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A Scoping Review on Engineering Student Perspectives of Ethics Preparedness

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***Abstract*– The importance of preparing students to make ethical decisions as practicing engineers is known within the industry, but little is known about how students perceive their preparedness to make these decisions based on instruction alone. This narrative scoping literature review investigates the student perspective on ethical preparedness from engineering ethics education. The results evaluated seven peer-reviewed publications from ERIC and Scopus databases over the last ten years focused on undergraduate engineering ethics education. Findings indicate three prevailing themes from the student perspective: (1) varying confidence in complexity, (2) limited technological literacy, and (3) disconnected professional roles and responsibilities. This review highlights the need for intentional classroom interventions that bridge the gap between student uncertainty in ethics and equipping them for the ethical bounds of the profession.**

***Keywords*— engineering, ethics, student, perspective, preparedness**

I. Introduction

As the field of engineering continues to evolve daily with new technological advancements (e.g. Artificial Intelligence, Machine Learning, etc.), and with the ever-growing number of participants, a spotlight has begun to shine on the increased need to enhance the student understanding of ethical engineering practices. Developing a student's understanding of ethical engineering practices also includes expanding the knowledge of the social responsibility of engineers [1]. Student self-reflection further aids the growth process by helping establish baselines in the development of the greater social responsibility of an engineer [2]. Ethics education within engineering collegiate disciplines carries into practical professional experience. Within the United States there are also degree obtainment requirements related to students receiving instruction in engineering ethics, through the Accreditation Board for Engineering and Technology (ABET) [3] and is a topic students are tested on while taking the Fundamentals of Engineering (FE) exam [4]. The goal of engineering ethics education is to additionally frame the impact of engineering design and solutions to students not only in an economic and environmental perspective but also a global collaboration perspective [1].

Recent publications related to teaching ethics in engineering focus primarily on the methods in which to teach and the general learning contexts that frame the environment to teach engineering ethics. Little is known about the student perspective on engineering ethics education and to what degree students feel prepared to make ethical decisions based on this instruction. This narrative scoping literature review will focus on ethics in engineering education using the lens of the student perspective which will allow for a deeper understanding of how students are best supported in making ethical decisions based on what is learned. Focusing on how students perceive their role of ethical and social responsibility within engineering is important to engineering education to assist in expanding the understanding of what students are taking away from ethical teachings and how they are prepared to apply these lessons in real world applications.

To assist in bridging the gap between ethical characteristics in engineering and engineering industry development, this paper focuses on understanding the strengths and limitations perceived by students in current engineering ethics education. The research question that structures this scoping review is:

RQ1: What does existing literature communicate about how engineering students perceive their preparedness to make ethical engineering decisions based on the ethics education received?

II. Learning Theories and Outcomes

Learning theories that support the student perspective evaluation lens of engineering ethics education are cognitive learning theory and social constructivism [5]. Cognitive learning theory is defined as the student learning process focused on how information is received, conceptualized, and remembered by the learner [6]. Learning under this theory is focused on what students know and how they obtain knowledge. This theory supports engineering ethics education from the student perspective through its foundation that repetition on a topic taking place at increasingly sophisticated levels can enhance retention and support in-depth recall in the future. Social constructivism is defined as the student learning process where knowledge is obtained as the result of social interaction and cannot be separately obtained without social environment formation [7]. This theory supports engineering ethics education from the student perspective through its understanding that learners develop best when authentic interaction with the conceptual topic frames the future environment in which learners will participate.

III. Methodology

A narrative scoping literature review was conducted to address the research question. This scoping review follows the Arksey and O'Mally [8] framework. This framework was chosen for the ability to map key concepts in the research area while still acknowledging the need for a more comprehensive review to take place in the future. This framework was also chosen as a tool to highlight gaps within existing literature through drawing on the overall state of engineering ethics education research.

In identifying relevant studies, it is important to note that specific literature was pulled with a focus on undergraduate engineering students and empirical studies that encompassed both single disciplinary and interdisciplinary ethics education. Undergraduate students were chosen as a focal point due to the increasing turnover rate of roughly 60% of undergraduate students obtaining fulltime employment in the respective industry shortly after graduation [9].

The databases queried for this review were ERIC (ProQuest) and Scopus. Many papers selected for the review were obtained from Scopus to provide access to publications from a wide range of publication sources. ERIC (ProQuest) helped provide coverage on the research topic and allowed broadening the search beyond engineering education and into the greater engineering field, including Science and Engineering Ethics journal.

The table below shows search string query information used in both database searches and the corresponding output per database with each paper type.

TABLE I
DATABASE SEARCH RESULTS SUMMARY

Database	Initial Output	Duplicates	Final Results
ERIC (ProQuest)	45	4	4
Scopus	7	0	6
Total	52	4	10*
Search String Query			
engineering education AND ethics education AND student (perspectives OR prepared) AND undergrad			

**7 met all inclusion criteria and were analyzed*

From 52 initial results, 4 duplicates were removed, 38 were excluded during abstract screening, and 10 were reviewed in full. Of these, 7 met all inclusion criteria and were analyzed. In identifying relevant studies, inclusion criteria consisted of both journal articles and conference proceedings, only peer reviewed publication sources, studies reported in the English language, and studies published between 2014 and 2024 to reflect the recent decade of scholarly publications at the time of data search. Exclusion criteria for filtering relevant studies omitted perspectives related to faculty or stakeholders and papers the databases incorrectly classified as relating to ethics or misidentifying the term “perspectives”.

