would not be allowed to answer them. In addition, participants were told that the administrator would not tell them when the session is complete or when to stop providing responses to the TESC, and that they must determine this on their own.

Warming Up

In order to warm up, a simple exercise for thinking aloud was used. Participants were asked to spend a minute describing the room where the think-aloud session was held. The method employed is different from the task and was intentional, as the administrator did not want to hint at the type of task the participant would be performing.

Behavior of Observer

During the think-aloud, the administrator of the TESC was minimally intrusive, only prompting participants to continue talking via desk taps. The observer also avoided looking at the participant and attempted to take limited handwritten notes to avoid distracting the participant.

Recording

The think-aloud session was recorded with an audio recording device.

Transcription of the protocol

The protocol was immediately transcribed from the audio recording with as many audio cues transcribed as possible.

Revision and Feedback

After each session, the TESC was revised to account for issues discovered during the session. Issues were resolved and changes were made after the first think-aloud and prior to administering the next think-aloud session (see Table 3.4). After completion of three iterations
of think-aloud sessions and prior to pilot testing the instrument, Participant P1 was asked to review the final version of the TESC and provide feedback.

Results

The outcomes of the think-aloud sessions revealed various usability issues with the TESC (see Table 3.4 for examples of issues revealed). Issues participants revealed during the think-aloud sessions were mechanical/structural issues (S) (typos, grammar) and/or cognitive (C) (relative information not recalled) issues, with the cognitive issues being more severe.\(^9,27\) Cognitive issues may impact a student’s ability to correctly respond to the vignettes of the TESC. For the TESC, cognitive issues were more prevalent than structural issues. Seven cognitive issues were found with the TESC (see Table 3.4).

Think-aloud sessions also revealed attributes of the TESC that were simply indeterminable during initial survey construction. The attributes included time to complete, determination if participants answer as intended, and elicitation of affective reasoning in processing responses.

**Table 3.4. Example Usability Issues Revealed by Think-Alouds**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Revealed Issues</th>
<th>Correction Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>(C) Project specifications too specific, distracts intent of vignette[s]</td>
<td>Changed specific project from airport renovation to simply ‘renovation’ for vignettes 1-5</td>
</tr>
<tr>
<td></td>
<td>(C) Specific documents (i.e., AIA documents) confused participant and extended time to complete</td>
<td>Removed unnecessary details irrelevant to responses sought for vignette</td>
</tr>
<tr>
<td></td>
<td>(C) Ambiguous and confusing details regarding project duration for vignette 6</td>
<td>Removed ambiguity for project details</td>
</tr>
<tr>
<td></td>
<td>(S) Typographical Error in Vignette 1</td>
<td>Adjustment made to punctuation and period placement</td>
</tr>
<tr>
<td></td>
<td>(C) Descriptor items 4 and 5a were confusing, indirect and did not contain all responses desired of participant</td>
<td>Word “introduced” changed to “taught.” Added co-op work experience to 5a and changed ‘level’ to ‘amount of construction experience.’</td>
</tr>
<tr>
<td>P2</td>
<td>(C) Instructions are unclear</td>
<td>Simplified instructions</td>
</tr>
<tr>
<td></td>
<td>(C) Vignette 8 contains unnecessary information and extends time to understand vignette, too large of a distractor</td>
<td>Removed unnecessary information not required to answer question</td>
</tr>
<tr>
<td>P3</td>
<td>(C) Collusion issue could not be identified by participant with ‘Joint Venture’ distractor in the vignette</td>
<td>Joint Venture distractor removed</td>
</tr>
</tbody>
</table>
**Time to Complete**

The average time of completion for the TESC for the think-aloud sessions was twenty-seven minutes. Participant P1 (as shown in Table 3.4) took approximately forty minutes to complete the TESC while P2 and P3 had completion times of twenty-one minutes each. Additionally, P1 on average took four and a half minutes to respond to each vignette, and three minutes to complete the descriptors section. P2 averaged a completion time of two and one quarter minutes for each vignette and two minutes to complete the descriptors section. P3 averaged a completion time of two and half minutes, with a completion time of roughly two minutes for the descriptors.

**Post Test Questionnaire Responses**

A post-think-aloud questionnaire was immediately administered to participants after they determined that they had completed the TESC. The post-think-aloud questionnaire involved eight, five-point Likert-type scale items (1 = strongly agree to 5 = strongly disagree), two binomial items (yes/no), and an open-ended feedback item. Table 3.5 shows the results of the post-think-aloud questionnaire.

**Table 3.5. Results of Post-Think-Aloud Questionnaire**

<table>
<thead>
<tr>
<th>Questionnaire Item</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The purpose of this test was clear</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I found the test unnecessarily complex</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I thought the test was easy to use [complete]</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>I found the various functions in the test were well integrated</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>I thought there was too much inconsistency in this test</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>I would imagine that most people would complete this test quickly</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>I found the test cumbersome to complete</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I need to learn a lot of things before I could get going with this test</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Was the test too long?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Did any of the questions make you feel uncomfortable?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Additional feedback received regarding the TESC included:

*P1* – Neutralize the questions [Vignettes], remove specific project documents, or project specifications.

*P2* – I am a fast test taker, so it didn’t feel long to me, but I know some of my peers would take a while completing it. Possibly have students choose one vignette to respond from sets of two vignettes.
It is hard thinking aloud, not a commonly done practice. That is all.

**P1 Pre-Pilot Feedback**

After all think-alouds were completed and prior to sending the instrument out for pilot testing, the first participant was asked to provide a review of the revised TESC and provide feedback concerning each vignette (see Table 3.6). Based on the feedback of the original participant, the modifications made to the TESC assisted mainly in its clarity and ability to complete the test.

<table>
<thead>
<tr>
<th>Vignette</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“This problem is set up much clearer than the last; very few people know much about airports or their building so this is easier to think on.”</td>
</tr>
<tr>
<td>2</td>
<td>“Still clear and understandable”</td>
</tr>
<tr>
<td>3</td>
<td>“Again well written, easy to comprehend.”</td>
</tr>
<tr>
<td>4</td>
<td>“Doesn’t seem to have changed much for this scenario [vignette].”</td>
</tr>
<tr>
<td>5</td>
<td>“Good change, makes it easier to understand what’s going on.”</td>
</tr>
<tr>
<td>6</td>
<td>“I think if you changed ‘anger’ to ‘angry’, it would make the sentence flow a little better, making it easier to understand.”</td>
</tr>
<tr>
<td>7</td>
<td>“By changing the scenario [vignette] to be about a project the company has no experience in, it makes it a little more easy to understand. Last time was a little too specific.”</td>
</tr>
<tr>
<td>8</td>
<td>“This scenario is set up to be MUCH clearer than previously. Good change.”</td>
</tr>
</tbody>
</table>

**Discussion**

To guide the discussion of this section, Rubin and Chisnell’s usability components\(^{14}\) are used. As discussed, the usability components are usefulness, efficiency, effectiveness, learnability, and satisfaction. Unintended affective responses emerged from think-aloud sessions and will be discussed.

**Usefulness**

The feedback of P1 reveals that the vignettes have improved and were clearer than the original TESC. Additionally, the follow-up questionnaire highlights an improvement in ease of use of the instrument. The responses of P1 and P2 indicate that with revisions to the TESC, the test became easier to use.
**Efficiency**

Based on the three think-aloud sessions, the TESC took an average of twenty-seven minutes to complete. The time to complete the TESC was vastly different from P1 (forty minutes) to P2 and P3 (twenty-one minutes each). These results may suggest that many issues of clarity in understanding and responding to the vignettes were resolved after the first session. Additionally, the follow-up questionnaire reveals that students did not find the test administration to be too long, and with each revision, the test is less cumbersome to complete.

**Effectiveness**

Even though the instrument had various cognitive issues, it still did not detract from the effectiveness of the TESC. Observations revealed that students were able to respond to vignettes in ways intended by the researchers with some exceptions.

There appeared to be an issue with three items embedded in various vignettes. The items included use of joint ventures to increase satisfaction of pre-qualification requirements, unfair labor allocation/use, and abuse of public/client resources. What was revealed is that the participants did not correctly understand these three items. For the joint venture item, a reason for this could be that it is an issue relevant to a particular region and is not prevalent in the United States. Additionally, possible reasons unfair labor allocation/use, and abuse of public/client resources were not understood is because these items may have had more dominant distractors in the vignette, or that the issues were not explicit enough. The lack of understanding of these items was accounted for in the scoring and analysis of the TESC.

Additionally, an improvement was made to the scoring rubric based on the think-alouds. Due to the use of words such as ‘plain clothes,’ a response generated by P1 revealed student recognition of the issue of safety. In responding to vignette five, P1 stated, “if the kid’s there just to look and watch, um, make sure he is dressed in the proper PPE [personal protective equipment],” P2 stated, “also ask that he wear PPE,” and, P3 also identified that this vignette may involve a “safety hazard.” Consideration is being made to include this as an issue for scoring the TESC. Changes will not be made to this vignette prior to pilot testing the TESC.
**Learnability**

There were no issues of learnability associated with the TESC. Participants were able to begin and complete the TESC without issue, under their ability, without additional training. What is a concern for learnability is P1’s response to the post-TESC questionnaire item, “I need to learn many things before I could get going with this test,” where he responded ‘strongly agree.’ In future work, it may be interesting to engage such participants and inquire what things needed to be learned before a participant could get going with the test.

**Satisfaction**

Based on the responses of the post-TESC questionnaire, participants seem satisfied with the completion of the instrument. On average, the participants rated ‘somewhat disagree’ that the test had too much inconsistency. They also ‘somewhat agree’ that the various functions [components] of the TESC were well integrated. Overall, there were no opinions of dissatisfaction with the TESC.

**Unintended Affective Response**

Even though the original intention of the think-aloud sessions for the TESC was to test the usability of the instrument, another attribute of the TESC emerged. The TESC is a survey instrument intended to measure the cognitive ability of students to recognize ethical issues in the construction industry; however, the think-aloud sessions reveal that the TESC also elicits affective reasoning in processing responses to the TESC not explicitly written as a response on the TESC. Example statements include:

*P1:* “I mean, I am really not a fan of this owner, and am kind of curious as to why am working here”

*P2:* “I would be questioning, my boss’ morals because it seems like, everything seems to be easily falling into place and now that we’ve received this bid, he’s trying to bring in other companies for different prices, so upon questioning his morals”

“the company does not have an ethical focus, as an individual, I would be wondering whether I would want to remain with the company with such low ethical standards”
Conclusion and Future Work

The think-alouds were useful in determining usability characteristics of the TESC that were indeterminable during original instrument development (i.e., usefulness, efficiency, and effectiveness). For the TESC, it was found that major cognitive issues hampered usability characteristics. Each think-aloud session offered unique contributions to the development of the TESC.

Overall, the think-aloud process improves usability by helping researchers discover mechanical/structural errors in the survey instrument. Even more importantly, it assists researchers to account for, and make revisions to, the instrument for cognitive issues that are more severe when trying to make observations that reflect what the researcher truly intended.

The benefits of think-aloud sessions warrant its use in survey development for instrument refinement and to obtain measures of instrument usability. It should be a part of a researcher’s repertoire of instrument development techniques.

As research suggests, there are other steps to complete to gain sufficient evidence of cognitive validity of the TESC beyond think-alouds, but these protocols are a start. The next step for the TESC is to pilot test the refined instrument.

References


CHAPTER 4

Toward a technique of evaluating student ethical sensitivity to issues of the construction industry

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Christine Fiori\textsuperscript{5}, Denise R. Simmons\textsuperscript{6}

\textbf{Abstract:} The construction industry is inundated with a variety of ethical issues and is viewed as one of the most corrupt industries in any business sector. The unethical issues of the construction industry have caught the attention of public agencies, industry groups, and academic accrediting bodies such as the American Council for Construction Education (ACCE) and the Accreditation Board for Engineering and Technology (ABET) which leads to a requirement for ethics education. The problem is that even though there is a requirement to teach ethics, there is no standard to which ethics should be taught in a construction program, including no standard of evaluation of construction student ethical competency. We believe at a minimum, construction students should possess the ability to recognize ethical issues of the construction industry, namely have \textit{ethical sensitivity}, as a first step to making proper ethical decisions in practice. The purpose of this study is to suggest a qualitative response, quantitatively scored means of testing the ethical sensitivity of construction students known as the Test for Ethical Sensitivity in Construction (TESC). This paper presents the test development process of the TESC technique in addition to initial findings from piloting the TESC in two construction programs in the United States.

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Introduction

The construction industry is plagued with a variety of unethical behaviors both societal and professional in nature (Sands & Pearce, 2014). The prevalence of unethical behavior in the construction industry has led to Transparency International’s revelation that corruption is more ingrained in the construction sector than any other is. Unethical conduct can result in negative effects that can be experienced by stakeholders external to the company performing unethically such as society, or internally within the company. Internal effects include wasted expenses on bidding, legal repercussions, blacklisting, risk of reputation, blackmail, and other negative effects. Negative external effects include unsuitable, overpriced, overly complex, and delayed construction projects (Adnan et al., 2012; FMI, 2004; Sands & Pearce, 2014; Transparency International, 2005).

Increasing awareness to ethical issues and ethical practice may provide positive effects. These characteristics may increase financial returns due to increased business. Another positive effect of ethical behavior includes the improvement of working relationships between project participants (Poon, 2004; Sands & Pearce 2014). As an example, a recent study that focuses on factors affecting relationships between general contractors and subcontractors highlights that unethical practices such as bid shopping, previous claims or disputes, and timeliness of payments (payment games) were factors in ending relationships between general contractors and subcontractors. This study also highlights other ethical issues such as safety, honesty, and fairness as factors affecting relationships between general contractors and subcontractors (McCord & Gunderson, 2014).

Attempts to Curb Unethical Behavior

There have been attempts to curb unethical conduct of construction professionals by owners/clients, practitioners of the industry, and academe. One such effort on the public owner’s side has been the implementation of the Federal Acquisition Regulation (FAR) (GSA, 2013). Subpart 3.10-Contractor Code of Business Ethics and Conduct, of the FAR states, “government contractors must conduct themselves with the highest degree of integrity and honesty” (p. 3.10-1). Additionally, it adds that contractors should have a written code of business ethics and conduct. It also states that in order to promote compliance,
contractors should have an employee business ethics and compliance training program and an internal control system that-

(1) Are suitable to the size of the company and the extent of its involvement in Government contracting,
(2) Facilitate timely discovery and disclosure of improper conduct in connection with Government contracts, and
(3) Ensure corrective measures are promptly instituted and carried out.

The FAR ethical policy is one that requires serious consideration by construction companies and their employees who wish to participate in public sector projects. The FAR states that,

a contractor may be suspended and/or debarred for knowing failure by a principal to timely disclose to the Government, in connection with the award, performance, or closeout of a Government contract performed by the contractor or a subcontract awarded thereunder, credible evidence of a violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations found in Title 18 of the United States Code or a violation of the civil False Claims Act. Knowing failure to timely disclose credible evidence of any of the above violations remains a cause for suspension and/or debarment until 3 years after final payment on a contract. (p. 3.10-1)

Lack of adherence to this regulation can cause detrimental effects on a company; nevertheless, unethical conduct is still persistent in the public sector.

Notable organizations such as the Construction Management Association of America (CMAA), the American Society of Civil Engineers (ASCE), the American Subcontractors Association (ASA), the Project Management Institute (PMI), the Associated Builders and Contractors (ABC) and the American Society of Professional Estimators (ASPE) all have codes of ethics or guidelines of professional conduct to which they expect their members to adhere.

Additionally, an organization called the Construction Industry Ethics and Compliance Initiative (CIECI), is a not for profit, private association that brings together U.S. construction companies who are committed to the highest level of ethics and conduct compliance with the law, to increase the ethical conduct of the industry. This organization frequently shares best practices to address ethics and compliance risks. They have published a program blueprint for organizations for the creation and maintenance of a business ethics program (CIECI, 2013).

Even though there have been various efforts to curb unethical behavior by multiple entities, unethical behavior is still prevalent. The impact of these means to influence an
organization’s ethical behavior such as the FAR, trade organizations’ codes of ethics, and the CIECI are hard to determine without empirical evidence from further research.

Publishing guidelines and regulations, having codes of conduct, and being part of trade organizations are important to improving ethical compliance, but they cannot be the only resource to assist an individual’s understanding of why one should conduct him/herself in an ethical manner. The guidelines and participation in organizations need to be complemented with the assignment of functional responsibility and employer training (Calhoun & Wolitzer, 2001; Vee & Skittmore, 2003) and this should be extended to future employees as well. This understanding of construction ethics is a necessary contribution of construction education. The FMI (2004) survey reinforces this by highlighting industry opinion: 90% of the over 270 respondents agree that the construction industry should get more training in ethics.

Adding to this, Ahn et al. (2012) performed a study to assess the key competencies required of construction students based on industry responses to a Likert survey assessing industry agreement with competencies required of students. Descriptive statistics are presented, and a comparison of means reveal that ethical issues resulted in the highest mean, indicating that there is strong agreement amongst industry respondents that ethical issues are an important competency for construction students.

**Academe Influenced**

In response to the assertion that the construction industry requires an increase in ethical competency or the ability to work in a manner as defined by professional ethical codes of conduct (Friedman, 2007), education, and training for its construction students, construction higher education and its accrediting bodies responded by making construction ethics education required in construction curriculum. These bodies ensure that construction students, whether they are constructors or designers, receive similar competencies in each accredited program, and each has some form of requirement for student ethical competency.

There are two main accrediting bodies for construction education in the U.S.: the Accreditation Board for Engineering and Technology (ABET) and the American Council for Construction Education (ACCE). ABET requires that students be able to design a system, component, or process to meet desired needs within ethical constraints (among others) with an understanding of professional and ethical responsibility for their civil, construction engineering,
and construction engineering technology programs (ABET, 2012). In parallel, the ACCE requires ethics integration in the construction curriculum (ACCE, 2010). Both bodies leave the art of ethics pedagogy up to the program seeking accreditation, which can be difficult for educators who are technically trained and view ethical issues as secondary to primary coursework (Sands & Pearce, 2014; Sands & Simmons, 2014; Sinha et al., 2007).

The Problem

Entities related to the construction industry focus on the goal of decreasing unethical practices in many ways. We firmly believe that the competency of ethics starts at the foundation of construction knowledge prior to and during practice. We believe that teaching ethics helps construction students think critically about various situations that may possess ethical issues, and this is essential for ethical behavior in practice. Requirements of accreditation create an expectation that students will be ethically competent regarding issues of the construction industry prior to entry into full-time practice; however, there is no set standard of ethical competency evaluation in construction education and limited resources on proper evaluation techniques. Is there a technique available to measure student ability to recognize ethical issues specifically related to professional issues of the construction industry, thus helping future practitioners make informed and responsible decisions?

The Purpose

The purposes of this paper are three-fold. The first is to present the development of a technique to understand construction student ethical sensitivity (the ability of an individual to recognize ethical issues of the construction industry) to professional issues of the construction industry via a Test for Ethical Sensitivity in Construction (TESC). The second is to use the TESC toward a preliminary understanding of the ethical sensitivity of construction students and present results of this initial investigation. The third is to suggest the use of this technique employed by the TESC as a means to test the ethical sensitivity of construction students for a range of ethical issues in the construction industry, beyond the issues presented in this initial version, opening the discussion on ethical sensitivity testing in construction education.
Ethical Sensitivity

Ethical sensitivity is “a caring response, skill in identifying the ethical dimension of care, intuition regarding others’ comfort and well-being, and a component of moral care” (Weaver, 2007, p. 142). Ethical sensitivity is “the first step in real-life moral decision making. Without recognizing the ethical aspects of a situation, it is impossible to solve any moral/ethical problem, for without the initial recognition no problem exists” (Clarkeburn, 2002, p. 439). Ethical sensitivity combines two skills, moral imagination, and recognition of ethical issues (Callahan, 1980; Clarkeburn, 2002).

The theoretical framework for this study is highlighted by Sands & Pearce (2014) and is based on Rest’s (1984) four-component ethical decision-making (for the purpose of this paper, ethical decision-making is the course of action when face with an ethical dilemma) model. Rest’s (1984) components are:

1. **Moral Sensitivity** – interpreting the situation as being moral
2. **Moral Judgment** – deciding which course of action is morally right
3. **Moral Intent** – prioritizing moral values over other values and;
4. **Moral Behavior** – executing and implementing the moral intention

Moral sensitivity is the awareness of how our actions affect others. It involves an awareness of the effect of different lines of action and it involves “imaginatively constructing possible scenarios, and knowing cause consequence chain of events in the real world; it involves empathy and role-taking skills” (Rest, 1994, p. 22). Note that, for the purpose of this study, the term *moral* refers to the personal belief or guiding principles of what is right and wrong whereas the term * ethic* refers to the community or organizational belief or guiding principles of what is right or wrong. Therefore, we define ethical sensitivity as the ability of an individual to recognize ethical issues of the construction industry (Sands & Pearce, 2014; Sands & Simmons, 2014). Ethical sensitivity for this study is a skill and students should possess the minimum skill of being able to recognize ethical issues of the construction industry in order to behave ethically.
**Ethics Evaluation in Construction Education**

Some means have been suggested as a way to evaluate ethical competencies of students that range from ethical sensitivity to ethical behavior. Robertson (1987) proposes the use of detailed case study review analysis for course evaluation. Sinha et al. (2007) discuss the evaluation of student portfolios of essays analyzing ethical issues, demonstrating student ability to apply knowledge of ethical theories to decision making. These techniques are useful for application purposes, but they do not specifically address the construct of ethical sensitivity.

Kang et al. (2006) uses a technique for evaluating ethical sensitivity of construction workers in a multi-cultural ethics-training program, the Defining Issues Test (DIT), but does not discuss the details of the test. The (DIT) in its basic form requires participants to read a moral dilemma and then rate and rank 12 statements that define the issues of the dilemma in various ways. Participants must rate and rank the issues in terms of their perceived importance in making a decision about the dilemma (Rest, 1975).

Killingsworth (1992) suggests that ethical sensitivity testing should be done using the Defining Issues Test (DIT). Killingsworth’s derivative of the DIT uses a modified form that is construction-specific. Killingsworth also suggests that the test be used longitudinally, administering the test at the beginning of a student’s curricular experience, at the end of the student’s curricular experience, and then again a few month after graduating from a course of study.

The evaluation techniques suggested for ethical competency to issues of the construction industry either do not specifically measure the construct of ethical sensitivity, or they do not provide supporting details for the ethical sensitivity evaluation technique suggested. To further knowledge of evaluation techniques used for ethical sensitivity testing, we sought literature that went beyond the discipline of construction.

**Alternative Techniques of Testing Ethical Sensitivity**

There are not many ethical sensitivity tests that specifically relate to issues of the construction industry; therefore, we draw inspiration from ethical sensitivity tests outside of construction to see what other alternatives exist. Multiple ethical sensitivity tests exist in a variety of specific disciplines (see Table 4.1) and each test defines ethical sensitivity in general as the recognition or awareness of ethical issues.
### Table 4.1. Available Ethical Sensitivity Tests

<table>
<thead>
<tr>
<th>Author</th>
<th>Test Name/Type</th>
<th>Study Population</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bebeau et al., 1985</td>
<td>An ethical sensitivity test for dental students (DEST)</td>
<td>Dental students</td>
<td>Verbal responses to audio drama</td>
</tr>
<tr>
<td>Borenstein et al., 2008</td>
<td>Test of Ethical Sensitivity in Science and Engineering (TESSE)</td>
<td>Science/Engineering students</td>
<td>Open-ended case study responses with follow-up Likert rating agreement to statement</td>
</tr>
<tr>
<td>Brabeck et al., 2000</td>
<td>Racial Ethical Sensitivity Test (REST)</td>
<td>Graduate students</td>
<td>Videotaped scenarios and semi-structured interviews</td>
</tr>
<tr>
<td>Clarkeburn, 2002</td>
<td>Test for Ethical Sensitivity in Science (TESS)</td>
<td>University science students</td>
<td>Open-ended questionnaire response to stories/ethical scenarios</td>
</tr>
<tr>
<td>Do Lim &amp; Perry, 2010</td>
<td>Ethical Sensitivity</td>
<td>Public administration students and servants</td>
<td>Open-ended responses &amp; case studies</td>
</tr>
<tr>
<td>Ersoy &amp; Goz, 2001</td>
<td>Ethical Sensitivity</td>
<td>Turkish nurses</td>
<td>Open-ended questionnaire &amp; case studies</td>
</tr>
<tr>
<td>Ersoy &amp; Gundogmus, 2003</td>
<td>Ethical Sensitivity</td>
<td>Turkish physicians</td>
<td>Open-ended questionnaire &amp; case studies</td>
</tr>
<tr>
<td>McNeel, 1994</td>
<td>Ethical Sensitivity</td>
<td>College students</td>
<td>Recorded dramas &amp; qualitative interviews</td>
</tr>
<tr>
<td>Hebert et al., 1992</td>
<td>Ethical Sensitivity</td>
<td>Medical students</td>
<td>Open-ended survey via vignettes</td>
</tr>
<tr>
<td>Shawver &amp; Sennetti, 2008</td>
<td>Ethical Sensitivity</td>
<td>Accounting students</td>
<td>Open-ended survey via vignettes</td>
</tr>
<tr>
<td>Sirin et al., 2003</td>
<td>Racial and Ethical Sensitivity Test Compact Disk (REST-CD)</td>
<td>University Students</td>
<td>Videos and interactive interviews via compact disk</td>
</tr>
<tr>
<td>Sparks &amp; Hunt, 1998</td>
<td>Ethical Sensitivity</td>
<td>Marketing students and practitioners</td>
<td>Open-ended &amp; case studies</td>
</tr>
</tbody>
</table>

Various means and techniques have been found reliable to test ethical sensitivity for their individual purposes, but many of the tests presented involve labor-intensive qualitative methodologies such as case studies, videotaped scenarios, responses to dramas, etc. that limit the participant sample size and are unsuitable in resource-constrained situations (Clarkeburn, 2002). Clarkeburn’s (2002) Test for Ethical Sensitivity in Science (TESS) was developed as a test for ethical sensitivity that can be administered to a larger participant sample, thus increasing the generalizability of findings. Therefore, an aim of this research was to develop a test based on this model that has those characteristics.
Clarkeburn (2002) insists that an ethical sensitivity test “needs to measure the spontaneous recognition of moral issues, the interpretation of a situation in moral terms,” (p. 443) if observations are to be made regarding ethical sensitivity of real-life situations. Therefore, testing ethical sensitivity should be qualitative, based on unstructured problems, and should only consist of minimal guidelines. The TESS consists of three vignettes with embedded ethical issues. Students are asked to write down no more than five issues or questions that should be considered before making a decision on the scenario. Administration of the TESS takes less than 15 minutes, and experienced raters can score approximately 30 protocols an hour, requiring less strain on students and raters than other ethical sensitivity tests such as the DEST and McNeel’s (1994) ethical sensitivity test. These tests are labor-intensive, requiring one-to-one interaction between participants and researcher and transcriptions which would be impractical when trying to administer a test to larger samples. They are also less suitable when time and resources are limited.

We seek to defend a derivative of this technique as a means of testing the ethical sensitivity of construction students. Specifically, we propose an approach that addresses the limitations of Clarkeburn’s approach by being applicable to a larger number of respondents while reducing strain on both participants and raters of the test from Clarkeburn’s cognitively intense qualitative format.

A Note on Instrumentation Quality in Ethical Sensitivity Testing

Even though ethical sensitivity is not detailed in construction education literature, there are inspirations toward understanding the maintenance of rigor of an ethical sensitivity instrument. To ensure validity, prior test development procedures on ethical sensitivity utilized expert review and participation by various researchers and practitioners of associated disciplines in the development of instruments to support arguments for content validity (Borenstein et al. 2008). Literature also supports the argument that reliability can be attained in ethical sensitivity testing via inter-scorer/inter-rater agreement (Bebeau et al., 1985; Clarkeburn 2002).

Additionally, Weaver (2007) identified various reliability threats to instruments of ethical sensitivity. Weaver reports that in quantitative studies of ethical sensitivity, generalizability is compromised due to convenience sampling, which also showed to be an issue of construct validity. Prompting participants to the presence of an ethical problem also was shown to reduce
the rigor. What is shown to be effective was the qualitative inquiry of ethical sensitivity, as validity was found to be preserved through respondents’ descriptions of their processes. We wanted to create a test for ethical sensitivity in construction while keeping qualitative inquiry essential to the responses, but we also wanted to ensure objectivity in scoring. Therefore, a numerical rating system was devised as discussed in the TESC development section of this paper.

TESC Development

Development of the TESC followed the test development model shown in Figure 4.1.

![Figure 4.1. TESC Development Process (Adapted from Sands & Simmons, 2014; Trenor et al., 2011)](image)

TESC Conceptualization

TESC conceptualization began with the development of a construct map. The construct map is a visual definition of the construct of measurement with the idea that this construct is composed of an underlying continuum of ability (Wilson, 2005). Utilizing Rest’s moral development model (1985) as a theoretical frame, the construct map for the TESC develops out of the idea that one can possess varying degrees of the skill of awareness to ethical issues of the
construction industry (see Figure 4.2). Essentially, the more a respondent recognizes ethical issues of the construction industry, the more ethical sensitivity awareness skill they possess. Likewise, the less a respondent recognizes ethical issues of the construction industry, the less ethical sensitivity awareness skill they possess.

<table>
<thead>
<tr>
<th>Decreasing ethical sensitivity skill of awareness</th>
<th>Respondent Response Continuum</th>
<th>Increasing ethical sensitivity skill of awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent possesses low ability to be aware of ethical issues of the construction industry</td>
<td>Respondent possesses some ability to be aware of ethical issues of the construction industry</td>
<td>Respondent possesses high ability to be aware of ethical issues of the construction industry</td>
</tr>
</tbody>
</table>

**Figure 4.2.** Respondent Construct Mapping for TESC

**TESC Construction**

Based on Clarkeburn’s (2002) model for testing ethical sensitivity of students, a test was created that would situate students in eight exaggerated vignettes specific to actual ethical issues of construction practice (TESC). Students are placed in the following scenario to begin the test (Sands & Simmons 2014).

*You recently graduated and have been hired as a project engineer for Solid Construction, an established medium-sized commercial construction company in the US. As an entry-level employee, you must participate in a rotation program so that you are involved in various company operations.*

The eight-vignette pen-and-paper TESC is developed from various ethical issues for diversity of testing as an experiment with the level of difficulty each vignette poses while attempting to introduce this framework for testing ethical sensitivity of other issues. The pen-and-paper technique was utilized because it is found to be a preferred real-time data collection technique by students (Smalls et al., 2014).

The items for piloting this technique to test the ethical sensitivity of construction students varied in type. The original selection of ethical issues (test items) stemmed from the idea that construction students should be familiar with some of the ethical issues, and some issues should not be so apparent. In addition, the test items are also ethical issues that seemed to be ethical issues closely related to the construction industry (Sands and Pearce, 2014). This type of item selection was purposefully done as a means of diversity and discrimination in the test. We want to observe student responses to each vignette. The TESC embeds 12 sample professional issues
of the construction industry. The issues of the TESC include claims games, collusion, bid shopping, bid peddling, theft, underage labor issues, safety front-loading, payment games, low competence of work performance, improper client relations, and bid rigging. These issues are embedded in eight vignettes (see Table 4.2).

Table 4.2. Embedded issues of the TESC

<table>
<thead>
<tr>
<th>#</th>
<th>Vignette</th>
<th>(#) Item of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Your first assignment is to shadow the estimator on an open bid, commercial renovation project with an estimated value of $15 million. Winning this project can significantly boost your company’s financial position. Prior to estimating the job, you and the estimator perform a routine site visit to go over the existing conditions of the project. You notice a peculiar look on the estimator’s face and hear him say with a smirk, ‘looks like the architect missed that.’ As you continue to shadow the estimator to pre-bid meetings, and assist with the bid process, there is no mention of, or questions asked about this error on the bid documents.</td>
<td>(1) Claims Games</td>
</tr>
<tr>
<td>2</td>
<td>It is bid day and you recall last night (the night before bid day), the familiar face of the renovation project’s owner’s representative (from the pre-bid meeting) entering your boss’ office. Today, your boss and estimator frantically receive sub-bids, complete bid forms with specific subcontract bids, and run out of the office to deliver the bid. A few hours later, a call comes in to your office and you hear, “we were the lowest bidder.”</td>
<td>(2) Collusion</td>
</tr>
<tr>
<td>3</td>
<td>Your company was awarded the renovation project and immediately begins preparations for project administration. You work with another colleague to buy out the project (i.e., material purchase and subcontracting). You receive multiple calls from various subcontractors providing you with quotes for this project. Additionally, your boss leaves business cards on your table and tells you to call up these companies, send them plans for the project, and “see what prices you can get.”</td>
<td>(3) Bid Shopping &amp; (4) Bid Peddling</td>
</tr>
<tr>
<td>4</td>
<td>The renovation project has begun and you spend a few days a week on this project’s site. A while into the project, light-gauge metal framing work is 90% complete and material will be left over. The drywall subcontractor’s foreman on your site talks about the renovations he is making at home. As you leave the site at the end of this particular day, you notice a bundle of framing material missing from the site.</td>
<td>(5) Theft</td>
</tr>
<tr>
<td>5</td>
<td>It is the end of the day on Friday. Before leaving, you are asked by your boss to work after hours that same evening to accompany the electrician. The electrician needs to perform electrical work unable to be performed during normal operating hours. The electrician and an underage looking individual in plain clothes, not familiar to you, enter the project site. The unfamiliar person is introduced as the electrician’s nephew.</td>
<td>(6) Labor &amp; (7) Safety</td>
</tr>
<tr>
<td>6</td>
<td>Currently the project is 60% complete and has been active for 7 months. Based on recommendations by the superintendent, you have been required to update and submit payment applications on a monthly basis to the owner. Now that you are familiar with the project, you notice that a large portion of the work has already been paid out, seemingly more than the value of what has been completed to this point. A few hours into the workday, a subcontractor calls in anger requesting payment for an application his company submitted 2 payment periods ago.</td>
<td>(8) Front-end loading &amp; (9) Payment Games</td>
</tr>
<tr>
<td>7</td>
<td>The renovation project is now substantially complete. A request for proposal (RFP) has been advertised for a particular type of project for which your company has no experience. The owner’s representative of this RFP is highly involved in charitable work and has a specific charity he favors. The owner of your company recently</td>
<td>(10) Low/No Competence of Work &amp; (11) Conflict of Interest</td>
</tr>
</tbody>
</table>
showed his interest in charity work by giving a sizeable donation to that favored charity. You somehow overhear that your company may be a viable contender for this RFP project.

8 Your company has interest in another request for proposal (RFP). Prior to finalizing price and submission of the RFP, familiar faces of competing contracting firms enter your company’s conference room with your boss and he locks the door. You have seen these familiar faces at previous bid openings and pre-bid meetings. (12) Bid Rigging/Price Fixing

To generate responses for the TESC, participants were told, “reflect on the situation, and write down at least 3 issues you are concerned with and/or questions you may have about the situation” and “please be as descriptive as possible.” We believe that requesting participants to write down multiple issues of concern or questions concerning the situation will assist the participant’s thought process, leading to the identification of ethical issues (Borenstein et al., 2008; Clarkeburn, 2002).

Descriptors

As part of the original TESC, descriptor items were used as a basis for statistical analysis. Descriptors included student age, gender, academic level, type of construction program (e.g., building construction, construction management, construction engineering, civil engineering) enrolled, amount of professional construction experience, and a question on the placement of ethics in their type of construction program. These descriptors were used to provide preliminary statistical analysis to assess statistical significance between groups.

Content Validity

Content validity of the TESC was supported via two processes. First, a literature analysis was performed using 65 non-instructional/educational research papers and 14 instructional/educational research papers from conference proceedings and journals which closely tied to the themes of ethics and construction. From this thematic analysis, 101 professional and societal ethical issues were found (Sands & Pearce, 2014). Selected issues were taken from this review and used for development of the vignettes of the TESC.

Second, since issues embedded in the TESC are specific to the construction industry, a panel of seven construction educators and industry members having significant experience in
ethical teaching and practice were asked to conduct a preliminary review of the TESC and provide feedback on initially developed vignettes for their authenticity and relevance to the construction industry.

**Usability Testing for the TESC**

Usability testing for the TESC was performed using think-aloud protocols, specifically a written transcript of think-aloud sessions. Think-aloud sessions require participants to continuously talk aloud as they responded to a testing instrument while being recorded (Cohen et al., 2013; Ericsson & Simon, 1980; Sands & Simmons, 2014; Trenor, et al. 2011). By hearing each participant’s thought processes while thinking aloud, we can gather information on the validity of the test and understand whether students are responding to the test as intended while focusing on correcting issues that present threats to cognitive validity. Cognitive validity focuses on student ability to use cognitive skills to complete the test (Thelk & Hoole, 2006) and threats to this ability such as confusing and ambiguous terms. Statements should be limited, as long statements hinder student ability to complete the test as intended. In addition, structural issues such as typographical and grammatical errors can be identified and addressed from think-aloud protocols; however, cognitive issues are of more concern (Sands & Simmons, 2014; Trenor et al., 2011).

Sands and Simmons (2014) provide the details of the usability testing done for the TESC. To summarize, three think-aloud sessions were performed with three different construction students, since the first three participants tend to detect the most severe problems of usability while additional participants are less likely to detect any additional issues (Sands & Simmons, 2014; Trenor et al., 2011; Virzi, 1992). Each student participated in a single think-aloud session. The first participant’s think-aloud protocol highlighted four cognitive issues and one structural issue of the TESC. Those issues were addressed prior to the second participant’s think-aloud session. The second participant’s think-aloud protocol highlighted two cognitive issues and no structural issues, and those issues were addressed prior to the third participant’s think-aloud session. The third participant’s think-aloud protocol identified one cognitive issue of the TESC; this issue was addressed. The first participant was asked to review the TESC after the third revision of the TESC, after which the TESC was finalized.
The first participant found that the final version of the TESC is much clearer and easier to read and respond to than the first TESC administered, as major threats to cognitive validity and structural issues of the TESC were addressed. Additionally, it was determined that students required an average of three minutes to respond to each vignette, with a total average TESC completion time of 27 minutes. Time of completion was important for pilot testing recruitment of student participants when requesting class time from instructors to administer the TESC.

**Piloting the TESC**

After usability testing was complete, the TESC was pilot tested with a sample as similar as possible to the population of the main study as recommended by Dillman (2000). We also wanted to pilot test in a setting common to test taking, specifically a classroom setting that would be a familiar context for students.

**Population of Interest**

For this study, the target population was students, preferably seniors, who are soon to be practitioners in the construction industry and who should have had construction ethics education at some point throughout their curricular experience. We decided on this target population because we wanted to know how competent construction students are at identifying ethical issues of the construction industry as they leave different types of construction programs and enter practice. We believe that educators may find that information on ethical sensitivity of seniors useful for curriculum evaluation. In addition, we believe that employers will find this information useful when recruiting construction graduates.

**Rating, Inter-rater Reliability, and Rater Strain**

Student response rating was originally based on a three-level scoring metric (0, 1, 2) indicating the level of student ability to recognize an issue. The three level metric was meant to allow for differentiation between responses that seemed to fall just short of full recognition of construction ethical issues versus those where clear understanding was evident. Two rounds of TESC rating with three raters were performed with the original three level scoring metric. Cohen’s Kappa was used to determine inter-rater reliability, and the original rating scale yielded low inter-rater reliability results. To increase inter-rater agreement and objectivity in scoring, the
A scoring metric was changed, and a binary rating scale was developed to apply a scoring metric for keyword, statement, theme, and concept identification. Table 4.3 provides a sample (non-exhaustive) of the types of terms/phrases/statements that were used to rate the TESC other than the actual name of the item. With the new metric developed, the following was used for scoring participant TESC responses:

- **Score of 0** = *Inability to recognize issue*
- **Score of 1** = *Ability to describe the issue by item name or synonym*

### Table 4.3. Sample Keywords/Phrases/Statements (and synonymous themes) used for Rating the TESC

<table>
<thead>
<tr>
<th>Items</th>
<th>Item Name</th>
<th>Sample Key Terms/Phrases for Rating TESC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Claims Games</td>
<td>Change order; Construction change directive</td>
</tr>
<tr>
<td>2</td>
<td>Collusion</td>
<td>Should not be conversing with owner/owner’s rep concerning project</td>
</tr>
<tr>
<td>3</td>
<td>Bid Shopping</td>
<td>GC should not be requesting additional sub prices after bid awarded; Fishing for lower bids</td>
</tr>
<tr>
<td>4</td>
<td>Bid Peddling</td>
<td>Other subs should not be calling awarded contractor post bid</td>
</tr>
<tr>
<td>5</td>
<td>Theft</td>
<td>Stealing; Should not be taking material off of site that owner pays for</td>
</tr>
<tr>
<td>6</td>
<td>Labor Issues</td>
<td>Minor, Child, Lawful to work, Legal age to work, possibly underage to work for electrician</td>
</tr>
<tr>
<td>7</td>
<td>Safety</td>
<td>Personal protective equipment (PPE), Liability, Incident, Injury, Properly dressed, Hurt</td>
</tr>
<tr>
<td>8</td>
<td>Front-End Loading</td>
<td>Requesting for work not performed, Contractor should not ask for more money than work performed</td>
</tr>
<tr>
<td>9</td>
<td>Payment Games</td>
<td>Subcontractor should be paid, Intentionally avoiding paying subs to gain financial benefit</td>
</tr>
<tr>
<td>10</td>
<td>Low/No Competence of Work</td>
<td>Should not perform work we have no experience in, Lack of knowledge</td>
</tr>
<tr>
<td>11</td>
<td>Conflict of Interest</td>
<td>Bribe, Gift, Shouldn’t give donation, Under the table, Donation for favor, Unfair advantage, Unfair competition</td>
</tr>
<tr>
<td>12</td>
<td>Bid Rigging/Price Fixing</td>
<td>Unfair competition, Competitive advantage, Antitrust laws, Collusion to gain unfair advantage</td>
</tr>
</tbody>
</table>
The new scoring metric was used to re-score the TESC responses of individual test items (n=300). Using ‘R’ statistical software, Cohen’s kappa of the TESC using this scoring metric yielded a Kappa correlation coefficient of 0.85, which is in the range of ‘almost perfect agreement’ (Viera & Garrett, 2005).

With the binary approach to rating, rater efficiency was also improved, making the test items easier to rate. A rater with an average reading speed with the original rating metric yielded an average time to score each vignette of 2.25 minutes. With the new binary metric, the average speed to rate each vignette is less than a minute. To ensure quality in rating, regular 15-20 minute breaks were taken by raters to ensure rater fatigue was limited when scoring the 124 TESC tests.

**Initial Pilot Investigation**

Piloting the TESC provided us with an initial understanding of the characteristics of the TESC. An initial item analysis using classical test theory (CTT) (Allen and Yen, 1979) of the pilot tests were performed using the ‘R’ statistical software (R Development Core Team, 2014). For the purpose of this paper, we have provided an initial difficulty assessment for each item of the TESC (see Table 4.4). The optimal difficulty level or ‘p value’ for an item, defined as the proportion of individual respondents in our sample to get an item correct, is 0.5 (Kline, 2005) since the item at 0.5 difficulty level tends to be more useful at discriminating between students. Items having a difficulty level less than 0.30 are identified as having a high level of difficulty. Items having a difficulty level between 0.30 and 0.79 are identified as having a moderate level of difficulty. Items having a difficulty level above 0.80 are identified as having low difficulty.
Table 4.4. Initial Item Analysis of the TESC

<table>
<thead>
<tr>
<th>Items</th>
<th>Item Name</th>
<th>Difficulty Assessment</th>
<th>Difficulty</th>
<th>SD</th>
<th>Discrimination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Claims Games</td>
<td>High</td>
<td>0.09</td>
<td>0.29</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>Collusion</td>
<td>Moderate</td>
<td>0.32</td>
<td>0.47</td>
<td>0.63</td>
</tr>
<tr>
<td>3</td>
<td>Bid Shopping</td>
<td>High</td>
<td>0.04</td>
<td>0.20</td>
<td>0.02</td>
</tr>
<tr>
<td>4</td>
<td>Bid Peddling</td>
<td>High</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>Theft</td>
<td>Low</td>
<td>0.81</td>
<td>0.39</td>
<td>0.34</td>
</tr>
<tr>
<td>6</td>
<td>Labor Issues</td>
<td>Moderate</td>
<td>0.38</td>
<td>0.49</td>
<td>0.46</td>
</tr>
<tr>
<td>7</td>
<td>Safety</td>
<td>Moderate</td>
<td>0.45</td>
<td>0.50</td>
<td>0.61</td>
</tr>
<tr>
<td>8</td>
<td>Front-End Loading</td>
<td>High</td>
<td>0.05</td>
<td>0.22</td>
<td>0.07</td>
</tr>
<tr>
<td>9</td>
<td>Payment Games</td>
<td>High</td>
<td>0.05</td>
<td>0.22</td>
<td>0.15</td>
</tr>
<tr>
<td>10</td>
<td>Low/No Competence of Work</td>
<td>Moderate</td>
<td>0.38</td>
<td>0.49</td>
<td>0.54</td>
</tr>
<tr>
<td>11</td>
<td>Conflict of Interest</td>
<td>Moderate</td>
<td>0.63</td>
<td>0.49</td>
<td>0.59</td>
</tr>
<tr>
<td>12</td>
<td>Bid Rigging/Price Fixing</td>
<td>Moderate</td>
<td>0.41</td>
<td>0.49</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Pilot investigations also provided us with student performance of the TESC. An initial comparison was made between groups based on their academic level. Bebeau et al. (1985) found that dental students at higher academic levels were more ethically sensitive to professional issues than students at lower levels. We wanted to investigate whether students at higher academic levels [juniors-seniors] are more ethically sensitive to the professional issues of the TESC than students at lower levels [freshmen-sophomores] by testing the hypothesis:

**H₁**: Students who participated in this pilot test at higher academic levels are more ethically sensitive to the ethical issues of the construction industry of the TESC than students of lower academic levels who participated in this pilot test.

**H₀₁**: There is no difference in ethical sensitivity to professional issues of the TESC between students at higher academic levels and those at lower academic levels who participated in this pilot test.
Programs related to the construction industry have various ways of teaching ethics. Ethics education emphasizes the learning of professional norms applicable to the program of study (Sparks & Hunt, 1998). As an example, civil engineering programs may focus on codes of ethics of the ASCE whereas, construction engineering programs may focus on codes of ethics of the CMAA. In addition, civil engineering programs may focus on ethical issues of design whereas construction engineering programs may focus on ethical issues of management and the construction process. We wanted to investigate whether a student’s program of study affected their ethical sensitivity to professional issues of the construction industry by testing the hypothesis:

H₂: Construction engineering students of this pilot test are more ethically sensitive to the professional issues of construction in the TESC than civil engineering students who participated in this pilot test.
H₀₂: There is no difference in ethical sensitivity to professional issues of the TESC between construction and civil engineering students who participated in this pilot test.

A one-tail Welch’s t-test was performed in ‘R’ statistical software to compare scores between student group one [freshman-sophomore] and student group two [juniors-seniors] of the pilot test. Student group two performed significantly better than student group one at the level of α = 0.01 and a p-value = 0.0031. Therefore, we reject the null hypothesis (H₀₁) that there is no difference in ethical sensitivity between student group one and student group two.

A one-tail Welch’s t-test was also performed to compare scores between construction and civil engineering students of the pilot test. The one-tail Welch’s t-test was marginally significant at the level of α = 0.05 and a p-value = 0.0503. Therefore, we fail to reject the null hypothesis (H₀₂) that there is no difference in ethical sensitivity to professional issues of the TESC between construction and civil engineering students.

Discussion of Pilot Results

Due to constraints, convenience sampling was used to identify participants (Creswell, 2009). Participants (n=124) for pilot testing the TESC were sophomores (n=12), juniors (n=8), seniors (n=97), and graduate students (n=3), with four respondents not indicating academic
standing. These participants consisted of construction engineering students \((n=28)\) and civil engineering students \((n=87)\) with nine students not indicating program of study. The TESC was administered to three different classes for students in different types of construction programs: a senior level course in estimating, production, and cost engineering \((n=17)\), a senior level professional and legal issues course \((n=89)\), and a sophomore-level introductory course on construction engineering and management \((n=18)\).

The results of the pilot study provide initial insight into test characteristics and student performance on the TESC. The intention of the pilot was not to perform a complete statistical analysis, but instead to provide a benchmark for future studies. First, the difficulty of items varies significantly. The pilot results indicate that five items of the TESC have very high difficulty. Students of this sample tended to struggle with the items of claims games, bid shopping, bid peddling, front-end loading, and payment games. Of these items, bid peddling was found to be the highest difficulty as it was not identified by any of the participants.

Reasons for high levels of difficulty vary. High difficulty of the five items could indicate that the vignette may have had very high distractors or possibly could be the result of the structure of the vignettes. Low ability to recognize these issues could indicate low coverage of these issues in these particular civil and construction engineering programs, relating to the issue of person fit. In terms of person fit, because the sample consisted largely of civil engineering students, answers for item one were consistent with design issues such as issues of public safety, which was not rated but could be considered in future administrations. A conclusion as to why these items show high difficulty cannot be made without further investigation into the programs of study.

Secondly, the first Welch’s t-test highlighted that there was a significant difference (even at the significance level of 0.01) between results of a freshmen-sophomores group and a juniors-seniors group when comparing abilities of each group to recognize ethical issues of the construction industry. This initial result indicates that of the sampled programs, construction ethics education may have some positive impact on construction students’ ethical sensitivity to issues of the construction industry. However, further investigation into curricular and co-curricular experiences of students during their course of study is necessary to explore the degree of impact.
Lastly, the second Welch’s t-test indicates no evident difference (at the significance level of 0.05) between results of students enrolled in a construction program and those enrolled in a civil engineering program. The results suggest that students of different construction related programs may have similar curricular experiences when it comes to construction ethics education; however, further investigation is necessary to make that conclusion.

Conclusions

The construction industry is still challenged by many unethical acts that have many impacts on society, but this does not mean that the industry cannot change. We believe that proper instruction and evaluation of construction student ethical sensitivity can assist current attempts at curbing unethical behavior in the construction industry. Having ethics education embedded in a construction curriculum is not enough to ensure ethical competency regarding issues of the construction industry. A proper means of evaluating student competency with respect to ethical issues of the construction industry is necessary to ensure students are equipped with the necessary competency to make proper ethical decisions.

By having a test that assesses student ability to recognize ethical issues of the construction industry via vignettes that place them into realistic situations, educators can understand how sensitive students are to ethical issues of the construction industry while evaluating their ethics education program. Thus, a technique to test ethical sensitivity was conceptualized and constructed to meet the need to assess this component of cognitive moral development in construction students. Through test development and piloting, we believe the TESC technique to be one that will assist in student ethical development and curriculum improvement.

Limitations

Resources that are available to develop an auxiliary form TESC with new vignettes, administer the TESC, and rate the TESC may limit the use of the TESC technique. The ability to generalize results to the larger population is also a function of resource availability. A way to minimize this limitation would be to shorten the test to one or two vignettes with focused issues such as bid shopping and bid peddling, thus allowing for a broader distribution to a larger sample to determine student ability to recognize specific ethical issues of the construction industry.
Additionally, the TESC does not provide the ability to control for other influences of ethical development such curricular and co-curricular experiences. In different types of construction programs, ethical concepts are taught throughout the curriculum and without resources to perform a longitudinal study, a pretest-posttest-control design is very difficult to perform.

Future Work

Ideally, we would like to expand the TESC technique of evaluating ethical sensitivity to include other ethical issues associated with the construction industry. Having the conceptual framework of the TESC as a foundational evaluation technique for construction ethics education, there is a need for vignettes that will test construction students’ ethical sensitivity to other issues not represented in this original TESC. Ideally, the research team envisions a vignette for each ethical issue of the construction industry that can be placed in a repository for ethics educators to teach in various courses throughout the construction curriculum. The inventory of ethical issues developed by Sands & Pearce (2014) could be a useful starting point for vignette ideas.

Additionally, per the pilot results there is a need to investigate the ethics education further in the different types of construction programs to understand the high level of difficulty with five of the items of the TESC. Further investigations are necessary to compare results of the TESC to various construction ethics pedagogy techniques to investigate how ethics pedagogy influences the ethical sensitivity of construction students.

As with any new instrument, the research team intends to continue adding arguments of validity and reliability for the technique of evaluating ethical sensitivity via vignettes. Another design may assist this effort once resources are available. Additionally, this testing technique could be applied to a longitudinal study of construction students or via an experimental design where a workshop is used as an intervention technique.

Ultimately, understanding construction student ethical sensitivity to professional issues of the construction industry may assist in providing a benchmark to assist in improving construction ethics education. We want students to have ethical sensitivity, and believe that proper ethical decision-making is elemental to changing the unethical stigma of the construction industry.
Acknowledgements

We would like to thank the Myers-Lawson School of Construction and the Department of Building Construction at Virginia Tech for their continuous support of this research. Additionally, we would like to thank the students, instructors, and assistants who provided us the class times to conduct our think-aloud sessions, and the pilot investigation. Lastly, we would like to thank Dr. Yanna Lambrinidou of Virginia Tech who contributed significantly to the work.

References


CHAPTER 5

Ethics pedagogy in undergraduate construction curricula:
A mixed methods approach

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Victoria Mouras\textsuperscript{IV}, Christine Fiori\textsuperscript{V}

Abstract: Construction programs must provide ethics education to their students in order to maintain accreditation. The difficulty in providing ethics education is that there are few resources that can assist instructors who teach ethics in these programs. This exploratory sequential mixed methods research study uses three of Eash’s five curriculum components (content, modes of transaction, and evaluation) to understand ethics pedagogy in construction education, and provide a range of content and pedagogical practices for educators who teach ethics in technical construction curricula. By performing an initial qualitative exploration on ethics education in construction and other disciplines, including a literature review and review of construction programs’ curriculum guides, we were able to have an initial understanding of how ethics is taught in construction education while identifying any gaps in the literature. Informed by the qualitative exploration, we were able to develop a survey on How Ethics is Taught in Construction (HETC). We performed an investigation into how ethics is taught in four purposefully sampled construction programs and one conveniently sampled construction program to gain a deeper understanding of the pedagogical content (topics) and techniques programs use to teach ethics. We found a wide range of pedagogical techniques available to teach ethics that can be used as a resource for construction educators, to assist and inspire the improvement of construction ethics education.

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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 (Bommer, Gratto, Gravander, & Tuttle, 1987; Fan & Fox 2009; Jones 1991; Ray, Hornibrook, Skitmore, & Zarkada-Fraser, 1999; Sands & Pearce, 2014; Tow & Loosemore, 2009). For this study, the particular group is the construction industry.

The construction industry has its share of poor ethical practices. Unethical conduct in the construction industry is indiscriminate of global region or stakeholder. The global construction industry as a whole is infamous for poor ethical performance and has been recognized as the most corrupt of any international business sector (Jaeger & Adair, 2012; Rodriguez, Waite, & Wolfe, 2005; Sands & Pearce, 2014; Sands & Simmons, 2014).

Research suggests that there are various issues associated with the construction industry’s poor ethical performance. The issues range from professional issues such as collusion, bid shopping, claims games, for example, to societal issues like sustainability, the environment, and discrimination (Sands & Pearce, 2014). 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 (American Council for Construction Education, 2010; Accreditation Board for Engineering and Technology, 2012).

Problem & Purpose

Construction programs’ ethics educators must develop a means to provide ethics education to construction students. According to construction ethics education 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 challenge, traditional and technically trained educators sometimes consider ethical topics secondary to technical curricula (Sands & Pearce, 2014; Sands et al., 2014; Sinha, Thomas, & Kulka, 2007). An alternative viewpoint suggests that ethical competency, or the ability to work in the construction industry, in a manner as defined by professional ethical codes of conduct (Friedman, 2007; Sands et al., 2014) is one of the most important competencies required of construction students and industry professionals support this viewpoint (Ahn et al., 2012). With ethical competency being so important, we seek
to continue the conversation on construction ethics pedagogy to move toward a framework of ethics education and best practices for construction education.

To move toward a framework of ethics education and best practices, we needed to answer the question: in what ways do the initial exploration into construction education literature on ethics, and curriculum guides on how ethics is taught in construction, help to explain the quantitative results about how ethics is taught in construction curricula? The umbrella research question involves the sub-questions:

RQ1. How do literature and construction programs’ curriculum guides operationalize Eash’s (1991) components on ethics education?
RQ2. What content and pedagogical techniques are used in construction programs to teach ethics?

The purpose of this mixed methods study is to answer these questions to gain a preliminary understanding of ethics pedagogy in construction education, and provide a range of content and pedagogical practices for educators who teach ethics in technical construction curricula.

This exploratory sequential design (Creswell & Plano Clark, 2011) was comprised of a qualitative exploration of current construction academic literature on ethics and a review of construction programs’ curriculum guides. From this initial exploration, the qualitative findings are used to develop a quantitative survey instrument on how ethics is taught in construction education (HETC). The HETC was administered to a larger sample of faculty and students of construction programs (sampled based on review of curriculum guides) to complement qualitative results (Creswell & Plano Clark, 2011; Edmeades et al., 2010; Mertens, 2011). Additionally, accreditation documents of sampled programs supplement our interpretation of the results to begin filling gaps not covered in previous strands (see Figure 5.1).
Methodology

According to Johnson, Onwuegbuzie, & Turner (2007, p. 23), mixed methods research can be defined as,

the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.

The particular reason for mixing methods for this study is that it allows for multiple ways of answering our research question, providing greater insight into the broad question of how ethics is taught in construction education. The mixed methods approach of this study provides complementarity of results from construction literature on ethics and construction programs’ curriculum guides, with the results of quantitative survey results from faculty and students. This method also allows for the addition of accreditation documents to be used to fill in gaps. Mixed methods provide us the opportunity for a greater assortment of divergent views and more completeness of understanding ethics pedagogy in construction (Creswell & Clark, 2011; Greene, Caracelli, & Graham, 1989; Teddlie & Tashakkori, 2009). This methodology also provides us a means of case study sampling, and assists with instrument development (Bryman, 2006; Creswell & Plano Clark, 2011).
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 (1991) curriculum components model as a conceptual framework for this research. Eash’s (1991) 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” (Eash, 1991, p. 67).

![Diagram of Eash's (1991) five components of the curriculum](image)

**Figure 5.2.** Eash’s (1991) five components of the curriculum

For the purpose of this study, we elect to investigate the operationalizing of Eash’s (1991) components of content (c), modes of transaction (d), and evaluation (e), as we are not concerned with assumptions or aims and objectives for this study.

**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 (1991) components (c) through (e) are operationalized. This exploration will begin to answer how literature and curriculum guides operationalize Eash’s (1991) components in ethics education.

We performed a literature review on ethics education research. Jaidka, Khoo, & Na (2013, p. 303) defines a literature review as “a summary of a set of related research papers.” The required functions of literature reviews for this study was to, “distinguish what has been done from what needs to be done and identify main methodologies and research techniques that have been used” (p. 304). We also performed a complementary review of construction programs’ curriculum guides to get initial insight into how programs operationalize Eash’s (1991)
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 (2009). Literature was then reviewed and elements of Eash’s (1991) components were extracted.

**Key Findings (Qualitative Strand)**

Key findings of our qualitative strand 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.

**Content or Subject Matter (c)**

Regarding content (c), Herkert (2000) provides an analysis of the development of engineering ethics education. Engineering was a focus because the U.S. Bureau of Labor Statistics (BLS) (2014) 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 many sub-disciplines, so having research on ethics content that specifically ties to the construction industry was necessary.

Sands & Pearce (2014) provides an inventory of ethical issues that specifically relate to the construction industry. This study used qualitative 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 (2014) inventory inspired the development of question six of the HETC survey to investigate what sampled programs cover in their construction curriculum.
Modes of Transaction (d)

Regarding modes of transaction (d), we identified three sub-components of curriculum setting (d_i) (Finelli et al., 2012), media (d_ii), and teaching styles (d_iii). Regarding sub-component (d_i) curriculum setting, Stephan (1999) studied ethics-related instruction in U.S. engineering programs. The intent was to focus on engineering programs where ethics was a significant part of the engineering curriculum and present this information in a database to inspire other engineering programs. In this study, Stephan (1999) 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 (2000) 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. (2012) assess engineering student ethical development based on their curricular and co-curricular experiences. The significance of this paper is Finelli et al.’s (2012) 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 (1999) briefly mentions the use of textbooks and Menzel (1998) 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. (2012) 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 (2000) 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 (Glaser & Strauss, 2009). This analysis was our first look into actual construction programs’ ethics education. We used Sands & Pearce’s (2014) 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 sampled 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 many programs have ethics education throughout the curriculum [curriculum setting (d)]. 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). Topics include 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.

Evaluation (e)

Component (e) evaluation is very difficult when it comes to teaching ethics, as it is difficult to assess student ability to behave ethically. As a start, Menzel (1998) provides insight into evaluation techniques used in ethics education. The evaluation techniques discussed include written papers, oral reports, objective exams, and essay exams (Menzel, 1998).
Construction Ethics Education Literature Review

We added to our initial review on construction ethics education research (Sands & Pearce, 2014) (see Table 5.1). There is a range of topics discussed in construction ethics education literature that complements Sands & Pearce’s (2014) inventory on construction ethics education topics. Additionally, we found that 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>
<thead>
<tr>
<th>Author(s)</th>
<th>Content or subject matter discussed (c)</th>
<th>Modes of transaction discussed (d)</th>
<th>Evaluation techniques discussed (e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robertson, 1987</td>
<td>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</td>
<td>Suggests the presentation of ethics throughout the curriculum and taught by faculty in the Philosophy department (d₁). Also suggests having faculty and upperclassmen act as exemplars to reflect ethical culture, using case studies, using problem-based learning (dᵢ).</td>
<td>Discusses use of detailed case review analysis assignment</td>
</tr>
<tr>
<td>Mulligan, 1991</td>
<td>Discusses topics of hazardous waste/pollution, culture/multiculturalism, global awareness, and environmental impact</td>
<td>Suggests the use of lectures (dᵢᵢ), textbooks, videos, and magazine articles from Engineering New Record (ENR) (dᵢᵢ).</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Killingsworth, 1992</td>
<td>Discusses topics of codes of ethical conduct/practice, construction safety, law, stealing, and cheating</td>
<td>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 (dᵢ). Suggests the use of case studies and use of peer discussions of ethical case studies (dᵢᵢᵢ).</td>
<td>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</td>
</tr>
<tr>
<td>Tepper, 1994</td>
<td>Discusses topics of construction safety and OSHA regulations as a moral and ethical issue</td>
<td>Suggests the use of course web page, and suggests video vignettes (dᵢᵢ).</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Ohrn, 2002</td>
<td>Discusses topics of bid shopping, bid peddling, front-end loading, payment delays, modification of lab results, codes of ethical conduct/practice</td>
<td>Suggests the introduction of ethics in a broad spectrum of courses such as estimating, project management, and soils and concrete (d₁).</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Toco, 2006</td>
<td>Discusses topics of alternative dispute resolution, conflict, arbitration, and mediation</td>
<td>Discusses the use of scenarios, exercises, mock arbitration, and mediation sessions (dᵢᵢᵢ).</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Kang, Price, Thorpe, &amp; Edun-Fotwe, 2006</td>
<td>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</td>
<td>Suggests the instruction of ethics via ethical courses in an ethics training program (d₁)</td>
<td>Discusses use of the defining issues test prior to and after ethical training</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Content or subject matter discussed (c)</td>
<td>Modes of transaction discussed (d)</td>
<td>Evaluation techniques discussed (e)</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
<td>bidding practice, safety, quality control, abuse of client resources, and ethical theory</td>
<td>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). Suggests the use of lectures, invited guest lectures, problem-solving, case studies (d_{iii}) and use of interactive videodisc (d_{ii}).</td>
<td>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</td>
</tr>
<tr>
<td>Sinha et al., 2007</td>
<td>Discusses topics of construction law and contracts, legal systems and maxims of law, societal values and morality, professional practice, and employer obligations</td>
<td>Suggests an ethics course situated as a one-credit course on construction ethics to upper-class students (d). Suggests discussion as a means of ethics instruction (d_{iii}) and use of video recordings, textbooks, and computers (d_{ii})</td>
<td>Not discussed</td>
</tr>
<tr>
<td>King, Duan, Chen, &amp; Pan, 2008</td>
<td>Discusses topic of adherence to building codes and regulations</td>
<td>Suggests the use of lectures (d_{iii})</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Scalza, 2008</td>
<td>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</td>
<td>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 single course on ethics (d). Also, suggests the use of case studies (d_{iii})</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Darwish, Agnello, &amp; Burgess, 2010</td>
<td>Discusses topics of sustainability, environmental ethics, green construction, code of ethics, construction safety, health, and welfare,</td>
<td>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})</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Darwish, Agnello, &amp; Olaniran, 2011</td>
<td>Discusses topics of sustainability, environmental ethics, green construction, safe water, resource depletion, generative waste, harmful emissions, energy efficiency, and globalization</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Ethics is Taught in Construction (HETC) Survey

Informed by the qualitative strand 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 qualitative data with information from actual construction programs to compile data on ethics education into a single source. Therefore, for our quantitative strand of the study, 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” (Fink, 2012, p. 2). 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 (Creswell, 2009; Dillman, 2007; Fink, 2012).

**HETC Survey**

Based on our qualitative study, we have a basis for developing the HETC survey. The basic form of the HETC survey is a self-administered questionnaire of six general questions, 147 binary (yes/no) survey items that are based on respondents’ recollection of how ethics was taught. Additionally, there are open-ended items for each question to allow respondents to provide additional information (Creswell, 2009; Fink, 2012).

There are two version 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 A). Eash’s (1999) 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 (d13) was not explicitly covered in the literature. However, this question was developed to gain additional knowledge, drawing from experiences.

The faculty HETC is similar to 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. Demographic information from both groups is useful for this and further analysis.

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**

Lastly, the administration techniques differed for the two surveys. We administered the HETC to faculty via an online survey method described by Dillman (2007) that allows faculty to complete the survey at their leisure, providing them the opportunity to return to the survey if incomplete. The web based survey software used for this study was the Qualtrics Research Suite, copyright © 2014 (Qualtrics, 2014). We administered a handwritten, pen-paper survey to students. Based on a study by Smalls, Matusovich, & McCord (2014), students tend to prefer this technique for real-time data collection.

Participant programs were selected purposefully based on how we initially understood their curriculum setting of ethics education from our review of curriculum guides (see Table 5.2). Additionally, degree requirements of construction professionals vary (BLS, 2014). A civil engineering program was conveniently added for diversity of responses. Per this study’s IRB protocol, we used pseudonyms to identify programs. The letters A through E identify programs.

Student surveys were administered to students (see Table 5.3) in participating programs in various senior level construction classes on professional and legal issues, risk management and construction safety, construction project management, contracting business, or thesis (capstone). Department heads and institutional collaborators of programs were asked to send survey links to individuals who may have an understanding of how ethics is taught in their construction program (see Table 5.4).
<table>
<thead>
<tr>
<th>ID</th>
<th>Program Type</th>
<th>Carnegie Classification</th>
<th>U.S. Census Bureau Region</th>
<th>Accreditation Type</th>
<th>Initial Understanding of Ethics Curriculum Setting</th>
<th>Student Surveys Returned</th>
<th>Faculty Surveys Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Building Science</td>
<td>Public research university (high research activity)</td>
<td>South</td>
<td>ACCE</td>
<td>Course in the philosophy department</td>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Construction Engineering</td>
<td>Public research university (very high research activity)</td>
<td>South</td>
<td>ABET</td>
<td>Module in a class</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Civil Engineering</td>
<td>Public research university (very high research activity)</td>
<td>South</td>
<td>ABET</td>
<td>Module in a class</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Construction Management</td>
<td>Private not-for-profit research university (high research activity)</td>
<td>West</td>
<td>ACCE</td>
<td>Technology/engineering ethics course</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Construction Operations &amp; Management</td>
<td>Public research university (high research activity)</td>
<td>Midwest</td>
<td>ACCE</td>
<td>Across the curriculum</td>
<td>42</td>
<td>2</td>
</tr>
</tbody>
</table>

**Totals**: 174 8

*Note:* The HETC was administered during class sessions. Nearly all students completed some portion of the HETC and one student of all programs formally opted out of the survey.
Table 5.3. Student Respondent Descriptive Data (n=174)

<table>
<thead>
<tr>
<th>Program ID</th>
<th>Mean Age</th>
<th>Gender (%)</th>
<th>Industry Experience (%)</th>
<th>Academic Level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
<td>None</td>
</tr>
<tr>
<td>A (n=55)</td>
<td>22</td>
<td>94.5</td>
<td>5.5</td>
<td>7.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>34.5</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.0</td>
<td>0.0</td>
<td>7.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.0</td>
<td>28.0</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.0</td>
<td>36.4</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.4</td>
<td>7.1</td>
<td>9.5</td>
</tr>
<tr>
<td>B (n=16)</td>
<td>22</td>
<td>93.7</td>
<td>6.3</td>
<td>18.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0</td>
<td>25</td>
<td>37.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.75</td>
<td>0.0</td>
<td>37.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.0</td>
<td>2.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.0</td>
<td>2.0</td>
<td>9.5</td>
</tr>
<tr>
<td>C (n=50)</td>
<td>22</td>
<td>80.0</td>
<td>20.0</td>
<td>36.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28.0</td>
<td>16.0</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28.0</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.1</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>D (n=11)</td>
<td>25</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>18.2</td>
<td>18.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.2</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.1</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>E (n=42)</td>
<td>22</td>
<td>98.0</td>
<td>2.0</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.1</td>
<td>14.3</td>
<td>66.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.3</td>
<td>0.0</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.8</td>
<td>7.1</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.8</td>
<td>0.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Totals</td>
<td>22</td>
<td>91.0</td>
<td>9.0</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17.0</td>
<td>20.0</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
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<td>28.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>11.0</td>
<td>11.0</td>
</tr>
</tbody>
</table>

87
Table 5.4. Faculty Respondent Summary Data

<table>
<thead>
<tr>
<th>Respondent #</th>
<th>Program A</th>
<th>Program B</th>
<th>Program C</th>
<th>Program D</th>
<th>Program E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Taught full course on ethics</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Taught course(s) that include ethics</td>
<td>Yes, Construction Safety; Construction Management</td>
<td>Yes</td>
<td>Yes, Construction Law; Contracting Business</td>
<td>Yes, Introduction to the Construction Engineering and Management Profession</td>
<td>Yes, Professional &amp; Legal Issues (In Civil Engineering)</td>
</tr>
<tr>
<td>Highest academic degree</td>
<td>Master’s</td>
<td>Doctorate</td>
<td>Doctorate</td>
<td>Doctorate</td>
<td>Master’s</td>
</tr>
<tr>
<td>Current faculty position</td>
<td>Associate Professor</td>
<td>Full Professor</td>
<td>Associate Professor</td>
<td>Professor of Practice</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Administrative position</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Associate Director; Director of Undergraduate Programs</td>
<td>N/A</td>
</tr>
<tr>
<td>Academic experience (years)</td>
<td>14</td>
<td>22</td>
<td>26</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Industry experience (years)</td>
<td>20</td>
<td>9</td>
<td>18</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Formal ethics training in construction</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Analysis

Descriptive data analysis best fits the purpose of this study. Pie charts are presented to visually represent the coverage of ethical topics and pedagogical techniques recalled. 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.

Graphical results of the HETC survey are represented in Figures 5.3-5.8. Student and faculty responses are represented side-by-side as a means to understand the difference in student responses and faculty responses. Since the focus of this study is not to obtain a measure of comparison, a deeper analysis of student versus faculty responses is not part of this particular study.

Responses to questions 1-5 (see Figures 5.3-5.7) that were not recalled were removed from pie charts to highlight key results. Additionally, question 6 (see Figure 5.8) has many items and, therefore, for the purpose of this study, items that were less than 2% of the total responses were removed from the graphical representation.

Key Findings (Quantitative Strand)

To review our key findings, we discuss total percentages of response to questions that were often recalled by participants (>10% of the total responses). Student responses are denoted as ‘s’ and faculty responses denoted as ‘f’. We also highlight items that were ‘other,’ less frequently recalled, and/or were not recalled.

Question 1, Curriculum Setting (d1) (see Figure 5.3): 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%). 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.”
Question 2, Media (dii) (see Figure 5.4): 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%). 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.

Question 3, Learning Environment (div) (see Figure 5.5): 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%). 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 (diii) with the response ‘guest speakers.’

Question 4, Teaching Styles (diii) (see Figure 5.6): 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%). 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.

Question 5, Evaluation (e) (see Figure 5.7): 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 class performance during ethics education. 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.

**Question 6, Content (c) (see Figure 5.8):** 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%). 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. In addition, we found 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.
Various Courses Throughout the Curriculum

Non-Ethics Course Where Ethics Was a Full Module

Philosophy Ethics Course

Business Ethics Course

Dedicated Course

Student Responses

Figure 5.3. Question 1; Curriculum Setting ($d_i$)

Philosophy Ethics Course

Dedicated Course

Non-Ethics Course Where Ethics Was a Full Module

Various Courses Throughout the Curriculum

Student Responses

Faculty Responses

Philosophy Ethics Course

Dedicated Course

Non-Ethics Course Where Ethics Was a Full Module

Various Courses Throughout the Curriculum

Student Responses

Faculty Responses

YouTube Videos

Textbook

News Articles

Journal Articles

The internet in general

Student Responses

Figure 5.4. Question 2; Media ($d_{ii}$)

The internet in general

Movies/Film

YouTube Videos

Other(s)

Magazines

Faculty Responses

Student Responses

Faculty Responses
Figure 5.5. Question 3; Learning Environment ($d_{in}$)

Student Responses

Faculty Responses

Figure 5.6. Question 4; Teaching Styles ($d_{iii}$)

Student Responses

Faculty Responses
Figure 5.7. Question 5; Evaluation (e)

Student Responses

Tests & Quizzes
Attendance in Class When Ethics is Taught
Participation in Discussions
Written Assignments and Reports
Group Projects

Faculty Responses

Tests & Quizzes
Written Assignments & Reports
Attendance in Class When Ethics is Taught
Participation in Discussions

Student Responses

Honesty, Integrity
Bid Shopping
Ethics Theory/Moral Philosophy
Safety
Codes of Ethical Conduct

Faculty Responses

Honesty, Integrity
Bid Shopping
Ethics Theory/Moral Philosophy
Safety
Front End Loading

Figure 5.8. Question 6; (c) Content

Student Responses

Faculty Responses
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.

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.

As a note on evaluation techniques, the HETC only studied evaluation techniques that measure the construct of class performance ostensibly and not ethical competency. However, there is a need to measure actual ethical competency of construction students. Results from the HETC survey has expanded knowledge on ethics evaluation, moving beyond evaluation of class performance during ethics classes and sessions by assessing 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.

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 using both qualitative and quantitative techniques for this study. The mixed methodological approach undertaken in this study was essential to answer each of the research questions. To understand how literature and curriculum guides operationalize Eash’s (1991) 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 investigate 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.

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. We believe that this study provides a collection of pedagogical techniques, for educators in various construction programs, which may assist in the development of ethics education resources to inspire the improvement of construction ethics education.

**Limitations**

This study had several limitations. Resources each institution provided to us, such as class availability to administer surveys, class times provided to administer surveys, number of faculty members capable of completing the HETC survey, and access to accreditation documents, limited data collection. In addition, we cannot generalize these results to the population of construction programs based on our purposeful sampling technique.

**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 about how ethics is taught in construction curricula, not only in the U.S., but internationally as well. 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. Assessing the effectiveness will provide a source for construction ethics education decision-making, based on student 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 life lessons, and from parents, neighbors, and relatives. Having this information may provide other contributing factors to student ethical competencies, and may guide curriculum decision-making in construction programs.

A repository of resources for construction ethics education is needed to provide construction educators the tools to teach ethics and resources to understand how to combine the pedagogical techniques and content to teach ethics more effectively. This may lessen the strain on construction ethics educators when preparing for ethics instruction.
We would like to expand the technique of the HETC survey into other areas of construction research where there may be little known about different techniques for teaching. We hope that by expanding this technique into other subject areas, we can provide more teaching resource for construction educators.

Acknowledgements
A great deal of appreciation is owed to Dr. Yanna Lambrinidou, Nicole J. Johnson, Dr. Elizabeth Creamer, Sheldon Masters, the participating construction programs’ students and faculty, and the Myers-Lawson School of Construction for their assistance in the development of this work.

References


APPENDIX A

Foundation Questions for the HETC Survey (Sample Student Form)

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
- 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__________________
CHAPTER 6

Toward an understanding of ethics education’s influence on the ethical sensitivity of construction students

Kenneth Sands I, Annie R. Pearce II, Denise R. Simmons III, Vickie Mouras IV, Christine Fiori V

Abstract: The construction industry has significant influences on the U.S. economy, including a high rate of employment and many employment opportunities. The construction industry expects its new hires to have competency regarding ethical issues of the construction industry, and at a minimum, students must be able to recognize these issues, i.e., have ethical sensitivity. Without much literature specifically regarding construction education’s relationship to the ethical development of its students, the purpose of this investigation is to study the ethical sensitivity of construction students and explore variables that may contribute to construction student ethical sensitivity. We administered a Test for Ethical Sensitivity in Construction (TESC) to student participants of five purposefully selected construction programs and found that students had various levels of difficulty recognizing ethical issues of the construction industry. We used nonparametric statistics to test hypotheses and found that variables such as industry experience, gender, and age did not significantly influence the levels of participant ethical sensitivity. We found significant differences in ethical sensitivity between students of different programs of enrollment. With these findings, we begin to understand how construction students’ curricular experiences may influence their ethical sensitivity, but more research is necessary to determine the extent of influence curricular experiences have on ethical sensitivity compared to co-curricular, professional, and personal experiences.

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Introduction

The construction industry has a significant influence on the U.S. economy (Abudayyeh et al. 2000; Ahn et al. 2012). According to the U.S. Bureau of Labor Statistics (BLS) (2014), the construction industry engages in building and engineering projects, and consists of three subsectors: construction of buildings, heavy and civil engineering construction, and specialty trade contractors. The U.S. Census Bureau (2014) estimates, as of July 2014, that the construction industry contributes close to $1 trillion dollars to the U.S. economy annually, and the U.S. Bureau of Economic Analysis (2014) adds that the construction industry contributed to 3.6% of the U.S. economy. Additionally, according to preliminary estimates by the U.S. Bureau of Labor Statistics (BLS) (2014), as of August 2014, the construction industry had over six million employees and as of June 2014, the construction industry had a preliminary estimate of 141,000 job openings.

To fill these openings with qualified personnel, construction students must possess key competencies required of the construction industry. A study by Ahn et al. (2012) indicates that there is significant agreement among construction professionals that competency regarding ethical issues of the construction industry is required of its new hires. As part of an effort to increase construction student competency in ethical issues of the construction industry, construction education must provide ethics education. This is required by accrediting bodies such as the American Council for Construction Education (ACCE 2014) and the Accreditation Board for Engineering and Technology (ABET 2012) which accredits over 110 U.S. based construction programs with ABET accrediting over 230 U.S. based civil engineering programs.

There are many ethical issues related to the construction industry (Sands and Pearce 2014). The sum of issues found by Sands and Pearce (2014) adds to the argument that the construction industry has an unethical stigma internationally. In addition, unethical behavior creates negative effects on construction companies and society, while ethical behavior contributes to positive gains of construction companies (Adnan et al. 2012; FMI 2004; Sands and Pearce 2014; Sands et al. 2014a; Transparency International 2005).

What is the most effective way to teach ethics to construction students? For students to make proper ethical decisions educators must ensure that students possess the ability to recognize ethical issues of the construction industry; in other words, they must possess ethical sensitivity to these issues (Rest 1984). With the ability to measure ethical sensitivity,
construction educators could then consider the question of how elements of the curriculum affect that sensitivity and design educational programs to improve it.

**Literature Review**

_Ethics Education’s Influence on Student Ethical Development_

Attempting to measure the influence of ethics education on students is not a new concept. Efforts have been made in engineering education (Borenstein et al. 2008; Finelli et al. 2012; Self and Ellison 1998; Shuman et al. 2004; Sindelar et al. 2003), medical education (Campbell et al. 2007; Goldie et al. 2002; Hebert et al. 1990; Hebert et al. 1992; Savulescu et al. 1999), dental education (Bebeau et al. 1985; Sharp and Kuthy 2008), public administration education (Jurkiewicz 2002), science education (Clarkeburn 2002), and business education (Cole and Smith 1995; Weber 1990).

Jurkiewicz (2002) studied the pedagogical influence on student ethical reasoning and found significant increases in the level of public administration students’ ethical reasoning from participation in an ethics course. Additionally, Weber (1990) makes the same conclusion about student reasoning in business students. Sindelar et al. (2003) assessed engineering students’ comprehension, analysis, and resolution of ethical dilemmas in an engineering context. Sindelar et al. (2003) illustrated increases in ethical skills by students after a semester-long course focusing on engineering ethics. Additionally, Self and Ellison’s (1998) study showed that taking a course in engineering ethics can improve moral judgment and that moral reasoning can be taught and objectively measured.

Finelli et al. (2012) investigated the relationship between ethical development of engineering students and characteristics of formal curricular experiences such as _curriculum setting_ of ethics instruction using the Student Engineering Ethical Development (SEED) survey. Curriculum setting is the placement of ethics in the curriculum: for example, in a single course, throughout the curriculum, or in workshops, among others. This study also investigated co-curricular experiences that contribute to the ethical development of engineers, finding that the quantity and quality of curricular and co-curricular experiences were highly related to ethical development of engineering students.
Hebert et al. (1992) specifically studied ethical sensitivity of medical students to assess the ethics education of the University of Toronto’s medical program using a vignette based ethical sensitivity test. They concluded that the ethical sensitivity of students for that program increased from their 1st year to their 2nd year; however, ethical sensitivity decreased from their 3rd year to their 4th year of medical studies. This study also highlighted that the career choice of a medical student (such as family medicine) influenced their ethical sensitivity.

Clarkeburn (2002) studied the ethical sensitivity of bioscience students. Clarkeburn’s study used a Test for Ethical Sensitivity in Science (TESS) to investigate differences between first-year and third-year students. This study found no significant differences between students at different academic levels; however, there were significant differences between students that participated in an intervention using new ethics educational material and those who did not.

Borenstein et al. (2008) studied the ethical sensitivity of science and engineering students using a Test for Ethical Sensitivity in Science and Engineering (TESSE). Borenstein et al.’s (2008) study tested the ethical sensitivity of undergraduate and graduate students and administered the TESSE in the beginning and ending of courses that had ethics as a component versus another class without, employing a pretest, posttest, and control group design. Borenstein et al.’s (2008) study found significant differences between the experimental group and control group. Borenstein et al. (2008) also tested differences in ethical sensitivity based on four different curriculum settings of ethics education: dedicated ethics in technical professions course, a full dedicated or general ethics course, some prior ethics content, and no formal ethics education. Three group comparisons illustrated significant differences between students who took a full ethics course in technical professions course and those who did not. Significant differences were also found between students who had a full dedicated or general ethics course and those who did not. No significant differences were found between students who only had some ethics content and those who did not.

Literature in other fields of study, illustrate the influence of ethics education on their students. Literature illustrates that students’ ethical development increases from participation in an ethics course or through an intervention of ethics teaching. In addition, the quantity and quality of curricular and co-curricular experiences during a term of study at an institution may have an influence on student ethical development, and the curricular placement and teaching of ethics instruction had an influence on the ethical development of students.
Problem and Purpose

Compared to other disciplines, literature on construction ethics education provides fewer studies on the understanding of ethics education’s influence on the ethical development of its students to identify how equipped students are when faced with ethical dilemmas in construction practice. In addition, formal tools for evaluation of student ethical development have been discussed; however, there has been limited discussion on the use of these tools to compare student ethical development to ethics education in construction programs. Techniques that have been provided to evaluate various components of ethical decision-making (for the purpose of this paper, ethical decision-making is the course of action when face with an ethical dilemma) (Rest 1984) include, case-study review analysis (Robertson 1987), evaluation of portfolios and essays analyzing ethical issues (Sinha et al. 2007), and the use of a modified Defining Issues Tests (DIT) (Kang et al. 2006; Killingsworth 1992). Seldom found is literature specifically regarding construction ethics education that investigates levels of difficulty students may have with recognizing certain ethical issues of the construction industry. Moreover, studies comparing variables that may influence the ethical sensitivity of construction students, or their academic, professional, and personal characteristics, against student ethical development are limited (Sands et al. 2014a). It is these gaps that this study is intended to address.

The overarching aim of this research is to ensure that ethics education provides students with competency of ethical issues as required by the construction industry and society. Understanding the relationship of construction ethics education and the ethical sensitivity of construction students is a step that provides an evaluation of education’s ability to meet this goal. However, literature does not provide much evidence regarding construction student ethical sensitivity. Therefore, the purpose of this study is to evaluate construction student ethical sensitivity to various ethical issues.

Evaluating ethics education’s influence on ethical sensitivity of construction students requires that we answer the questions: what can we understand about construction students’ ethical sensitivity to issues of the construction industry, and what may be the influence of construction education on their level of ethical sensitivity? Answering these questions requires the administration of a test that will evaluate the ethical sensitivity of construction students and evaluate the results with respect to academic, professional, and personal characteristics of students. Therefore, the objectives of this paper are to use an evaluation technique to test the
ethical sensitivity of construction students, observe how difficult it was for students to recognize ethical issues of the construction industry, understand how student difficulty is related to ethical topic coverage in curriculum, and test hypotheses to determine if certain variables influenced student ethical sensitivity.

**Hypothesis Development**

**Academic Characteristics**

To understand the influence of construction education on the ethical sensitivity of construction students, we must test hypotheses that compare the ethical sensitivity of students between groups of students based on program of enrollment and curriculum setting of ethics instruction.

**Construction Program of Enrollment**

For the purpose of this study, the term *construction program* or *construction program of enrollment* is used to indicate the program of study or the academic major in which students can enroll, whereby the construction industry is the intended industry of employment of the student. Chinowsky and Diekmann (2004) discusses ‘the construction program’ and its evolution out of the civil engineering discipline. Variants discussed included civil engineering-based construction programs, construction engineering and management construction programs, and civil engineering programs with a specialty track in construction. In addition, accredited construction programs can vary by accreditation focus, such as engineering and design-focused construction programs, construction management, and means and methods-focused construction programs, or hybrid construction programs such as construction engineering and management.

The ABET accredits engineering and design-focused construction programs of, civil engineering. They also accredit hybrids of construction engineering, and construction engineering technology for example, among other construction-related programs. The ACCE accredits construction programs focused on management, means, and methods that vary in nomenclature, specialty, and track such as, *building science, construction management, construction operations and management*, and *construction science and management* construction programs for example. We are not concerned with focus, specialized tracks, or naming variations of construction programs for the purpose of this study; our focus is on
programs that educate students who may be employed in the construction industry. Construction programs can vary by focus, accreditation type, specialty tracks offered, and can be found in different departments in different academic institutions; however, we would expect student competency in ethical issues of the construction industry to be as good as or better than minimum accreditation requirements, regardless of program of enrollment.

Ethics education increases the understanding of professional norms applicable to the program of study (Sparks and Hunt 1998), and different construction programs may focus on different ethical codes, such as the American Society of Civil Engineers (ASCE) and the Construction Management Association of America (CMAA). Certain programs may focus on areas of management whereas other programs may focus on design aspects. Additionally, programs investigated in this study have different accreditation requirements for ethics education (ACCE and ABET), and meeting these requirements may differ between programs. Pilot investigations by Sands et al. (2014a) indicate that there is no significant difference between the ethical sensitivity of students enrolled in construction engineering versus those enrolled in civil engineering. We want to confirm findings by Sands et al. (2014a) that there is no apparent significant difference in ethical sensitivity of students based on their construction program of enrollment and thus, we will test the hypothesis:

H₁: The results of the TESC by the participants of this study differ significantly based on program of enrollment.

Curriculum Setting

Borenstein et al. (2008) found significant differences in levels of ethical sensitivity among students that experienced ethics education in various ways in their educational program, whether it was dedicated courses on ethics, full courses on ethics, or a specialized course in ethics. As determined by Sands et al. (2014b), ethics is set in construction curricula in various ways, such as in a single business ethics courses, a single philosophy ethics courses, a module in a non-ethics course, or in multiple courses throughout the curriculum. To understand whether participants have significant differences in ethical sensitivity based on curriculum setting of ethics education, we will test the hypothesis:
H₂: The results of the TESC by the participants of this study differ significantly based on the curriculum setting of ethics education.

**Professional and Personal Characteristics**

To understand whether other, non-academic characteristics contribute to ethical sensitivity of construction students, we also need to test for significant differences of non-curricular student characteristics. The characteristics we compare include the amount of construction industry experience, as a study by Shadmehr and Moradi (2013) identified that there was no significant difference between participants’ ethical sensitivity and their relative amount of work experience. Gender was also a means of comparison in a study by Sidani et al. (2009), who highlighted that female participants of their study had higher levels of ethical sensitivity than males. Sidani et al. (2009) also indicated that ethical sensitivity of males and females of their study tended to change relative to their age, especially in males, while Shadmehr and Moradi (2013) found that participants in their study had higher levels of ethical sensitivity with increasing age. Therefore, to understand the influence of professional and personal characteristics on participants’ ethical sensitivity, we will test the following hypotheses:

H₃: The results of the TESC by the participants of this study differ significantly based on the amount of **construction industry experience**.

H₄: The results of the TESC by the participants of this study differ significantly based on **participant age**.

H₅: The results of the TESC by the participants of this study differ significantly based on **gender**.

**Methodology**

This non-experimental, cross-sectional research study (Robson 2011) employed the Test for Ethical Sensitivity in Construction (TESC) to gain an initial understanding of the ethical sensitivity of construction students.
Instrumentation

Measuring Ethical Sensitivity in Construction

In this study, the ethical sensitivity of students was measured using a Test for Ethical Sensitivity in Construction (TESC) developed by Sands et al. (2014a). The TESC was selected because it is a test for ethical sensitivity that focuses on ethical issues of the construction industry whereas other tests were used for other academic disciplines. In addition, the TESC allowed us to test the ethical sensitivity of multiple student at the same time at different institutions whereas, other approaches required labor intensive, resource-laden means and methods (Sands et al. 2014a).

The TESC is a pen-and-paper test (Smalls et al. 2014) that embeds 12 ethical issues of the construction industry (potential claims games, collusion, bid shopping, bid peddling, theft, labor issues, safety, front-loading, payment games, no/low competence of work, improper client relations, and bid rigging) in eight vignettes. The vignettes of the TESC focus on post-design ethical issues focused on project procurement and contract management. The TESC elicits qualitative responses from participants (students) but is quantitatively scored on a binary scale. Participants receive a score of one for recognition of an ethical issue, and a score of zero when no recognition is present in their response. The maximum score a participant can obtain on the TESC is 12. Scores of the TESC are then totaled to understand how many issues participants can recognize to understand each participant’s level of ethical sensitivity to the issues embedded in the TESC.

Understanding How Ethics is taught in Construction

To make comparisons between the ethical sensitivity of construction students and academic characteristics that may influence student ethical sensitivity, we must understand how ethics is taught in construction programs. For this purpose, Sands et al. (2014b) developed a survey instrument to study how ethics is taught in construction education (HETC). The HETC survey is based on three of Eash’s (1991) five curriculum components of content, modes of transaction, and evaluation. The HETC survey is comprised of binary (yes/no) response items allowing participants to indicate different ways they recall teaching (faculty) and learning (students) ethical topics of the construction industry. For the purpose of this study, we use the HETC survey to understand the content covered by participant construction programs by
administering the HETC to both faculty members in those programs and student respondents to
the TESC. We compare HETC survey results of content coverage with participant difficulty in
recognizing ethical issues of the TESC, to evaluate the influence of content coverage on the
ethical sensitivity of construction students

**Operationalizing Variables**

For the purpose of this study, the dependent variable is student ability to recognize ethical
issues of the construction industry that are part of the TESC (reflected by TESC student scores).
We first assessed the difficulty (mediator variable) participants had with each item and compared
this difficulty with the independent variable of whether or not the ethical issue was taught in
participants’ particular program. Faculty and students of participant programs were asked to
complete the HETC. Faculty were also asked to provide curriculum documents regarding how
they teach ethics. Survey responses and curriculum documents reviewed and combined to
understand the coverage of ethical issues in each construction program and was compared with
TESC results.

When performing an item analysis for test development, the optimal difficulty level is 0.5
(Kline 2005; Sands et al. 2014a); however, for the purpose of this study, we want to understand
how difficult each item was for participants. This is different from Kline’s assessment because
we do not wish to conduct an item analysis for assessment of the TESC; we want to make
observations about actual difficulty students experienced with each item of the TESC.

To understand whether academic, professional, and personal characteristics have an
influence on the ethical sensitivity of construction students, we conducted hypothesis tests on
results of the dependent variable versus independent variables of participant program of
enrollment, curriculum setting of construction ethics instruction, participant construction
industry experience, gender, and age. Understanding participant program of enrollment was
based on our sampling technique as discussed in a subsequent section, with the understanding
that each construction program teaches ethics differently. To make comparisons between groups
based on curriculum setting of ethics, we used student responses to the HETC survey
administered to all participants.

In terms of professional characteristics, construction industry experience may provide
practical experience or exposure to ethical issues that may not be taught in a construction
program; therefore, it is important to know if industry experience has any influence on the ethical sensitivity of construction students. Students in a four-year program may have the opportunity to participate in internships or may be existing professionals; so, we asked students if they had industry experience in increments that may reflect internship terms.

The independent variables of gender and age (personal characteristics) were illustrated in research to have significant influence on participant ethical sensitivity of other disciplines; therefore, we asked students to provide these personal characteristics as part of the TESC administration, which we used as independent variables for hypotheses testing to assess the impact of these characteristics on participant ethical sensitivity.

**Sample**

For the purpose of this study, the target population was undergraduate senior level students in accredited U.S.-based construction programs because we want to know the level of student ethical sensitivity prior to entering practice.

A purposeful sampling technique (Creswell 2009) was used to identify programs that teach ethics in various ways (curriculum setting of ethics education). Sampling of programs was based on whether ethics is taught via a single construction course, a single business course, a single philosophy course, a module in another course of study, or throughout the curriculum in multiple courses.

To select programs, a review was performed on 118 curriculum guides of undergraduate ABET and ACCE accredited construction programs that focus on construction management, and means and methods in the U.S., as well as ACCE accreditation candidates, as an initial look into various construction programs. We collected data from each construction program’s website and conducted a textual analysis on curriculum guides of each of the 118 construction programs to understand how ethics is placed in each program’s construction curriculum. Based on our findings, 78 of the construction programs appeared to spread its ethics education throughout their curriculum, two have a stand-alone course in construction ethics, and nine have a course in construction ethics that includes other non-ethics content. In addition, seven programs include ethics via an engineering/technology ethics course, seven provide ethics education via a business ethics course, and eight include ethics in an ethics course provided by the philosophy
department, and there were seven programs where we could not identify where ethics was placed in their curriculum (see Appendix B).

For this study, we wanted to obtain at least one participant program for each type of ethics curriculum placement. We sent 14 (two from each curriculum placement type) purposefully selected accredited construction programs recruitment letters without promise of compensation for participation based on our feasibility to administer the TESC at the test site. Four programs agreed to participate in the study based on our curriculum guide review (see Table 6.1). One program (program C) was conveniently sampled for variation in construction program type (engineering focused).

Table 6.1. Participant Programs’ Summary Data (Sands et al. 2014b)

<table>
<thead>
<tr>
<th>ID</th>
<th>Program Type</th>
<th>Carnegie Classification</th>
<th>U.S. Census Bureau Region</th>
<th>Accreditation Type</th>
<th>Initial Understanding of Ethics Curriculum Setting</th>
<th>Student TESC’s Returned</th>
<th>Faculty HETC’s Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Building Science</td>
<td>Public research university (high research activity)</td>
<td>South</td>
<td>ACCE</td>
<td>Course in the philosophy department</td>
<td>55</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Construction Engineering</td>
<td>Public research university (very high research activity)</td>
<td>South</td>
<td>ABET</td>
<td>Module in a class</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Civil Engineering</td>
<td>Public research university (very high research activity)</td>
<td>South</td>
<td>ABET</td>
<td>Module in a class</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Construction Management</td>
<td>Private not-for-profit research university (high research activity)</td>
<td>West</td>
<td>ACCE</td>
<td>Technology/ engineering ethics course</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>Construction Operations &amp; Management</td>
<td>Public research university (high research activity)</td>
<td>Midwest</td>
<td>ACCE</td>
<td>Across the curriculum</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>174</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: TESC refers to returned tests for ethical sensitivity in construction by student participants included the students’ version of the HETC survey. HETC’s refer to completed surveys which investigate how ethics is taught in faculty’s respective construction program.
**Data Collection**

Participating programs were asked permission to administer the TESC in senior level classes of their undergraduate construction program during the spring 2014 academic semester. Student participants were conveniently selected based on each program’s class availability for TESC administration by corresponding faculty. Student participants were given 45 minutes to complete the TESC. Students were also asked to provide demographic information (see Table 6.2), and to complete a survey on how they recall ethics being taught to them in their construction program (Sands et al. 2014b). A test administrator visited four of the five program sites, and a collaborator at one of the programs administered the TESC on the research team’s behalf and returned complete responses via U.S. mail.

Data was collected on how each program teaches ethics using the HETC survey. Students and faculty were asked to recall how their construction program taught ethics using the HETC survey. The HETC survey was administered to students simultaneously with the administration of the TESC in pen-and-paper form. For faculty responses, the electronic HETC survey was sent to department heads of participating programs. Department heads were asked to forward the survey link to faculty having authority to provide information on how ethics was taught in their curriculum. They were asked to forward the HETC survey link to faculty who either taught construction ethics, taught construction ethics or had the knowledge of how ethics was taught in their respective construction program. Faculty background results of this survey indicate that all faculty respondents either teach or taught topics in construction ethics. Since the HETC is based on recollection, discrepancies between multiple faculty members were reconciled by allowing the agreement (yes) response to prevail; this was also done for settling discrepancies between faculty members’ responses and curriculum documents.

Curriculum documents were gathered from corresponding faculty members who were asked to provide material from their construction program that highlight how ethics is taught in their construction program. Program A provided ACCE accreditation documents for our review, program B and C provided ABET self-study accreditation documents and syllabi of courses where ethics was taught, program D provided ACCE accreditation application documents, and program E provided their program’s assessment plan. We analyzed documents provided to us by corresponding faculty.
<table>
<thead>
<tr>
<th>Program ID</th>
<th>Mean Age</th>
<th>Gender (%)</th>
<th>Industry Experience (%)</th>
<th>Academic Level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (n=55)</td>
<td>22</td>
<td>94.5</td>
<td>5.5</td>
<td>7.3 18.2 34.5 20.0 20.0 0.0 0.0 100.0</td>
</tr>
<tr>
<td>B (n=16)</td>
<td>22</td>
<td>93.7</td>
<td>6.3</td>
<td>18.75 0.0 25.0 37.5 18.75 0.0 0.0 0.0 93.7</td>
</tr>
<tr>
<td>C (n=50)</td>
<td>22</td>
<td>80.0</td>
<td>20.0</td>
<td>36.0 28.0 16.0 14.0 4.0 2.0 0.0 0.0 24.0 76.0</td>
</tr>
<tr>
<td>D (n=11)</td>
<td>25</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0 18.2 18.2 18.2 36.4 9.0 0.0 0.0 27.3 72.7</td>
</tr>
<tr>
<td>E (n=42)</td>
<td>22</td>
<td>98.0</td>
<td>2.0</td>
<td>7.1 7.1 4.8 14.3 66.7 0.0 2.4 7.1 9.5 81.0</td>
</tr>
<tr>
<td>Totals</td>
<td>22</td>
<td>91.0</td>
<td>9.0</td>
<td>16.0 17.0 20.0 18.0 28.0 1.0 1.0 2.0 11.0 86.0</td>
</tr>
</tbody>
</table>
Analysis and Results

How Ethics is taught in each Participant Construction Program

Faculty and student responses to the HETC were analyzed, and results of content coverage are presented in Table 6.3. Accreditation and syllabi documents assisted in the identification of topics covered in each program, and were used to confirm or add to faculty responses (as these were documents provided by faculty). Faculty responses (F) provide an indication of topic coverage (yes=Y, no=N). Student response data (S) reflect the percentage of students who recall that a particular ethical topic (item) is covered. Items that were not recalled by any faculty participant of each program, or were not in program documents, and had particularly low (<30% for this study) recollection by students of each program are shaded in Table 6.3.

Table 6.3. Ethics Topic Coverage in Each Participant Program

<table>
<thead>
<tr>
<th>TESC Item</th>
<th>Program</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Potential Claims Games</td>
<td>F (Y/N)</td>
<td>S (%)</td>
<td>F (Y/N)</td>
<td>S (%)</td>
<td>F (Y/N)</td>
<td>S (%)</td>
</tr>
<tr>
<td>Y</td>
<td>30.9</td>
<td>N 50.0</td>
<td>N 6.0</td>
<td>Y 63.6</td>
<td>N 31.0</td>
<td></td>
</tr>
<tr>
<td>Collusion</td>
<td>N 32.7</td>
<td>N 25.0</td>
<td>N 2.0</td>
<td>N 36.4</td>
<td>Y 35.7</td>
<td></td>
</tr>
<tr>
<td>Bid Shopping</td>
<td>Y 65.5</td>
<td>Y 12.5</td>
<td>N 20.0</td>
<td>Y 81.8</td>
<td>Y 81.0</td>
<td></td>
</tr>
<tr>
<td>Bid Peddling</td>
<td>Y 20.0</td>
<td>N 6.3</td>
<td>N 4.0</td>
<td>N 18.2</td>
<td>Y 61.9</td>
<td></td>
</tr>
<tr>
<td>Theft</td>
<td>Y 43.6</td>
<td>N 25.0</td>
<td>N 36.0</td>
<td>Y 54.5</td>
<td>N 47.6</td>
<td></td>
</tr>
<tr>
<td>Labor Issues</td>
<td>N 12.7</td>
<td>N 12.5</td>
<td>N 8.0</td>
<td>N 27.3</td>
<td>N 14.3</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>Y 67.3</td>
<td>Y 68.8</td>
<td>Y 78.0</td>
<td>Y 72.7</td>
<td>Y 76.2</td>
<td></td>
</tr>
<tr>
<td>Front-loading</td>
<td>Y 61.8</td>
<td>N 43.8</td>
<td>N 8.0</td>
<td>Y 18.2</td>
<td>Y 61.9</td>
<td></td>
</tr>
<tr>
<td>Payment Games</td>
<td>N 23.6</td>
<td>N 0.0</td>
<td>N 2.0</td>
<td>N 27.3</td>
<td>N 9.5</td>
<td></td>
</tr>
<tr>
<td>No/Low Competence of Work</td>
<td>N 38.2</td>
<td>Y 25.0</td>
<td>N 28.0</td>
<td>Y 81.8</td>
<td>N 38.5</td>
<td></td>
</tr>
<tr>
<td>Improper Client Relations</td>
<td>Y 29.1</td>
<td>Y 56.3</td>
<td>Y 50.0</td>
<td>N 63.6</td>
<td>N 35.7</td>
<td></td>
</tr>
<tr>
<td>Bid Rigging</td>
<td>Y 52.7</td>
<td>N 25.0</td>
<td>N 14.0</td>
<td>N 45.5</td>
<td>N 42.9</td>
<td></td>
</tr>
</tbody>
</table>

Note: Shaded results illustrate no indication by faculty that this topic is covered in their program and that there is particularly low recollection (<30%) by students that this topic is covered in their construction program.

(F) Faculty recollection and curriculum documents indication of ethical topic coverage (Yes or No)
(S) Student recollection of ethical topic coverage (% of student recollection in each program)

After analyzing the recollection of faculty and students regarding ethical topic coverage, we analyzed student responses to the TESC. A summation of test scores was used to perform a descriptive analysis of total responses of all participating programs. Adding to this, using
classical test theory (CTT) (Allen and Yen 1979), an item analysis was performed using Microsoft Excel.

**Item Difficulty Assessment**

Difficulty assessment allows us to understand the level of difficulty participants found with each item of the TESC. We used three levels of difficulty for assessment as previously used by Sands et al. (2014a): high, moderate, and low (see Table 6.4). Difficulty values of the dichotomously scored TESC reflect item means because they are the average proportion of students getting an answer correct.

We performed difficulty assessment for two purposes. The first is to assess the level of difficulty all participants had with each item of the TESC (see Table 6.5). The second is to assess the level of difficulty participants found with each item of the TESC based on their program of enrollment (see Table 6.6). Grouping TESC results by program of enrollment allows us to evaluate how ethics instruction in construction programs (ethical content coverage in each program) influences the ethical sensitivity to ethical issues of the TESC of construction students who participated in this study.

**Table 6.4. Difficulty Assessment Levels**

<table>
<thead>
<tr>
<th>Difficulty Assessment</th>
<th>Difficulty Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>&lt;0.30</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.30 – 0.79</td>
</tr>
<tr>
<td>Low</td>
<td>≥ 0.80</td>
</tr>
</tbody>
</table>
Table 6.5. TESC Participant Difficulty Assessment

<table>
<thead>
<tr>
<th>TESC Item</th>
<th>Difficulty Assessment</th>
<th>Difficulty (Mean)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Claims Games</td>
<td>High</td>
<td>0.09</td>
<td>0.28</td>
</tr>
<tr>
<td>Collusion</td>
<td>Moderate</td>
<td>0.41</td>
<td>0.49</td>
</tr>
<tr>
<td>Bid Shopping</td>
<td>High</td>
<td>0.25</td>
<td>0.43</td>
</tr>
<tr>
<td>Bid Peddling</td>
<td>High</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Theft</td>
<td>Moderate</td>
<td>0.53</td>
<td>0.50</td>
</tr>
<tr>
<td>Labor Issues</td>
<td>High</td>
<td>0.29</td>
<td>0.45</td>
</tr>
<tr>
<td>Safety</td>
<td>Moderate</td>
<td>0.46</td>
<td>0.50</td>
</tr>
<tr>
<td>Front-loading</td>
<td>High</td>
<td>0.20</td>
<td>0.40</td>
</tr>
<tr>
<td>Payment Games</td>
<td>High</td>
<td>0.23</td>
<td>0.42</td>
</tr>
<tr>
<td>No/Low Competence of Work</td>
<td>Moderate</td>
<td>0.33</td>
<td>0.47</td>
</tr>
<tr>
<td>Improper Client Relations</td>
<td>Moderate</td>
<td>0.51</td>
<td>0.50</td>
</tr>
<tr>
<td>Bid Rigging</td>
<td>Moderate</td>
<td>0.35</td>
<td>0.48</td>
</tr>
<tr>
<td>Totals (n=174)</td>
<td></td>
<td>3.64</td>
<td>2.26</td>
</tr>
</tbody>
</table>

*Note: Shaded results illustrate extremely high difficulty (<0.10) with particular TESC item (ethical issue)*

Difficulty Assessment: High Item Difficulty <0.30
Moderate Item Difficulty 0.30 – 0.79
Low Item Difficulty ≥ 0.80

Two item difficulty levels predominated when we assessed the level of difficulty all participants had with each item of the TESC: high difficulty and moderate difficulty. The most difficult items for all participants included potential claims games and bid peddling. Other highly difficult items for all participants included bid shopping, labor issues, front-loading, and payment games. Items that were found to be moderately difficult included collusion, theft, safety, no/lowlow competence of work, improper client relations, and bid rigging.

Following the assessment of all participant difficulty with test items of the TESC, we performed another assessment of how difficult each item was for all participants based on program of enrollment (see Table 6.6). We start our analysis by highlighting items that were found to be the most difficult issues to recognize for each student based on participating program. The most difficult item for all program participants was bid peddling. Participants of programs C and E had high difficulty with potential claims games. Participants of program B had high difficulty with payment games, while participants of programs C and D had high difficulty with front-loading.

All participants appeared to have some difficulty with the issue of potential claims games. Participants of programs A, B, and C appeared to have difficulty with recognizing issues of bid shopping. Participants of programs C and E appeared to have difficulty with underage
labor issues. Participants of program B appeared to have difficulty with front-loading. Participants of programs C and E both had difficulty in recognizing issues associated with payment games. Participants of programs A and E had difficulty recognizing the issue of no/low competence of work, and participants of programs C and E had difficulty recognizing the issue of bid rigging. Results indicate that none of the items of the TESC had low difficulty.
# Table 6.6. Difficulty Assessment for Participants by Program of Enrollment

<table>
<thead>
<tr>
<th>TESC Item</th>
<th>Program A (n=54)</th>
<th>Program B (n=16)</th>
<th>Program C (n=51)</th>
<th>Program D (n=11)</th>
<th>Program E (n=42)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difficulty Mean</td>
<td>Difficulty SD</td>
<td>Difficulty Mean</td>
<td>Difficulty SD</td>
<td>Difficulty Mean</td>
</tr>
<tr>
<td>Potential Claims Games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.15</td>
<td>0.36</td>
<td>0.13</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.54</td>
<td>0.50</td>
<td>0.50</td>
<td>0.52</td>
<td>0.24</td>
</tr>
<tr>
<td>Bid Shopping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.24</td>
<td>0.43</td>
<td>0.19</td>
<td>0.40</td>
<td>0.08</td>
</tr>
<tr>
<td>Bid Peddling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Theft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.50</td>
<td>0.50</td>
<td>0.69</td>
<td>0.48</td>
<td>0.57</td>
</tr>
<tr>
<td>Labor Issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.31</td>
<td>0.47</td>
<td>0.31</td>
<td>0.48</td>
<td>0.22</td>
</tr>
<tr>
<td>Safety</td>
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<td></td>
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</tr>
<tr>
<td>Moderate</td>
<td>0.43</td>
<td>0.50</td>
<td>0.38</td>
<td>0.50</td>
<td>0.53</td>
</tr>
<tr>
<td>Front-loading</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.33</td>
<td>0.48</td>
<td>0.13</td>
<td>0.34</td>
<td>0.00</td>
</tr>
<tr>
<td>Payment Games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.39</td>
<td>0.49</td>
<td>High</td>
<td>0.06</td>
<td>0.25</td>
</tr>
<tr>
<td>No/Low Competence of Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.28</td>
<td>0.45</td>
<td>0.19</td>
<td>0.40</td>
<td>0.33</td>
</tr>
<tr>
<td>Improper Client Relations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.46</td>
<td>0.50</td>
<td>0.69</td>
<td>0.48</td>
<td>0.49</td>
</tr>
<tr>
<td>Bid Rigging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0.41</td>
<td>0.50</td>
<td>0.50</td>
<td>0.52</td>
<td>0.27</td>
</tr>
<tr>
<td>Test Totals</td>
<td>4.04</td>
<td>2.16</td>
<td>3.75</td>
<td>1.91</td>
<td>2.82</td>
</tr>
</tbody>
</table>

**Note:** Shaded results illustrate extremely high difficulty (<0.10) with particular TESC item (ethical issue)

**Difficulty Assessment Levels:**
- High Item Difficulty <0.30
- Moderate Item Difficulty 0.30 – 0.79
- Low Item Difficulty ≥ 0.80
Testing for Significant Differences between Groups

To begin our exploration of how different variables affect levels of ethical sensitivity of construction students, we need to test for significant differences in total scores between different groups participating in this study. Our comparisons are made based on student recollection regarding program of enrollment, curriculum setting of ethics instruction, academic level, experience in the construction industry, age, and gender. Data analysis for our comparisons were conducted using JMP® Pro 10 (JMP 2012; Sall et al. 2012).

To guide the selection of our statistical tests, we must first test for normality (Corder and Foreman 2009). We used the Shapiro and Wilk’s (1965) test for normality, which is a test statistic for the null hypothesis \( (H_0) \) that test response data is from a normal distribution. We conducted a Shapiro-Wilk \( W \) test on total responses of the TESC. At \( \alpha = 0.05 \) and \( p\)-value = 0.0001, we reject the null hypothesis \( (H_0) \) that our data is normally distributed. The data distribution of TESC responses reflect a skewed right distribution (see Figure 6.1.); therefore, we do not meet the assumptions for parametric test statistics. We used nonparametric statistical analysis for our group comparisons. We use this ordinal ranking method because of the data’s skewed right distribution, groups’ unequal and small sample sizes, and because we meet the assumptions for using this method. Findings using this method are provided on a cardinal scale (Corder and Foreman 2009; Fraenkel et al. 1993; Robson 2011; Sprent and Smeeton 2007).

![Data Distribution with Box-and-Whisker Plot of TESC Test Scores](image)

Figure 6.1. Data Distribution with Box-and-Whisker Plot of TESC Test Scores
When comparing more than two groups, we used Kruskal-Wallis H-test (rank-based test), which is the nonparametric equivalent to the parametric one-way ANOVA, to test statistically significant differences between group test scores. Additionally, when significant differences were found from the H test, we conducted post hoc analyses using the Steel-Dwass All Pairs method of comparisons, which is the nonparametric version of the All Pairs Tukey HSD statistical test, to identify significant differences between all pairs of groups. For comparisons made between two independent groups, we used the Mann-Whitney U-test (rank-based test) (Cronk 2008; Sall et al. 2012; SAS Publishing Co. 2012; Sprent and Smeeton 2007). We provide box plots as a visual representation of the distribution of results among different test groups to supplement hypothesis test results. On each box plot figure, the total mean line depicts average test scores for all groups compared and group mean lines depict the average test scores for each compared group.

**Hypotheses Testing**

We want to understand the ethical sensitivity of construction students and how it may be influenced by certain variables, including academic characteristics such as, program of enrollment and curriculum setting of ethics instruction. We also want to determine if professional and personal characteristics of students such as experience in the construction industry, age, and gender have some influence on the ethical sensitivity of construction students. We established hypotheses regarding the results of the TESC versus groups of independent variables. When conducting the Kruskal-Wallis (H) test, the null hypothesis (H₀) to each alternative hypothesis is, ‘the mean ranks of groups participating in this study are the same.’ When conducting the Mann-Whitney U-test to compare differences between two groups, the null hypothesis (H₀) to each alternative hypothesis is, ‘there is no significant difference between the mean ranks of the two groups participating in this study.’

**Hypotheses Test Results: Academic Characteristics**

*Construction Program of Enrollment*

To test hypothesis H₁, a Kruskal-Wallis H test was conducted comparing the outcome of TESC total scores for students between the five participating programs. A significant result at the level of α = 0.05 was found \( H (4) = 12.3882, p = 0.0147 \), indicating that results of participants
from different programs differed significantly from each other (see Table 6.7), rejecting the null hypothesis ($H_0$) that there is no difference between participant programs (see Figure 6.2).

Table 6.7. Average Rank Placement of Participants by Program of Enrollment

<table>
<thead>
<tr>
<th>Participant Group by Program of Enrollment ($n=173$)</th>
<th>Average Rank Placement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D ($n=10$)</td>
<td>120.85</td>
</tr>
<tr>
<td>A ($n=54$)</td>
<td>95.61</td>
</tr>
<tr>
<td>B ($n=16$)</td>
<td>92.00</td>
</tr>
<tr>
<td>E ($n=42$)</td>
<td>86.50</td>
</tr>
<tr>
<td>C ($n=51$)</td>
<td>70.08</td>
</tr>
</tbody>
</table>

Figure 6.2. Box-and-Whisker Plots with Mean Lines Comparing TESC Results of Participants based on Program of Enrollment

With significant differences found between programs when we conducted the $H$ test, we conducted a post hoc analysis of nonparametric comparisons for all pairs using the Steel-Dwass method. Results indicate that at $\alpha = 0.05$, participants of program D performed significantly better than participants of program C ($Z = 2.971, p = 0.0248$) and participants of program A performed significantly better than program C ($Z = -0.471, p = 0.0482$). Other paired comparisons do not indicate significant differences between any other programs (see Table 6.8).
Table 6.8. Steel-Dwass Multiple Comparisons Method for All Pairs Comparisons between Programs

<table>
<thead>
<tr>
<th>Program-Program</th>
<th>Score Mean Difference</th>
<th>Std Err Dif</th>
<th>Z</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D C</td>
<td>18.0608</td>
<td>6.079377</td>
<td>2.97083</td>
<td>0.0248*</td>
</tr>
<tr>
<td>D A</td>
<td>10.4296</td>
<td>6.324481</td>
<td>1.64909</td>
<td>0.4659</td>
</tr>
<tr>
<td>E C</td>
<td>7.7066</td>
<td>5.569417</td>
<td>1.38373</td>
<td>0.6382</td>
</tr>
<tr>
<td>D B</td>
<td>4.7125</td>
<td>3.047171</td>
<td>1.54652</td>
<td>0.5320</td>
</tr>
<tr>
<td>B A</td>
<td>-1.3368</td>
<td>5.698729</td>
<td>-0.23458</td>
<td>0.9993</td>
</tr>
<tr>
<td>E B</td>
<td>-1.3378</td>
<td>4.914112</td>
<td>-0.27224</td>
<td>0.9988</td>
</tr>
<tr>
<td>E A</td>
<td>-4.8042</td>
<td>5.668362</td>
<td>-0.84755</td>
<td>0.9156</td>
</tr>
<tr>
<td>E D</td>
<td>-8.4810</td>
<td>5.289817</td>
<td>-1.60326</td>
<td>0.4952</td>
</tr>
<tr>
<td>C B</td>
<td>-9.0319</td>
<td>5.519578</td>
<td>-1.63633</td>
<td>0.4740</td>
</tr>
<tr>
<td>C A</td>
<td>-16.0893</td>
<td>5.870404</td>
<td>-2.74075</td>
<td>0.0482*</td>
</tr>
</tbody>
</table>

Note: Shaded results indicate significant differences between compared programs.

Curriculum Setting

To test hypothesis $H_2$, a Kruskal-Wallis $H$ test was conducted comparing the outcome of TESC total scores for students who recall receiving ethics education via various curriculum settings. Even though rank placements appear to indicate difference, based on the $H$ test, there appears to be no significant difference was found at the level of $\alpha = 0.05$ ($H(6) = 8.6025, p = 0.197$). We fail to reject the null hypothesis ($H_0$) that the mean ranks of participant results are the same between groups where ethics was taught in single classes of particular disciplines or in various programs throughout the curriculum for the participants of this study (see Table 6.9 and Figure 6.3).

Table 6.9. Average Rank Placement of Participants by Recollection of Ethics Inclusion

<table>
<thead>
<tr>
<th>Participant Group by Ethics Placement in Curriculum ($n=172$)</th>
<th>Average Rank Placement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Philosophy Ethics Course ($n=13$)</td>
<td>111.96</td>
</tr>
<tr>
<td>Various Courses ($n=129$)</td>
<td>88.12</td>
</tr>
<tr>
<td>Single Business Ethics Course ($n=9$)</td>
<td>75.56</td>
</tr>
<tr>
<td>Dedicated Construction Ethics Course ($n=3$)</td>
<td>74.17</td>
</tr>
<tr>
<td>Single Eng./Technology Ethics Course ($n=8$)</td>
<td>73.94</td>
</tr>
<tr>
<td>Module in a Non-ethics Course ($n=6$)</td>
<td>58.25</td>
</tr>
<tr>
<td>None ($n=4$)</td>
<td>52.75</td>
</tr>
</tbody>
</table>
Hypotheses Test Results: Professional and Personal Characteristics

Professional Construction Industry Experience

To test hypothesis $H_3$, a Kruskal-Wallis $H$ test was conducted comparing the outcome of TESC total test scores of students who indicate various levels of experience in the construction industry. No significant difference was found at the level of $\alpha = 0.05$ ($H(4) = 2.525, p = 0.6581$), indicating that ethical sensitivity did not differ significantly based on various levels of industry experience of students; therefore, we fail to reject the null hypothesis ($H_0$) that there is no difference between groups. Experience in the construction industry did not seem to influence significantly the results of test scores of the TESC (see Table 6.10 and Figure 6.4).

Table 6.10. Average Rank Placement of Participants by Experience

<table>
<thead>
<tr>
<th>Participant Groups By Experience ($n=173$)</th>
<th>Average Rank Placement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;12 Months ($n=46$)</td>
<td>94.5978</td>
</tr>
<tr>
<td>$\leq$4 Months ($n=29$)</td>
<td>82.0517</td>
</tr>
<tr>
<td>5-8 Months ($n=35$)</td>
<td>89.4857</td>
</tr>
<tr>
<td>9-12 Months ($n=32$)</td>
<td>81.6563</td>
</tr>
<tr>
<td>None ($n=30$)</td>
<td>80.0667</td>
</tr>
</tbody>
</table>
Gender

To test hypothesis $H_4$, we conducted a Mann-Whitney $U$-test to test if female students who participated in this study performed, on average, better on the TESC than male students. We found that there is no significant difference between male and female students at $\alpha = 0.05$, ($U (1) = 0.0511, p = 0.8211$); therefore, we fail to reject the hypothesis ($H_0$) that there is no significant difference between TESC scores of males and females who participated in this study. Gender did not seem to influence significantly the TESC test scores of participants of this study (see Table 6.11 and Figure 6.5).

Table 6.11. Average Rank Placement of Participants by Gender

<table>
<thead>
<tr>
<th>Participant Group by Gender (n=173)</th>
<th>Average Rank Placement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (n=15)</td>
<td>89.77</td>
</tr>
<tr>
<td>Male (n=158)</td>
<td>86.74</td>
</tr>
</tbody>
</table>
To test hypothesis H₅, a Kruskal-Wallis H test was conducted comparing the outcome of TESC total scores for students of various ages. No significant difference was found at the level of $\alpha = 0.05$ ($H(10) = 16.268, p = 0.092$); therefore, we fail to reject the null hypothesis ($H_0$) that ethical sensitivity to ethical issues of the TESC did not differ significantly based on ages of students. Age did not seem to influence significantly the TESC test scores of the participants of this study (see Table 6.12 and Figure 6.6).

**Table 6.12. Average Rank Placement of Participants by Age**

<table>
<thead>
<tr>
<th>Participant Group by Age (n=165)</th>
<th>Average Rank Placement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 (n=5)</td>
<td>120.10</td>
</tr>
<tr>
<td>28 (n=1)</td>
<td>99.00</td>
</tr>
<tr>
<td>30 (n=2)</td>
<td>98.00</td>
</tr>
<tr>
<td>22 (n=63)</td>
<td>91.91</td>
</tr>
<tr>
<td>23 (n=20)</td>
<td>89.48</td>
</tr>
<tr>
<td>24 (n=14)</td>
<td>89.25</td>
</tr>
<tr>
<td>29 (n=2)</td>
<td>80.00</td>
</tr>
<tr>
<td>21 (n=48)</td>
<td>68.83</td>
</tr>
<tr>
<td>27 (n=1)</td>
<td>68.00</td>
</tr>
<tr>
<td>20 (n=63)</td>
<td>59.00</td>
</tr>
<tr>
<td>26 (n=3)</td>
<td>28.00</td>
</tr>
</tbody>
</table>
Discussion

We administered a Test for Ethical Sensitivity in Construction (TESC) to five participant construction programs to begin understanding which academic, professional, and personal characteristics influence the ethical sensitivity of construction students to issues of the construction industry. With the results of the TESC, we can understand the level of difficulty participants had with recognizing ethical issues covered by the TESC in general, and the level of difficulty participants had based on program of enrollment. In addition, testing various hypotheses to compare average rank placements between groups allowed us to begin discussing possible variables that may have influenced TESC results.

Difficulty of TESC Items Compared with Content Coverage

We assessed item difficulty among the participant groups to get an initial understanding of how difficult participating programs found each item. Extreme cases where difficulty values were less than 10% are discussed.

Bid peddling was found to be extremely difficult by all participants. Participants of programs A-D had no recognition of this item, and participants of program E had very low recognition of this item from participants. Comparing the low recognition to ethical topic coverage of each program, it appears that programs B-D do not cover this topic in their instruction, although a faculty member of program A indicated that it is included. However, there
is low recollection (20%) among students enrolled in program A that this topic is taught in construction program A. Program E is the only program where a faculty member indicates that this topic is covered, coupled with more than a ‘low recollection’ (61.9%) among students that this topic was covered in their construction program. This possibly indicates that students found this item to be difficult due to lack of coverage of this ethical topic. High difficulty by all participants could also indicate an issue with this item of the TESC.

The item of potential claims games was found to be highly difficult for all program participant groups; however, participants of programs C and E had particular difficulty with this item. Program C’s faculty respondent and curriculum documents do not reveal that this topic is taught in their program’s curriculum, which can explain the extremely high level of difficulty with this item. Program E’s faculty responses and provided curriculum documents reviewed do not indicate that potential claims games is not a topic covered in its program. Only a marginal segment of students (31.0%) recalled that this topic is covered in their construction program. This may explain the significant difficulty participants had recognizing the ethical issue covered by this item in the TESC.

Front-loading was another item that was found to be difficult by two programs. Participants of program C had significant difficulty, as this topic is not covered in their construction program. Participants of program D also had very high difficulty with the item of front-loading. Even though the faculty respondent stated that front-loading is included as an ethical topic in the curriculum, student responses indicate a low recollection (18.2%) of it being taught to them.

The item payment games was found to be significantly difficult for participants of programs B and C. Both programs indicate that this topic is not covered in their construction program and students had low recollection that it was taught to them (B=0.0%) (C=2.0%). Based on faculty responses, curriculum documents, and student recollection, it appears that all other programs indicate that payment games is not recalled as an ethical topic covered in their construction program; however, it was not found to be extremely difficulty for participants of those programs to recognize.

Another occurrence is that there was no indication by faculty, students, or curriculum documents that the use of underage labor (item of labor issues) on a hazardous project site is found to be taught in any participant program’s construction curriculum. However, no program
participant groups found this item to be extremely difficult. This occurrence may be the result of variables not controlled for in this study. Co-curricular experiences, personal experiences, or other influential variables unaccounted for, may have made students aware of this issue, but further investigation is required to make this conclusion.

Regarding the difficulty participants had with the TESC, we found that predominating levels of difficulty were high and moderate, with no items found to be particularly ‘easy.’ This could indicate various problems. One problem could be that the TESC may need to cover a broader range of topics in order to obtain more discriminate results. Another problem could be student retention of ethical topics. Further research is required to account for this response distribution.

**Hypotheses Testing**

To investigate significant differences between participant total test scores of the TESC and variables of academic characteristics (program of enrollment and ethics instruction curriculum setting), professional industry experience characteristics, and personal characteristics (gender and age), we performed several hypothesis tests. The Kruskal-Wallis *H*-test was conducted when comparing differences between groups of three or more, followed up with the Steel-Dwass *All Pairs* comparison method for post hoc analysis. The Mann-Whitney *U*-test was conducted when comparing differences between two groups.

To preface the discussion on possible variables that contribute to the ethical sensitivity of construction students, we want to highlight variables that do not appear to be influential. Professional characteristics such as the amount of experience did not significantly influence test scores of the TESC, confirming earlier findings by Shadmehr and Moradi (2013). Personal characteristics such as gender and age seemed, in this study, to have no significant influence on the ethical sensitivity of construction students to issues on the TESC. This contradicts the findings of earlier studies by Shadmehr and Moradi (2013) and Sidani et al. (2009).

In terms of testing for influences of academic characteristics, we found a variety of results. When comparing ethical sensitivity between participant programs, we found that there were significant differences between participants of programs D-C and programs C-A. Participants of program C found more items to be significantly difficult than participants of programs A and D. There were no other statistically significant differences of ethical sensitivity
when making multiple comparisons which support findings by Sands et al. (2014a) that there was no statistically significant difference between participants enrolled in a civil engineering (design and engineering focused) construction program and a construction engineering (hybrid) program.

High difficulty levels of the TESC exhibited by participants of program C could be explained by the finding that 75% of the topics of the TESC were identified as not being covered in program C. As a civil engineering program and per ABET requirements, students of program C must be able to design systems, components, and processes within realistic ethical constraints while understanding basic ethical concepts and ethical responsibility (ABET 2012). Therefore, focus may be placed on ethical elements associated with design and codes of conduct (as per curriculum document review) rather than ethical issues regarding post-design phase, project procurement, and contract management issues. Further investigation is necessary to make any conclusions about these results.

When comparing TESC results based on curriculum setting of ethics instruction, it was found that there was no significant difference among TESC test scores of students who recalled learning ethics in one setting versus another. We initially understood that each program places ethics within curriculum differently, such as via modules, throughout the curriculum, or via single discipline-specific courses; however, we found that in every participant program of this study, ethics is being taught in various courses throughout each program’s curriculum. Students recalled the placement of ethics instruction differently from faculty recollection. This revelation contradicts our initial understanding of how ethics is placed in curricula of each construction program, and could explain why there were no significant differences between groups based on curriculum setting. There is no evidence at this time that suggests that construction programs actually teach ethics throughout the curriculum; therefore, further investigation is necessary.

**Conclusion**

The construction industry is a significant contributor to the U.S. economy. However, it is also considered to have many unethical practices associated with it, thus requiring instruction of ethics to construction students. Students must possess competencies in ethical issues of the construction industry. However, based on construction literature, little is understood about
construction students’ ability to recognize ethical issues of the construction industry (ethical sensitivity).

This study had objectives of using an evaluation technique to test the ethical sensitivity of construction students, observing how difficult it was for students to recognize ethical issues of the construction industry, understanding how student difficulty is related to ethical topic coverage in curriculum, and testing hypotheses to determine if certain variables influenced student ethical sensitivity. We tested the ethical sensitivity of 174 construction students from five participant construction programs using the Test for Ethical Sensitivity in Construction (TESC) and analyzed the difficulty participants had with each item in comparison to its coverage in each program’s curriculum. Additionally, we performed hypotheses tests using nonparametric statistical methods to assist our understanding of the variables that may influence the ethical sensitivity of construction students.

The results of this study assist our understanding of student ethical sensitivity regarding issues of the construction industry. We identified some ethical issues (specific TESC test items) that were found to be very difficult for students to recognize, such as potential claims games and bid peddling. Results also provide insight into how ethics education relates to ethical sensitivity of construction student participants of this study. We used the TESC results to test average rank placements of student participants based on their amount of construction industry experience, gender, and age. Our findings indicate that the amount of construction industry experience, gender, and age do not appear to influence participant test scores. Program of enrollment appeared to be a variable that influence the results of the TESC; however, further investigation is necessary to make these conclusions.

This study provides a foundation for construction ethics researchers to build an understanding of construction student ethical sensitivity. Investigating various variables that relate to construction student ethical sensitivity provides educators with a resource for curricular decision-making. Ethical sensitivity evaluation is necessary to understand how equipped students are when faced with ethical dilemmas in construction practice. We believe that some form of ethical evaluation of students should be part of each construction program’s evaluation criteria.
Limitations

This study focused on five construction programs from which 174 student participants were gathered. This is only a small proportion of the population of construction programs and students within them. This, in addition to the sampling technique, does not provide us the ability to generalize the results of the TESC to the larger population of this study. An experimental design was not feasible due to the time restriction to complete this study, the sampling technique employed, and because most construction programs were found to teach ethics throughout the curriculum.

Future Work

This study builds on the work by Sands et al. (2014a) for ethical sensitivity testing in construction. We have added knowledge of construction student ethical sensitivity, and possible variables that influence student ethical sensitivity. However, more work is necessary.

The administration of the TESC involved purposeful sampling of construction programs and faculty representatives conveniently provided classes to administer the TESC. Therefore, in order to generalize results to the population of undergraduate construction students, a larger sample size and a random sampling technique that allows for generalizing is necessary.

We have an initial understanding of construction students’ ethical sensitivity and various possible contributing variables for this study’s participants. However, further investigation is necessary to understand what other variables influence student ethical sensitivity to ethical issues of the construction industry. Other variables may include co-curricular experiences such as student organizations, or personal influences, such as teaching from family and friends. We need to obtain this knowledge to determine whether ethical sensitivity is solely attributable to construction ethics education in the curriculum or if other variables contribute to student ethical sensitivity. A longitudinal case study approach may provide a deeper understanding of student ethical sensitivity changes over time, adding to the understanding of influences other variables may have on the ethical sensitivity of construction students which may assist in construction program evaluation of its construction ethics education. Further investigation may be necessary to understand the correlations between other variables of this study.
Acknowledgements

A great deal of appreciation is owed to Dr. Yanna Lambrinidou and participating construction programs’ students and faculty. Additionally, a great deal of appreciation is owed to the Myers-Lawson School of Construction at Virginia Tech for their assistance with the development, administration, and completion of this study.

References


JMP Pro 10 version 10.0.2 (2012), (computer software). SAS Institute, Cary, N.C.


CHAPTER 7

Conclusion

This chapter summarizes the administration, significant findings, and significance of this dissertation. Recommendations for future work are also provided. Reference to Figure 1.1 should be made to understand relationships of this dissertation’s manuscripts and corresponding chapters.

Summary of Dissertation

This dissertation provides multiple studies that explored the influence of ethics education on the ethical sensitivity of construction students. The compilation of five manuscripts details the processes undertaken to facilitate this exploration. Eash’s curriculum components and Rest’s four-component model for ethical decision-making was operationalized to answer the following questions:

RQ1: How is ethics taught in construction programs?
RQ2: What is the ethical sensitivity of undergraduate construction students regarding ethical issues of the construction industry?
RQ3: What is the relationship between ethics education and the ethical sensitivity of construction students regarding ethical issues of the construction industry?

Summary of Significant Tasks

To respond to these questions, the independent variable of how ethics is taught in construction programs and the dependent variable of student ethical sensitivity (ability to recognize ethical issues of the construction industry) were operationalized. Investigating these variables required the development and administration of two instruments: a survey on how
ethics is taught in construction education (HETC) and a Test for Ethical Sensitivity in Construction (TESC).

**Significant Tasks in Response to RQ1**

*Chapter 2:* A collection and review of non-instructional/educational research regarding the ethical issues of the construction industry were conducted, which contributed to the development of the HETC. This also contributed to the development of the TESC. Data were analyzed using qualitative textual analysis via the computer-aided, qualitative data analysis software Atlas.ti.

*Chapter 5:* The development of the HETC survey instrument was conducted. The HETC was administered to faculty and students of participating construction programs. Results of the HETC survey were analyzed quantitatively using descriptive statistics. A supplemental review was conducted on 118 curriculum guides (checklists or flowcharts of degree completion requirements supplemented by course descriptions when available) of construction programs, and a review of documents having information on ethics instruction in each program’s curriculum were collected from faculty of five participating construction programs regarding their ethics education, with results analyzed using qualitative textual analysis.

**Significant Tasks in Response to RQ2**

*Chapter 3 and Chapter 4:* The development, usability testing, piloting, and administration of the TESC were conducted. The TESC elicits qualitative student responses to eight ethical vignettes. Embedded in the vignettes are 12 post-design, contract management-focused, ethical issues of the construction industry. Results of the TESC were quantitatively analyzed using descriptive statistics, difficulty assessments, and nonparametric inferential statistics via statistical software packages R and JMP Pro 10.

**Significant Tasks in Response to RQ3**

*Chapter 6:* The comparison of results, from the investigations of the independent and dependent variables, was conducted to make inferences regarding ethics education and its influence on construction student ethical sensitivity to issues of the construction industry.
Summary of Significant Findings

The significant findings of this research included the following:

**Significant Findings in Response to RQ1**

*Chapter 2*: By using qualitative data analysis, we found 101 ethical issues that were associated with the construction industry. These ethical issues were categorized into two broad categories: societal (with impact on society) and professional (based on professional practice). Thematic coding generated classifications of ethical issues for each broad category. In the societal category, there are ethical classifications of social responsibility, social environment, sustainability, safety and health, and ethical issues related to human resources. In the professional category, emergent classifications were, ethical issues of project administration, procurement, owner influenced issues, legal/legislative issues, general corruption, fraud, finance, and remediation of ethical conduct.

*Chapter 5*: By conducting qualitative analysis of literature on ethics education focusing on ethical content, modes of transaction, and evaluation techniques used, the HETC survey was developed and results provided quantitative measures of how ethics is/was taught in construction programs. The HETC was administered to faculty and students of participant programs and by utilizing descriptive statistics to analyze responses, it was found that there is a broad range of pedagogical techniques and content used to teach construction ethics to students.

**Significant Findings in Response to RQ2**

*Chapter 3 and Chapter 4*: By conducting think-aloud protocols, the TESC was found to be useable. Performing think-aloud protocols allowed for correction of issues that may pose threats to cognitive validity of the TESC. In addition, it was possible to make an argument for content validity through expert reviews. Lastly, a significant finding from performing think-aloud protocols is that, participants demonstrated affective reasoning in responding to think-aloud protocols, which supports an argument that ethical decision-making involved more than cognitive reasoning.

After performing a pilot test of the TESC, inter-rater reliability was achieved through results of a Cohen’s Kappa coefficient of 0.85, which is considered to be in the range of ‘almost
perfect’ agreement. In addition, pilot results indicated that there were items of the TESC (potential claims games, bid shopping, bid rigging, bid peddling, front-end loading, and payment games) which participants found extremely difficult.

Hypothesis tests were used to see whether there were significant differences between groups of pilot participants. There was a significant difference in TESC total test scores between groups of students at lower academic levels (freshmen-sophomores) and those at higher academic levels (juniors-seniors). No evidence of a significant difference between total TESC test scores of students who were enrolled in a civil engineering program of study (academic major) and those enrolled in a construction-engineering program of study was found.

**Significant Findings in Response to RQ3**

Chapter 6: By conducting difficulty assessments, we found that student participants of the five participant construction programs had extreme difficulty with recognizing certain ethical issues of the TESC. These issues were bid peddling, potential claims games, front-end loading, and payment games. Extreme difficulty participants had with items of the TESC was also investigated for all participants first, and then again based on program of enrollment. Participants’ difficulty was compared with the understanding of each participant program’s ethical content coverage from the mixed methods study of how ethics is taught in construction. We found some items that were extremely difficult for participants to recognize tended to be items that were not taught in that construction program’s curriculum. The items of payment games and labor issues had instances where the topic was not taught in construction programs’ curricula; however, these items were not found to be extremely difficult.

Additionally, results of hypothesis tests indicate that professional construction industry experience and personal characteristics, including gender and age, did not significantly influence participant results. What was found is that participants’ construction program of study influenced the results of total TESC test scores. Curriculum setting of ethics instruction did not appear to influence participant TESC test scores.
Discussion and Significance of this Dissertation

This dissertation attempts to move toward an understanding of ethics education and its relationship to the ethical sensitivity of construction students. A wide range of ethical issues of the construction industry was identified which contributed to the development of the HETC survey and the TESC. Administration of the HETC survey and the TESC allowed for the comparison of the predominant variables. Based on findings, it appears that construction education can have some influence on the ethical sensitivity of construction students to issues of the construction industry. For this study, there was no indication that professional experience and personal characteristics such as age and gender significantly influenced the ethical sensitivity of construction students. Contributions to construction education’s body of knowledge include:

Chapter 2: An inventory of various ethical issues, that are associated with the construction industry; including, a meta-framework for classifying ethical issues of the construction industry

Chapter 3 and Chapter 4: A test instrument (TESC), to evaluate the ethical sensitivity of construction students that has been piloted, administered, and for which initial arguments for its usability, validity, and reliability have been made

Chapter 5: A survey instrument (HETC), that can be used to understand how ethics is taught in construction programs and a collection of pedagogical techniques that broadly illustrates how ethics is taught in construction programs; including, content coverage, modes of transaction, and evaluation of ethical competencies

Chapter 6: A benchmarking study, for understanding the influence of construction ethics education on the ethical sensitivity of construction students
Limitations

Of the TESC

Resources available to develop an auxiliary form of the TESC with new vignettes, strain required to administer the TESC, and rater strain of the TESC may limit its use. The ability to generalize results to a larger population is also a function of resource availability. A way to minimize this limitation would be to shorten the TESC to one or two vignettes with focused issues such as bid shopping and bid peddling, thus allowing for a broader distribution to a larger sample to determine student ability to recognize specific ethical issues of the construction industry. Additionally, the TESC does not provide the ability to control for other influences of ethical development such curricular and co-curricular experiences. In different types of construction programs, ethical concepts are taught throughout the curriculum and without resources to perform a longitudinal study, a pretest-posttest-control design is very difficult to perform. In addition, the current and most common ethical issues of the construction industry may not have been part of the TESC. Having those issues that are current and most common ensures that students are prepared to face ethical issues in practice.

Of Comparing Ethics Education to Student Ethical Sensitivity

Resources each participating institution provided, such as class availability to administer the TESC and HETC surveys, class times provided to administer surveys, number of faculty members capable of completing the HETC survey, and access to accreditation documents, limited data collection. In addition, we cannot generalize results of this study to the population of construction programs and its students based on our purposeful sampling technique of the five participant construction programs, their eight faculty participants, and their 174 student participants. This is only a small proportion of the population of construction programs and its students.
Recommendations for Future Research

For the TESC

It is recommended that the TESC be modified and/or shortened, to decrease the resource strain involved in administering and rating the TESC. In addition, it is recommended that with a shorter version, the TESC be administered to a larger random sample of participants. When administered, the TESC should also be accompanied by a survey that will control for other contributing factors to TESC results.

It is recommended that, further investigation be made into the current and most critical ethical issues of the construction industry, and these issues are used to update vignettes of the TESC. The construction industry is dynamic, and changes in the industry present new challenges and new ethical issues; therefore, an assurance that students are competent in current and most critical ethical issues of the construction industry is needed.

For Comparing Ethics Education to Student Ethical Sensitivity

The study that compares how results of the HETC, influences TESC test scores should be performed on a larger random sample, to generalize results to a larger population. Having the ability to generalize the results may influence ethics education accreditation requirements by understanding gaps in student ethical sensitivity.

It is also recommended that further investigation be made into other variables that may contribute to the ethical sensitivity of construction students. Ethics education may prove to be significantly influential on the ethical sensitivity of construction students; however, without knowing the influence of other variables such as co-curricular experiences, professional industry experiences, and personal experiences on the ethical sensitivity of construction students, this assumption cannot be made at this time.

For Research in Other Construction Education Domains

For other domains of construction education research, it is recommended that manipulation of the TESC and HETC survey be done to compare how other subject areas is taught compares with student development of that subject area. Having a technique to evaluate student recognition (TESC) and a survey framework (HETC) to understand how a knowledge
area is taught, researchers can understand the influence of education on other non-technical knowledge areas that are related to the construction industry. Areas can include, more in-depth work in sustainability, corporate social responsibility, and safety, for example.

Reflection

Extended Discussion

This extended discussion section is used to provide further, more personal commentary on significant findings of the study.

Ethical issues: One of the biggest surprises of this research is that there were many ethical issues related to the construction industry based on the Sands and Pearce’s (2014) study, and still, there were other ethical issues that were found by reviewing curriculum documents that were provided to us by participating construction programs. In addition, the finding that 33% of the ethical issues were not recalled as topics taught in participating construction programs was also very interesting; this demonstrates gaps in content coverage.

Affective reasoning: Based on the results of performing think-aloud protocols; it appears that affective reasoning is a component of ethical decision-making. Affective reasoning was not considered when developing and administering the TESC; however, Rest (1989) does highlight that there is a cognitive-affective interaction involved with ethical sensitivity in terms of one’s feelings of empathy and disgust regarding the other parties involved. Further research is warranted to understand the role of affective reasoning in ethical sensitivity and ethical decision-making for construction students.

Significant differences based on program of enrollment: Program of enrollment appears to be a factor in student ability to recognize the ethical issues of the TESC. Construction program C performed significantly lower than two other construction programs when multiple comparisons were made. Recall, the TESC is a biased, management-focused, ethical sensitivity test and this may be the reason why program C (a design-focused, civil engineering program) may have exhibited significantly lower scores than some other management based programs. There are different governing agencies and organizations associated with each program that may stipulate what the critical ethical issues are for that particular discipline. For example, the management-focused construction programs may focus on the code of ethics developed by the Construction Management Association of America (CMAA) and the design-based construction
program may focus on the American Society of Civil Engineers code of ethics. This may also explain why many of the ethical issues of the TESC were not taught in the civil engineering program. These differences may explain why program of enrollment is a factor that influenced professional ethical sensitivity to the issues of the TESC; however, without further investigation this cannot be certain.

No significant difference based on professional experience: This was a very interesting finding. Students were asked to provide the amount of professional experience they had. This was based on the assumption that students would participate in co-ops or internships (which is why the levels of experience were defined in 4-month periods). Professional experience may not have been influential because, students may not have been exposed to certain situations or may not have received additional training on ethical issues while gaining professional experience. Additionally, we did not ask about the company size or the duties of the student while working in the industry, and these could be factors as well. We cannot conclude that exposure, training, company size, or duties have any influence on the professional ethical sensitivity of construction students to the ethical issues of the TESC, this is only speculation. Note that, our results support the findings of the study by Shadmehr and Moradi (2013) which shows that professional experience does not relate to professional ethical sensitivity. Further investigation is necessary to determine whether these factors play a role in construction student ethical sensitivity.

Lessons Learned

Through the process of conducting this research study, there has been a variety of lessons learned by contributors of this work. This section documents lessons learned from conducting this work and are as follows:

- When making observations about groups, gender and/or gender identity is not binary. Consideration will be made for additional options to account for one’s gender identity in future research.
- Resources may be limited to conduct research, and you must work within your limitations and justify them.
- Research instruments should be developed with simplicity in mind, especially when there is no direct and explicit benefit (such as a financial benefit for participating in the study) to the participant.
**Implications for Practice**

There are implications for practice that are as follows:

- With the knowledge obtained from conducting this research, the use of some form of the TESC should be done to ensure that students have the ability to recognize ethical issues of the construction industry. The fundamental question of ‘how?’ still needs answering.

- Educators and researchers of construction programs should experiment with the collection of pedagogical techniques found, to assist in understanding the effectiveness of various pedagogical techniques, and share this knowledge. An ethicist (one well versed in the area of construction ethics) would be very useful to assist this effort.

- The focus of this research takes bias toward the negative effects of unethical conduct in the construction industry; however, there are reasons why unethical behavior is still prevalent (positive gains). At the time of conducting this research, there were no studies found that observed common reasons behind unethical behavior in the construction industry. This would be a great area for future research.

**Moving Forward**

In moving forward, the goal is to continue research in the area of construction education and ethics. Additionally, there are particular studies of interest that was inspired by this work. Contributors of this work would like to:

- Investigate the ethical issues of greatest significance to the industry. One way to do this may be to survey industry professionals regarding their experiences with the ethical issues found herein.

- Investigate other sources of research to add to the inventory of ethical topics related to the construction industry.

- Investigate the severity, occurrence, and relevance of each ethical topic, based on the perception of construction professionals.

- Investigate the ethical sensitivity of professionals in the industry.

- Modify the TESC. The TESC follows Clarkeburn’s (2002) model, which focuses on using fewer resources than other tests for ethical sensitivity. It is also focused on administering ethical sensitivity tests to larger sample sizes. However, following this model, the TESC still required many resources, especially when trying to administer the
test to larger samples. Therefore, a hybrid version of the TESC combining the original TESC with a Likert-type Defining Issues Test (DIT) may improve our chances of obtaining a larger random sample size.

- Develop a single educational resource that will assist construction educators with teaching ethics in various classes throughout the curriculum, whether it is in the form of a book, manual, or an online resource.
- Map various ethical issues to various construction classes throughout the curriculum so students are taught what ethical issues are associated with different areas of the construction industry.
- Perform a deeper investigation into construction curriculum, possibly using case study analysis.
- Observe any correlations between variables of the TESC, to draw further conclusions about findings.
- Investigate the influence of affective reasoning on ethical decision-making of students and construction professionals.
- Perform a study that would observe the long-term effects of ethical behavior by construction companies.
References
# APPENDIX B

## Ethics Education in Various Construction Programs (Sampling Frame)

<table>
<thead>
<tr>
<th>School Name</th>
<th>Ethics Courses/Possible Component</th>
<th>Location</th>
<th>ASC Region</th>
</tr>
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<tbody>
<tr>
<td>Iowa State University</td>
<td>Unidentifiable</td>
<td>Ames, IA, US</td>
<td>4</td>
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</table>
| North Carolina State University at Raleigh | 1. CE 464 - Legal Aspects of Contracting (3)  
2. MIE 330 - Human Resource Management (3) | Raleigh, NC, US    | 2          |
| North Dakota State University            | 1. CM&E 385 - Construction Safety (2)  
2. **ENGR 402 Engineering Ethics and Social Responsibility** (1) | Fargo, ND, US     | 4          |
| Purdue University at West Lafayette      | 1. CEM 497 - Legal Aspects in Construction Engineering (3)  
2. CEM 324 - Human Resource Management in Construction (3) | West Lafayette, IN | 3          |
| San Diego State University               | 1. **CON E 301 - Construction Ethics, Law, and Contracts** (3)  
2. CON E 490 - Construction Project Management and Safety (3)  
3. CON E 420 - Environmentally Conscious Construction (3) | San Diego, CA, US | 7          |
| Southern Polytechnic State University    | 1. CM 4639 - Construction Safety and Law (4)                          | Marietta, GA, US  | 2          |
| The University of Alabama                | 1. CE 464 - Safety Engineering (3)                                     | Tuscaloosa, AL, US| 2          |
| University of Central Florida            | Unidentifiable                                                        | Orlando, FL, US   | 2          |
| University of Nebraska-Lincoln           | 1. BLAW 371 - Legal Environment (3)  
2. Accident Prevention in Construction (3) | Lincoln, NE, US    | 4          |
| University of New Mexico                 | 1. **Engineering Ethics** (1)  
2. Construction Law (3)  
| Virginia Polytechnic Institute and State University | 1. CEE 4804 - Professional and Legal Issues in Engr. (3)  
2. **MGT 4334 - Ethical Leadership (Elective)** | Blacksburg, VA, US | 2          |
| Western Michigan University              | 1. **PHIL 3160 - Ethics in Engineering and Technology** (3)  
2. CCE 3330 - Construction Codes, Specifications, and Contracts (3) | Kalamazoo, MI, US | 3          |
### ABET Accredited Construction Engineering Technology Programs

<table>
<thead>
<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
<th>ASC Region</th>
</tr>
</thead>
</table>
| 13  | Alfred State College                         | 1. CIVL 4143 Contracts/Spec/Estimating (3)  
2. CIVIL 6212 Construction Safety (2)  
3. BUAD 3043 Business Law 1 (3)        | Alfred, NY, US | 1          |
| 14  | California State Polytechnic University, Pomona | 1. ETC 204 Construction Inspection (3)  
2. ETC 403 Construction Safety (3)       | Pomona, CA, US | 7          |
| 15  | East Tennessee State University               | 1. ENTC 4777 - Safety Management (3)                                                                     | Johnson City, TN, US | 2          |
| 16  | Fairleigh Dickinson University (Metropolitan Campus) | 1. ENGR 3000 Modern Technologies (3) (Claims to Cover Ethical and Moral Analysis Component)    | Teaneck, NJ, US | 1          |
| 17  | Florida A&M University                        | 1. BCN 4705 - Contracts, Codes & Law (3)  
2. PHI 3601 Ethics (3)                     | Tallahassee, FL, US | 2          |
| 18  | Indiana University - Purdue University        | 1. CEMT 30200 Construction Law and Ethics (3)  
2. CEMT 45500 Construction Safety and Inspection (3) | Indianapolis, IN, US | 3          |
| 19  | Indiana University - Purdue University        | 1. CNET 45700 Construction Safety (3)                                                                     | Fort Wayne, IN, US  | 3          |
| 20  | Louisiana Tech University                     | 1. BLAW 255 Legal Environment of Business (3)  
2. CVEN 437 Contracts and Specifications | Ruston, LA, US | 5          |
| 21  | Missouri Western State University             | 1. BGEN 361 - Intro to Law                                                                              | St. Joseph, MO, US  | 4          |
| 22  | Montana State University – Bozeman            | Unidentifiable                                                                                           | Bozeman, MT, US     | 6          |
| 23  | Murray State University                       | 1. Any Course in Sub-Category of Ethics, Social Responsibility, and Civic Engagement  
2. CET 284 - Sustainable Design and Construction  
3. OSH 384 - Construction Safety        | Murray, KY, US | 3          |
| 24  | New Jersey Institute of Technology            | 1. CET 323 Construction Safety (3)  
2. CET 421 Construction Contracts (3)         | Newark, NJ, US | 1          |
| 25  | Oklahoma State University                     | 1. CMT 4563 Law & Insurance  
2. CMT 4443 Safety & Loss Control             | Stillwater, OK, US | 5          |
<p>| 26  | Pennsylvania State University, Harrisburg, The Capital College | 1. CE 254 Personal and Occupational Safety (3) | Middletown, PA, US | 1          |</p>
<table>
<thead>
<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
<th>ASC Region</th>
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<tr>
<td>27</td>
<td>Pittsburg State University</td>
<td>1. EST 396 Intro to Construction Safety (3)</td>
<td>Pittsburg, KS, US</td>
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| 28 | Purdue University Calumet            | 1. Technology in Society(Any)  
2. OLS 34000 Fundamentals of Construction Safety (3)  
3. CMET 42000 Construction Law (3) | Hammond, IN, US          | 3          |
| 29 | Purdue University North Central      | 1. CMET 44500 - Construction Management I (3) (Safety component)  
2. CEMT 34101 - Construction Operations (3) – (Ethics component) | Westville, IN, US         | 3          |
| 30 | State University of New York, College of Technology at Farmingdale | 1. CON 361 Government Building & Environmental Codes & Regulations (3) | Farmingdale, NY, US       | 1          |
| 31 | Temple University                    | 1. CMT 2125 Construction Contracts and Specifications (3)  
2. CE 2396 Environmental and Safety Aspects of Construction (2) | Philadelphia, PA, US      | 1          |
| 32 | Texas Tech University                | 1. CONE 4300 Construction Safety (3)  
2 CONE 4324 Construction Contracts and Specifications (3)  
3. ENGR 4392 Engineering Ethics and Its Impacts (3) | Lubbock, TX, US          | 5          |
| 33 | The University of Akron - Summit College | 1. 2990: 356 Safety in Construction (3)  
2. 2990: 371 Green & Sustainable Building Practice (3)  
3. 2990: 453 Legal aspects of construction (2)  
| 34 | The University of Toledo             | Unidentifiable                                                                                             | Toledo, OH, US           | 3          |
| 35 | University of Maine                  | 1. CET 224 Construction Safety  
2. CET 351 Construction Law  
3. CET 412 Sustainable Pop & Envir. Design and Construction **Ethics Requirement indicated through electives** | Orono, ME, US            | 1          |
| 37 | University of Southern Mississippi   | 1. BCT 480 Construction Safety (3)  
2. BCT 478 Applications of Construction Law (3)  
3. BCT 476 Construction Labor (3) | Hattiesburg, MS, US      | 2          |
<p>| 38 | Youngstown State University          | Unidentifiable                                                                                             | Youngstown, OH, US        | 3          |</p>
<table>
<thead>
<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
<th>ASC Region</th>
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<tr>
<td>39</td>
<td>University of Alaska, Anchorage</td>
<td><strong>1. PHIL A301 Ethics (3) (Option)</strong>&lt;br&gt;2. CM A205 Construction Safety (3)&lt;br&gt;3. CM A401 Construction Law (3)&lt;br&gt;4. Sustainability in Built Environment (3)</td>
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<td>40</td>
<td>Auburn University</td>
<td>1. BSCI 4850 Business and Construction Law (3)&lt;br&gt;2. BSCI 3550 Safety &amp; Hoisting</td>
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<td>Arizona State University</td>
<td>1. CON 271 Construction Safety (3)</td>
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<tr>
<td>42</td>
<td>Northern Arizona University</td>
<td>1. CM 391 Safety and Risk Management (3)&lt;br&gt;2. ACC 205 Legal Environment and Business (3)**(Not fully CM)</td>
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<td>43</td>
<td>John Brown University</td>
<td>1. CM 3213 Construction Safety and Quality (3)&lt;br&gt;2. <strong>BUS 3153 Business Ethics</strong></td>
<td>Arkansas</td>
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<td>44</td>
<td>University of Arkansas, Little Rock</td>
<td>1. CNMG 4342 Construction Safety (3)&lt;br&gt;2. CNMG 4334 Construction Contracts and Law (3)</td>
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<td>45</td>
<td>California Polytechnic State University</td>
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<td>46</td>
<td>California State University, Chico</td>
<td>1. CMGT 380 - Green Building Practices and LEED Certification (3)&lt;br&gt;2. CMGT 460 - Legal Aspects of Construction</td>
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<td>47</td>
<td>California State University, Fresno</td>
<td>1. CM 122 Construction Law (3) - Sustainability, Ethics, and Safety Topics&lt;br&gt;2. CM 180A Capstone 1 (3) - Sustainability, Ethics, and Safety Topics&lt;br&gt;3. CM 180B Capstone 2 (3) - Sustainability, Ethics, and Safety Topics&lt;br&gt;4. Contracts and Specs (3) - Sustainability, Ethics, and Safety Topics&lt;br&gt;5. CM 1S (3) Sustainability, Ethics, Safety Topics&lt;br&gt;6. Various Elective with Sustainability, Ethics, Safety Topics</td>
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<td>48</td>
<td>California State University, Long Beach</td>
<td>1. CEM 315 - Construction Safety (2)</td>
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<td>7</td>
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<td>49</td>
<td>California State University, Northridge</td>
<td>1. BLAW 280 - Business Law I (3)&lt;br&gt;2. CMT 480 - Construction Law (3)</td>
<td>California</td>
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<td>#</td>
<td>School Name</td>
<td>Ethics Courses/Possible Component (Credits)</td>
<td>Location</td>
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</tbody>
</table>
| 50 | California State University, Sacramento | 1. MGMT 117 - Business, Ethics, and Society (3)  
2. MGMT 101 - Business Law  
3. CM 111 - Construction Labor Relations  
4. CM 110 - Legal Aspects of Construction  
5. CM 129 - Construction Management | California | 7          |
| 51 | Colorado State University       | 1. CON 317 - Safety Management  
2. BUS 205 Legal and Ethical Issues in Business | Colorado | 6          |
| 52 | Central Connecticut State University | 1. CM 335 Construction Safety (3)  
2. PHIL 240 Ethical Problems in Business (3) | Connecticut | 1          |
| 53 | Florida International University | 1. BCN 3730 - Construction Safety  
2. BCN 3740 - Legal Aspects of Construction  
3. BUL 4320 Business Law | Florida | 2          |
| 54 | University of Florida           | 1. BCN 4023 - Creating Affordable Housing (3)  
2. BCN 4905 - Sustainable Housing (3)  
3. BUL 4310 - Legal Environment Business (3)  
4. BCN 1582 - International Sustainable Development (3) | Florida | 2          |
| 55 | University of North Florida      | 1. BUL 3130 Legal Environment of Business (3)  
2. BCN 4730 Construction Safety (3)  
3. BCN 4587C Green Construction/Sustainability (3) | Florida | 2          |
| 56 | Georgia Tech                    | 1. BC 3610 Construction Law (3) | Georgia | 2          |
| 57 | Georgia Southern University      | 1. TCM 2430 Construction Safety (3)  
2. TCM 2330 Green Bldg & Sustainable Construction (3)  
3. LSTD 3230 Building Construction Law (3)  
4. TCM 3320 Building Codes | Georgia | 2          |
| 58 | Southern Polytechnic State University | 1. CM 3500 Building Codes (2)  
2. CM4710 Safety (4)  
3. CM 4760 Construction & Real Property Law (3)  
4. CM 3190 BTM IV (LEED) (3) | Georgia | 2          |
| 59 | Boise State University           | 1. UF 200 Civic and Ethical Foundations (3)  
2. ENGR 101 Intro to Sustainable Building Science  
3. CMGT 385 Construction Contracts and Law | Idaho    | 6          |
| 60 | Bradley University               | 1. CON 356 Construction Safety (3)  
2. BMA 342 The Legal Environment of Business (3) | Illinois | 3          |
| 61 | Illinois State University        | 1. HSC 272 Construction Safety (3)  
2. TEC 226 - Construction Contracts and Law (3)  
3. TEC 329 - Sustainable Buildings and Urban Development (3)  
4. FIL 185 - Legal Ethical and Social Environment of Business (3)  
5. TEC 322 Building Codes and Inspection (3) | Illinois | 3          |
<table>
<thead>
<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
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</table>
| 62 | Southern Illinois University, Edwardsville | 1. CNST 411 - Construction Contracts (3)  
2. CNST 452 - Construction Management (3) - Includes Safety | Illinois      | 3          |
| 63 | Indian State University        | 1. CNST 201 - Construction Contract Documents (3)  
2. CNST 330 - Construction Accounting Finance and Safety (3) | Indiana      | 3          |
| 64 | Ball State University          | 1. ITCST 365 - Construction Safety (3)  
2. ITCST 310 - Ethics in Construction (3)    
3. BL 260 - Principles of Business Law (3)  
4. ITCST 420 - Construction Finance and Law (3) | Indiana      | 3          |
| 65 | Purdue University              | 1. BCM 4570 - Construction Safety  
2. MGMT 45500 - Legal Background for Business I  
3. BCM 45500 - Construction Business and Contracts | Indiana      | 3          |
| 66 | Kansas State University        | 1. MANGT 390 - Business Law 1 (3)  
2. CNS 542 - Ethics and Professional Standards (1)  
3. CNS 650 - Construction Safety (2) | Kansas       | 4          |
| 67 | Eastern Kentucky University    | 1. OSH 379 - Construction Safety (3)  
2. CON 421 - Contracts and Bidding (3)  
3. GBU 204 - Legal and Ethical Environments of Business (3) | Kentucky     | 3          |
| 68 | Northern Kentucky University   | 1. CMGT 225 - Construction Safety (3)  
2. CMGT 400 - Building Codes (3)  
3. CMGT 427 - Construction Law and Legal Contracts (3) | Kentucky     | 3          |
| 69 | Western Kentucky University    | 1. AMS 140 - Introduction to Occupational Safety (1)  
2. SFTY 171 - Safety and First Aid (1)  
3. PHIL 321 - Morality and Business (3)  
3. MGT 301 - Business Law (3)  
4. CM 426 - Construction Law (3) | Kentucky     | 3          |
| 70 | Louisiana State University     | 1. CM 3000 - Construction Safety (3)  
2. CM 4201 - Construction Law (3) | Louisiana    | 5          |
| 71 | University of Louisiana Monroe| 1. Business Law 4001 (3) - NOT CLEAR | Louisiana    | 5          |
| 72 | University of Maryland, Eastern Shore | Unidentifiable | Maryland | 1          |
| 73 | Wentworth Institute of Technology | 1. CCEV625 - Construction Safety and Risk Management (3)  
2. CCEV670 - Construction Law and Government Regulations (3) | Massachusetts | 1          |
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<tr>
<th>#</th>
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<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
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<tr>
<td>74</td>
<td>Eastern Michigan University</td>
<td>1. CNST 213 - Construction Safety (3)</td>
<td>Michigan</td>
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<td>2. CNST 406W - Construction Law (3)</td>
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<td>3. CNST 440 LEED: For new construction (3)</td>
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<td>75</td>
<td>Ferris State University</td>
<td>1. BLAW 301 - Legal Environment of Business (3)</td>
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<td>76</td>
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<td>1. CMP 401 - Construction Safety Management (3)</td>
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<td>2. GBL 323 - Introduction to Business Law (3)</td>
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<td>77</td>
<td>Michigan Technological University</td>
<td>1. BA2500 - Business Law I</td>
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<td></td>
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<td>2. BA3580 - Legal Environment of Business</td>
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<td>78</td>
<td>Minnesota State University, Mankato</td>
<td>1. CM 300 - Construction Safety (3)</td>
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<td>2. CM 297 - Construction Professional Practice (1)</td>
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<td>(Has ethics component)</td>
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<td>79</td>
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<td>1. CM 365 Construction Safety (2)</td>
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<td></td>
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<td>2. CM 327 Sustainability in the Built Environment (3)</td>
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<td>3. ACCT 304 Legal Environment of Business (3)</td>
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<td>80</td>
<td>University of Southern Mississippi</td>
<td>1. BAD 3413 - Legal Environment of Business (3)</td>
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<td>2. PHI 2143 - Ethics (PHI 171)</td>
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<td>3. BCT 478 - Construction Law</td>
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<td>4. BCT 470 - Construction Safety</td>
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<td>81</td>
<td>University of Central Missouri</td>
<td>1. CMGT 4310 - Construction Safety</td>
<td>Missouri</td>
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<td></td>
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<td>2. BLAW 2720 - Legal Environment of Business</td>
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<td>82</td>
<td>Missouri State University</td>
<td>1. PHI 115 Ethics and Contemporary Issues</td>
<td>Missouri</td>
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<td>2. TCM 455 Safety Management</td>
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<tr>
<td>83</td>
<td>University of Nebraska, Lincoln</td>
<td>1. BLAW 371 Legal Environment</td>
<td>Nebraska</td>
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<td>84</td>
<td>University of Nevada, Las Vegas</td>
<td>1. PHI 248 Professional Ethics (3)</td>
<td>Nevada</td>
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<td>2. CEM 301 Construction Safety (3)</td>
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<td>3. BLW 302 Legal Environment (3)</td>
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<td>4. CEM 485 Construction Law and Contracts (3)</td>
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<td>5. CEM 450 Construction Inspection (3)</td>
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<td>85</td>
<td>University of New Mexico</td>
<td>1. CE 473 Construction Law (3)</td>
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<td>2. CE 409 Engineering Ethics (1)</td>
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<td>3. CE 475 Construction Safety (3)</td>
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<td>86</td>
<td>Alfred State College</td>
<td>1. CIVL 4143 Contracts/Spec/Estimating (3)</td>
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<td>2. CIVIL 6212 Construction Safety (2)</td>
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<td>3. BUAD 3043 Business Law 1 (3)</td>
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<td>Ethics Courses/Possible Component (Credits)</td>
<td>Location</td>
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| 87  | East Carolina University   | 1. CMGT 3900 - Construction Project Safety Management  
2. CMGT 4300 - Construction Quality and Human Resource Mgmt  
3. CMGT 4320 Construction Sustainability  
4. EHST 3060 - Environmental Issues in Construction  
5. CMGT 2400, 2401 Building Systems and Codes | North Carolina | 2           |
| 88  | North Carolina A&T State University | 1. CM 320 - Construction Safety  
2. MGMT 361 - Legal Environment of Business  
3. CM 450 - Construction contracts and Law  
4. CM 460 - Principles of Sustainable Development and Construction | North Carolina | 2           |
| 89  | Western Carolina University | 1. ENVH 390 Environmental Issues in Construction  
2. LAW 230 - Legal Environment of Business  
3. CM 430 Construction Legal Aspects  
| 90  | North Dakota State University | 1. CM&E 315 Specs and Contracts  
2. CM&E 385 Construction Safety  
3. BUSN 431 Business Law I  
4. CM&E 310 Construction Quality Control  
5. CM&E 200 Construction Doc & Codes | North Dakota | 4           |
| 91  | Bowling Green State University | 1. CONS 4110 - Safety/Health Mgmt (3)  
2. CONS 4400 - Construction Contracting (3)  
3. CONS 4000 - LEED & Lean (3)  
4. ECT 2050 Renewable Energy (3) | Ohio         | 3           |
| 92  | University of Cincinnati   | 1. CM 276 Construction Safety Management (3)  
2. BLAW 2080 Legal Environment Business (3) | Ohio         | 3           |
| 93  | University of Oklahoma     | **1. PHIL 1213 Introduction to Ethics (3)**  
2. LS 3323 Legal Environment of Business (3)  
3. CNS 4153 Legal Issues in Construction (3)  
4. CNS 4881 Construction Safety Management (3) | Oklahoma     | 5           |
| 94  | Oregon State University    | **1. PHIL 205 - Ethics Perspective**  
2. BA 230 - Business Law  
3. BA 453 Human Resources Management  
4. H 385 Safety and Health Standards and Laws  
5. Synthesis Science, Tech & Society  
| 95  | Pennsylvania College of Technology | 1. MGT 301 - Business Law I (3)  
2. HRM300 - Human Resource Management (3)  
3. BCM 420 Construction Safety (3) | Pennsylvania | 1           |
<table>
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<tr>
<th>#</th>
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<th>Location</th>
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| 96 | Drexel University         | 1. BLAW 201 - Business Law I (4)  
2. PHIL 301 - Business Ethics (3)  
3. CMGT 355 - Intro to Sustainability in Construction (3)  
4. CMGT 261 - Construction Safety (3) | Pennsylvania | 1          |
| 97 | Roger Williams University | 1. PLS 436 Construction Law  
2. CNST 480 - Capstone Project, Ethics, and New Technology  
3. CNST 445 - Construction Project Management and Safety Lab  
4. PLS 221 - Law of Contracts | Rhode Island | 1          |
| 98 | Clemson University        | 1. LAW 322 Legal Environment of Business  
2. CSM 411 Safety in Building Construction  
3. MGT 307 Personnel Management | South Carolina | 2          |
| 99 | South Dakota State University | 1. GE 231 Technology, Society, and Ethics | South Dakota | 4          |
| 100| Texas A&M University      | 1. COSC 364 Construction Safety I & II (1)  
(3 - Advanced)  
2. COSC 463 Construction Law and Ethics (3) | Texas | 5          |
| 101| University of Houston     | 1. CNST 4302 Construction Law and Ethics  
2. CNST 3205 Construction Safety Management | Texas | 5          |
| 102| Texas State University    | 1. TECH 4369 Construction Contracts, Liability, and Ethics  
2. TECH 4368 Environmentally Conscious Design and Construction | Texas | 5          |
| 103| Brigham Young University  | 1. CM 345 Construction Safety Management  
2. CM 285 Construction Contracts and Law  
3. CM 455 Sustainable Construction  
4. ENG T 231 Moral Leadership in a Technological World | Utah | 6          |
| 104| Weber State University    | 1. CMT 2220 Construction Contracts and Specifications  
2. CMT 2360 Building Codes and Inspections  
3. CMT 4550 Construction Safety  
4. BSAD 3200 Legal Environment of Business  
5. BSAD 3330 - Business Ethics and Environmental Responsibility (Elective)  
6. BTNY 1403 - Environment Appreciation (Support Course) | Utah | 6          |
<p>| 105| Virginia Tech             | 1. Spread Throughout | Virginia | 2          |</p>
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<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
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</table>
| 106| Central Washington University | 1. CMGT 452 LEED in sustainable construction (4)  
2. SHM 323 Construction Safety (3)  
3. BUS 241 Business Law (5)  
4. CMGT 444 Codes, Contracts and Specifications | Washington | 7          |
| 107| University of Washington | 1. MGMT 200 Intro to Law (4)  
2. CM 423 Construction Law (3)  
3. CM 333 Construction Safety (3)  
4. CM 430 Building Codes and Environmental Regulations (3)  
5. CM 340 Sustainable Design and Construction (3)  
6. MGMT 323 Business Ethics and Corporate Social Responsibility (3) | Washington | 7          |
| 108| Washington State University | 1. Cst M 467 Ethics and Construction Management (3)  
2. Cst M 468 Safety and Health  
3. Cst M 362 Legal Aspects of Construction and Design | Washington | 7          |
| 109| Milwaukee School of Engineering | 1. CM 3022 Business and Construction Law(3)  
2. CM 4511 Construction Safety Management (3)  
3. CM 4002 Sustainable Design and Construction (3)  
4. HU-432 Ethics for Professional Managers and Engineers (3) | Wisconsin | 3          |
| 110| University of Wisconsin - Stout | 1. RC 388 Construction Safety  
2. BULGL 473 Legal Aspects of Construction | Wisconsin | 3          |
<table>
<thead>
<tr>
<th>#</th>
<th>School Name</th>
<th>Ethics Courses/Possible Component (Credits)</th>
<th>Location</th>
<th>ASC Region</th>
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</table>
| 111 | University of Minnesota, Twin Cities | 1. **CMgt 4013 Legal, Ethical, and Risk Issues in Construction** (3)  
2. CMgt 4031 Construction Safety and Loss Control (3)  
3. CMgt 4471 Sustainability for Construction Managers (2) | Minnesota | 4          |
| 112 | Pratt Institute                      | 1. MSCI-280 Environmental Science for Construction Management  
2. MGMT 303 - Business Law  
3. CM 471 - Construction Law | New York | 1          |
| 113 | Utica College                        | 1. PHI 108 Professional Ethics (3)  
2. CMG 415 Construction Law (3)  
3. CMG 447 Project Management and Safety (3) | New York | 1          |
| 114 | The Ohio State University            | 1. Construction Safety and Health (3)  
2. Construction Contracts and Documents (2) | Ohio     | 3          |
| 115 | Lamar University                     | 1. CMGT 4330 - Safety and Industrial Construction (3)  
2. CMGT 4350 - Legal Practice in Construction (3)  
3. BULW 3310 - Business Law | Texas    | 5          |
| 116 | Prairie View A&M University          | 1. FINA 2203 - Legal Environment (3)  
2. ARCH 3463 - Sustainable Building (3)  
3. CONS 4603 - Labor and Safety (3)  
4. CONS 4633 - Law and Ethics (3) | Texas    | 5          |
| 117 | University of Texas at San Antonio   | 1. CSM 4623 - Construction Safety II  
2. BLW 3013 Business Law  
3. CSM 4633 Construction Law  
4. CSM 4613 Sustainable Building Practice  
**Credit Hours for Each Course Not Listed** | Texas    | 5          |
| 118 | Vermont Norwich University           | 1. MG341 Business Law (3) | Vermont | 1          |
APPENDIX C

The Test for Ethical Sensitivity in Construction (TESC) Pre-Pilot Test Version
(Used for conducting think-aloud protocols)

Test for Ethical Sensitivity in Construction (TESC)

Background Information for Mental Avatar

You recently graduated from a 4 year accredited construction program. You have been an employee for 2 months as a project coordinator for ‘Solid Construction’, an established commercial construction company in the United States. The company requires all entry-level employees to be involved in a rotation program where you are involved in various company operations during the first year.

Scenario 1 – *Claims Games (Project Administration - Future)

Your first assignment is to shadow the estimator on an open bid project for an airport terminal renovation with an estimated cost of $15 million, which can boost your company’s financial position. Prior to getting into heavy estimating process, you and the estimator perform a routine site visit to go over the plans and look at the existing conditions. You notice a peculiar look on the estimator’s face and hear him say with a smirk, ‘looks like the architect missed that’. As you continue to shadow the estimator, assist with the bid process, and go to pre-bid meetings etc. no mention of this exclusion the estimator talked about comes up.

Reflect on the scenario and write down 3 statements or questions concerning this scenario.

Scenario 2 - *Collusion (Project Procurement)

It is bid day and you were recently advised that your company desperately needs work. You recall the night before where the familiar face of the airport’s owner representative (from the pre-bid meeting) entering your boss’ office. Your boss and estimator frantically receive sub-bids, complete bid forms with specific subcontract bids, and run out of the office to deliver the bid. An hour later, a call comes in and you hear, “we were the lowest bidder.”

Reflect on the scenario and write down 3 statements or questions concerning this scenario.

Scenario 3 - *Bid Shopping and Bid Peddling (Project Administration)

After celebrating the lowest bid for the airport project, your company immediately begins preparing for project administration where you are working with another colleague to buy out the project (i.e. material purchase and subcontracting). You receive multiple calls from various subcontractors providing you with quotes for this work. Additionally, your boss leaves business cards on your table and tells you to call up those companies and send them the electronic plans for the airport project.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.
Scenario 4 - *Theft and Abuse of Public/Client Resources (Project Administration)

The airport project has begun and you have to spend a few days a week on site as part of your orientation. A few weeks into the project, light-gauge metal framing work is 90% complete and material will be left over. The drywall subcontractor’s foreman on your site talks about the renovations he is making at home. As you leave the site at the end of this particular day, you notice a bundle of framing material missing from the site.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.

Scenario 5 - *Unfair Labor Allocation and Overtime & Child Labor (Human Resources)

It is Friday and the end of your workday. Before leaving you are asked by your boss to work after hours that evening to accompany the electrician who needs to perform electrical work that cannot be performed during normal operating hours. The electrician and younger person in plain clothes not familiar to you enter the project site. The younger person is introduced to you as the nephew of the electrician.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.

Scenario 6 - *Frontloading and Payment Games (Project Administration)

Currently the project is 60% complete and has been going on for a few months. Throughout this time, based on recommendations by the superintendent on your site, you have been required to update the AIA G702 application and certificate of payment forms and the AIA G703 continuation sheet with the agreed schedule of values on a monthly basis having already received a few owner payments. Now that you are familiar with the project, you notice that a large portion of the work has already been paid, seemingly more than the value of what has been completed to this point. A few hours into the workday, the plumbing subcontractor calls requesting information for his payment application submitted during your company’s first application to the owner.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.

Scenario 7 - *Low Competence of Work Performance & Improper Client Relations (Project Procurement)

The airport project is now substantially complete and it is time to look for more work. An RFP (request for proposal) is advertised for a medical facility, and your company has never performed work for a hospital before. The owner’s representative is highly involved in charitable work. The owner of your company recently gained interest in similar charitable work and provides a sizeable donation to the charity.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.
Scenario 8 - *Use of Joint Ventures to Increase Satisfaction of Prequalification Requirements & Bid Rigging (Project Procurement)*

The medical facility RFP has a substantial small business enterprise requirement for the performance of the work. There has been talk around the office about possibly forming a joint venture with a contractor who is a small business enterprise and has worked with the medical facility before. Prices are determined collectively with the small business enterprise. Prior to finalizing the price and submission of the RFP, you notice familiar faces of companies from previous bid openings you attended throughout your training year entering your office, and meeting in the conference room with your boss.

Reflect on the scenario and write down 6 statements or questions concerning this scenario.

**DESCRIPTOR ITEMS**

1. What is your current academic level?
   - [ ] Freshman
   - [ ] Sophomore
   - [ ] Junior
   - [ ] Senior
   - [ ] Graduate

2a. Are you in a construction related program (includes architecture and civil engineering)?
   - [ ] Yes
   - [ ] No (if No selected, test ends here)

2b. What type of construction related program are you attending?
   - [ ] Building Construction
   - [ ] Construction Management
   - [ ] Construction Engineering
   - [ ] Construction Engineering and Management
   - [ ] Building Construction Technology
   - [ ] Other (Please specify): ____________________________

2c. Have you spent your entire academic career in the same construction program (i.e. at the same university and in the same department)?
   - [ ] Yes
   - [ ] No
2d. If NO to 2c, what academic level did you start your current program?

☐ Freshman  ☐ Sophomore  ☐ Junior  ☐ Senior  ☐ Graduate

3. How were you introduced to ethics during your undergraduate career? (Select all that apply)

☐ Via a 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 formal ethics education
☐ Other (Please provide): __________________________

4. What level of construction industry work experience do you have (including internships)?

☐ No Experience  ☐ Up to 4 months  ☐ 5-8 months  ☐ 9-12 Months  ☐ More than 12 months (Please specify time, if over 12 months)____________________

5. I have worked for a(n) (select all that apply):

☐ General Contractor/Prime Contractor/Construction Manager  ☐ Subcontractor  ☐ Owner/Owner’s Representative  ☐ Supplier  ☐ Consultant (Engineer/Architect)  ☐ Other (Please list): ______________________

END
APPENDIX D
The Test for Ethical Sensitivity in Construction (TESC) Final Version

Dear Participant:

I would appreciate your assistance with this research project aimed at studying a student’s ability to recognize issues of the construction industry. The results will be used toward the completion of the doctoral research of Kenneth Sands and may be used for reporting in relevant journals and conference proceedings. It is anticipated that results of this research study will improve decision-making in curriculum development of construction education.

Participation in the study requires you to be at least 18 years of age. Completion of the attached test instrument should take approximately 45 minutes. Completion and submission of this test instrument constitutes your consent to participate.

Associated risk may include disclosure of personal experiences. Use of pseudonyms/coded identifiers will be used in all reporting to eliminate identification of your participation. The data you provide will be collected and analyzed anonymously. Interview data, notes, and recordings will be securely stored in the office of the principal and co-investigators of this project. Personally identifying features will not be required of participants, and will not be maintained with data collected. Data from this study will only be accessible by investigators of the study.

At no time will the researchers release identifiable results of the study, without your written consent, to anyone other than individuals working on the project. The Virginia Tech (VT) Institutional Review Board (IRB) may view the study’s data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research. The IRB # for this research is IRB 13-859.

There is no compensation for participation in this research study.

It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.

Please note that there may be circumstances under which the investigator may determine that a subject should not continue as a subject.

Should you have any questions about this study, you may contact one of the research investigators at ksands01@vt.edu or apearce@vt.edu.

Should you have any questions or concerns about the study’s conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991.

Thank you for your time.   __________ - SP14 - __________
Background:
You recently graduated and were hired as a project engineer for an established, medium-sized, construction company. As a new employee, you must participate in a rotation program to gain experience in various company operations.

Reflect on the situation below and write down at least 3 issues you are concerned with and/or questions you may have about the situation. Please be as descriptive as possible.

Situation 1
Your first assignment is to shadow the estimator on a public, open bid, commercial renovation project solicitation with an estimated value of $15 million. Winning this project can significantly boost your company’s financial position. Prior to estimating the job, you and the estimator perform a routine site visit to go over the existing conditions of the project. You notice a peculiar look on the estimator’s face and hear him say with a smirk, ‘looks like the architect missed that.’ As you continue to shadow the estimator to pre-bid meetings, and assist with the bid process, there is no mention of, or questions asked about, this error on the bid documents.
Reflect on both situations below and write down at least 3 issues you are concerned with and/or questions you may have about each situation. Please be as descriptive as possible.

Situation 2

It is bid day, and you recall last night (the night before bid day) the familiar face of the renovation project’s owner’s representative (from the pre-bid meeting) entering your boss’s office. Today, your boss and estimator frantically receive sub-bids, complete bid forms with specific subcontract bids, and run out of the office to deliver the bid. A few hours later, a call comes in to your office and you hear, “we were the lowest bidder.”

Situation 3

Your company was awarded the renovation project and immediately begins preparations for project administration. You work with another colleague to buy out the project (i.e. material purchase and subcontracting). You receive multiple calls from various subcontractors providing you with quotes for this project. Additionally, your boss leaves business cards on your table and tells you to call these companies, send them plans for the project, and “see what prices you can get.”
Reflect on both situations below and write down at least 3 issues you are concerned with and/or questions you may have about each situation. Please be as descriptive as possible.

**Situation 4**

The renovation project has begun, and you spend a few days a week on this project’s site. A while into the project, light-gauge metal framing work is 90% complete, and material will be left over. The drywall subcontractor’s foreman on your site talks about the renovations he is making at home. As you leave the site at the end of this particular day, you notice a bundle of framing material missing from the site.

**Situation 5**

It is the end of the day on Friday. Before leaving, you are asked by your boss to work after hours that same evening to accompany the electrician. The electrician needs to perform electrical work unable to be performed during normal operating hours. The electrician and an underage looking individual in plain clothes, not familiar to you, enter the project site. The unfamiliar person is introduced as the electrician’s nephew.
Reflect on both situations below and write down at least 3 issues you are concerned with and/or questions you may have about each situation. Please be as descriptive as possible.

**Situation 6**

Currently, the project is 60% complete and has been active for 7 months. Based on recommendations by the superintendent, you have been required to update and submit payment applications on a monthly basis to the owner. Now that you are familiar with the project, you notice that a large portion of the work has already been paid out, seemingly more than the value of what has been completed to this point. A few hours into the workday, a subcontractor calls in anger requesting payment for an application his company submitted 2 payment periods ago.

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**Situation 7**

The renovation project is now substantially complete. A request for proposal (RFP) has been advertised for a particular type of project for which your company has no experience. The owner’s representative of this RFP is highly involved in charitable work and has a specific charity he favors. The owner of your company recently showed his interest in charity work by giving a sizeable donation to that favored charity. You somehow overhear that your company may be a viable contender for this RFP project.

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Reflect on the situation below and write down at least 3 issues you are concerned with and/or questions you may have about the situation. Please be as descriptive as possible.

Situation 8

Your company has interest in another request for proposal (RFP). Prior to finalizing price and submitting the RFP, familiar faces of competing contracting firms enter your company’s conference room with your boss, and he locks the door. You have seen these familiar faces at previous bid openings and pre-bid meetings.

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APPENDIX E

The How Ethics Is Taught In Construction Faculty Survey (HETC-FS)

How Ethics is Taught in Construction (HETC) Faculty Survey

Dear Participant:

I would appreciate your assistance with this research project aimed at studying student ability to recognize issues of the construction industry. The results will be used toward the completion of the doctoral research of Kenneth Sands and may be used for reporting in relevant journals and conference proceedings. It is anticipated that results of this research study will improve decision making in curriculum development of construction education. Participation in the study requires you to be a faculty member who teaches some form of ethics/has some ethical component included in your class. Completion of the attached survey should take approximately 15 minutes or less. Completion and submission of this survey constitutes your consent to participate. Associated risk may include disclosure of personal experiences. Use of pseudonyms/coded identifiers will be used in all reporting to eliminate identification of your participation. The data you provide will be collected and analyzed anonymously. Interview data, notes, survey results and recordings will be securely stored in the office of the principal and co-investigators of this project. Personally identifying features will not be required of participants, and will not be maintained with data collected. Data from this study will only be accessible by investigators of the study. At no time will the researchers release identifiable results of the study to anyone other than individuals working on the project without your written consent. The Virginia Tech (VT) Institutional Review Board (IRB) may view the study’s data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research. The IRB # for this research is IRB 13-859. There is no compensation for participation in this research study. It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty. Please note that there may be circumstances under which the investigator may determine that a subject should not continue and if such a determination is made, subject may be asked to stop and complete the survey at another time. Should you have any questions about this study, you may contact one of the research investigators at ksands01@vt.edu or apearce@vt.edu. Should you have any questions or concerns about the study’s conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991. Thank you for your time.
Q1 Have you ever taught or do you teach a FULL course dedicated to construction ethics?

☐ Yes (1)
☐ No (2)

Q2 Do you currently teach, or have you previously taught, a course or courses that include ANY form of construction ethics education?

☐ Yes (Please provide course titles) (1) ____________________
☐ No (2)

Q3 Please select your highest academic degree achieved:

☐ Bachelor's (1)
☐ Master's (2)
☐ Doctoral (3)
☐ Other(s) (Please list) (4) ____________________

Q4 Please select or state your current position:

☐ Instructor/Lecturer (1)
☐ Adjunct Professor/Instructor (2)
☐ Visiting Professor (3)
☐ Professor of Practice (4)
☐ Assistant Professor (5)
☐ Associate Professor (6)
☐ Full Professor (7)
☐ Other (Please state) (8) ____________________
Q5 What formal administrative position(s) have you held or do you currently hold in your department?

Q6 Please select the type of construction program of which you are current faculty:

- Building Construction (1)
- Construction Management (2)
- Construction Engineering (3)
- Construction Engineering and Management (4)
- Building Construction Technology (5)
- Civil Engineering/Civil and Environmental Engineering (6)
- Other(s) (Please list) (7) ____________________

Q7 Please select or list subject areas of courses you have previously taught or currently teach. (Select all that apply):

- Introductory Course in Construction (1)
- Construction Principles (2)
- Estimating and Bidding (3)
- Project Control Planning, Scheduling, Budgeting (4)
- Construction Law (5)
- Safety & Health (6)
- Drawing and Specifications/Contracts/ Documents/Computer Applications in Construction (7)
- Quality Control and Assurance (8)
- Sustainability (9)
- Engineering Economics/Economy (10)
- Construction Accounting and Finance (11)
- Construction/Project Management & Relations (Business Management, Industrial Management, Organizational Behavior, Labor Relations) (12)
- Ethics (13)
- Real Estate (14)
- Design Theory (Statics, Strength of Material, Dynamics, Thermodynamics, Soil Mechanics, Hydraulics, Hydrology etc.) (15)
- Analysis and Design of Construction Systems (Structural, HVAC, Plumbing, Mechanical, Electrical, Roadways, Drainage, Utilities) (16)
- Construction Methods and Materials (Materials, Assembly Techniques, Equipment Selection, Components, Materials Testing) (18)
- Project Development, Feasibility Studies, Value Analysis, Site Planning, Elements of Building and Site Design (19)
- Building Codes, Inspection (20)
- Capstone Course (21)
- Other(s) (Please list) (22) ____________________
Q16 Please indicate the amount of experience (in years) you have in the following areas:

_____ Construction Academe (1)
_____ Construction Industry (2)

Q17 For what type of construction organization have you worked? (Select all that apply)

- General Contractor/Prime Contractor/Construction Manager (1)
- Architecture/Engineering Consultant (2)
- Developer (3)
- Material/Equipment Supplier (4)
- None (5)
- Other (Please list) (6) ____________________

Q18 Please describe your current teaching load:

Q19 How have you received formal ethics training? (select all that apply)

- Ethics course during higher education (1)
- Faculty Development Seminar (2)
- Online Course/Workshop (3)
- Professional Industry Training (4)
- No formal training (5)
- Other (Please list/explain) (6) ____________________

Q20 Have you been involved in construction ethics research?

- Yes (1)
- No (2)

Q21 Please explain the nature of the ethics research you were involved:
Q4 Which topics serve as the subject matter for construction ethics education in your construction course(s) or program? (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__________________
Q5 Which forms of media are used for construction ethics instruction in your course(s) or program? (Select all that apply)

- YouTube Videos (1)
- Movies/Film (2)
- Audio Recordings (3)
- Text Book (4)
- Magazines (5)
- Journal Articles (6)
- Blogs (8)
- Social Media (9)
- Construction Websites (10)
- The internet in general (11)
- Interactive Video/Website (12)
- Other(s) (Please list) (13) ____________________

Q7 Ethics education for our construction students is taught: (Select all that apply)

- In our construction department (1)
- Outside of our construction department (e.g., business, philosophy, engineering dept. etc.) Please indicate which departments below: (2) ____________________
- Other (Please explain) (3) ____________________

Q6 Where is construction ethics education placed in your curriculum? (Select all that apply)

- A single course (1)
- A module in a course (2)
- Throughout the curriculum in various courses (3)
- An out of class workshop/lecture series/professional development seminar (4)
- An internship highlighting ethical issues (5)
- Other(s) (Please list) (6) ____________________

Q8 Which learning environments are used for ethics education in your construction course(s) or program? (Select all that apply)

- In a classroom/lecture hall (1)
- In a conference room (2)
- Outdoors (3)
- Online via live lecture (4)
- Online via recorded lecture (5)
- Online without visual and audio media (6)
- Construction site visits and tours (7)
- Visits to construction companies offices (8)
- Other(s) (Please list) (9) ____________________
Q9 Which pedagogies are used in your course(s) or by your department for construction ethics education? (Select all that apply)

- Presentation by single professor (1)
- Presentation by person speaking about own experiences (2)
- Presentation by working professional of the construction industry (3)
- Panel discussions with guest or faculty (4)
- Peer discussion (5)
- Think-pair share (cooperative discussion strategy) (6)
- Case studies (7)
- Project/problem based learning (8)
- Videos on construction ethics (9)
- Skits (student or instructor initiated) (10)
- In-class games (11)
- Role-playing (12)
- Online modules (13)
- Decision trees (14)
- Student performed interviews with industry professionals (15)
- Other(s) (Please list) (16) ____________________

Q10 How do you or your department evaluate student understanding of ethical concepts? (Select all that apply)

- Tests & Quizzes (1)
- Written Assignments & Reports (2)
- Student Presentations (3)
- Student Blog Posts (4)
- Student Social Media Posts (As required by course) (5)
- Activity Logs (6)
- Journals (7)
- Interviews (8)
- Progress Meetings with Students During Instruction (9)
- Group Project (10)
- Individual Project (11)
- Participation in Discussions (12)
- Attendance in Classes When Ethics is Taught (13)
- Other(s) (Please list) (14) ____________________