Databases of IEEE Xplore, Journal of Engineering Education (JEE), and American Society for Engineering Education Papers on Engineering Education Repository (ASEE PEER) were queried. Inclusion criteria consisted of both journal articles and conference proceeding, only peer reviewed publication sources, studies reported in the English language, and studies that were published between 2014 and 2024. Work in Progress (WIP) papers were included as a part of this search. Exclusion criteria for filtering relevant studies omitted papers that did not discuss student perspectives, engineering ethics education, or did not take place within the United States. No papers from IEEE Xplore, JEE, or ASEE PEER fit the inclusion criteria. The search string used to analyse these databases was the same string used for ERIC and Scopus but included to term "decision" in the string to help each databases filter more precisely around documents associated to decision making of students in engineering ethics education.

From the 7 studies reviewed, overall student perspective themes emerged as both adequate and poor with the key takeaway that perceptions of preparedness can be influenced by the implemented pedagogical method of instruction. For mapping which pedagogy instruction methods were used in the evaluated studies, general instruction methods were defined based on the pedagogy summaries mapped by Yeaman et al. [10] and defined as either global pedagogy, embedded pedagogy, or discrete pedagogy. Global pedagogy is defined in ethics education as learning types that include case based, project based, and service learning. Embedded pedagogy is defined as technologically enhanced and collaborative learning within engineering ethics education. Discrete pedagogy is defined as learning types that include written reflections, discissions, and traditional lecture instruction.

IV. SUMMARY OF PAPERS

In “Assessing the Ethical Development of Civil Engineering Undergraduates in Support of the ASCE Body of Knowledge”, Carpenter et al. [11] examined ethical development of civil engineering undergraduate students with the goal of identifying educational practices that promoted strong student ethics outcomes. This empirical study adapted a conceptual model for ethical development to further define ethical development for an engineering student across three distinct domains: knowledge of ethics, ethical reasoning, and ethical behavior. Survey data was collected from undergraduate civil engineering students collected through the SEED survey completed during the 2009-2010 academic year, complemented by student focus groups and interviews with academic administrators and faculty. While findings reveal that “Over 90% of civil engineering students feel ethics education is important or very important…” and 87% of these student are satisfied or very satisfied with their ethics education, an inverse relationship exists between student ethical reasoning abilities and satisfaction with ethics education; suggesting that students with lower-level ethical reasoning skills respond poorly to information overexposure while higher-level students respond poorly to surface level information. With these findings, the study highlights the importance of structuring ethics education to align with instructional design strategies and the progression levels of

Bloom's Taxonomy to promote meaningful ethical development for engineering students.

In "Building students' nascent understanding of ethics in engineering practice", Valentine et al. [12] investigated how first and second year undergraduate engineering students start to develop ethical understandings of the engineering practice when participating in a two-hour workshop structured by real world experiences. Applying the theoretical framework of Thorton and Nardi's (1975) four-stage model of role acquisition, the study focused on how student perceptions of ethical responsibilities can be influenced by exposure to professional experiences in the engineering field. Data was collected through a post-workshop questionnaire from 183 students from 22 different workshops sessions during the 2019 academic year. While student exposure to ethics is still at the novice level, findings reveal that students recognize ethics to be a critical component of the engineering practice and acknowledge that ethical decisions can occur at a large- and small-scale levels. Students felt comfortable explaining how ethics relates to the professional behavior of engineers but struggle to connect these responsibilities to the complex challenges that may be encountered in industry. The study notes the effectiveness of introducing ethics to engineering students but highlights that this introduction is meant to support initial understanding but is insufficient for the long-term goal of fostering deeper ethical reasoning and engagement in engineering students.

In "Creative Anticipatory Ethical Reasoning with Scenario Analysis and Design Fiction", York and Conley [13] examined cases of how analysis of resources can encourage students to anticipate ethical implication of emerging technologies. Through exploring the impact of Creative Anticipatory Ethical Reasoning (CAER) as a pedagogical intervention for supporting ethical reasoning development of undergraduate STEM students, this qualitative study is framed by the practice-based approach of Scholarship of Teaching and Learning (SOTL) and supported by grounded theory. Data was collected from pre-and-post surveys from different case workshops and overall research projects in combination with student work results and overall student course engagement results. Findings indicate that initial student engagement with ethics focused on the perceived societal benefits of technological advancements while also noting that students were readily persuaded on the importance of ethical responsibilities in the STEM field. Students reported feeling more prepared to face ethical issues in the field once equipped with the appropriate resources to assist in ethical decision making.

In "Ethical Responsibility Formation of Students in a Nuclear Engineering Course Through Inquiry Learning", Ha et al. [14] examined how engineering ethics education can be supported through inquiry-based instruction design approaches that encourage the formation of informed ethical decision-making practices for undergraduate engineering students. Utilizing a triple bottom line framework of sustainability (environmental, social, and economic relations) integrated with guided inquiry learning (IL), this study frames ethics education to engineering students as a sociotechnical concept with a long-term vision of empowering students to act as moral agents in their respective disciplines. Approaches were integrated into group projects for an engineering physics class in the 2017 through 2019 academic year with data collected from pre-and-post course surveys that focused on the student perspective of engineering ethics education. Findings revealed that student confidence in integrating social and technical analysis into ethical decision making increased as a part of the IL integration into projects. Students also noted the impact and value of feedback in guiding understandings of the ethical reasoning processes.

In "Freshmen Engineering Students' Perspectives on Engineering Ethics – A Qualitative Study", Binani [15] explored engineering ethics perspectives of first year undergraduate engineering students after a one-hour online instructional session. This qualitative research study sought to map the current engineering undergraduate student understandings of ethics to help inform future engineering ethics education instruction. Data was collected after the instructional session through an online open-ended survey of 23 undergraduate engineering students. Findings reveal five main emerging themes that map the existing landscape of key areas students perceive as critical in engineering ethics: perceptions about ethics in engineering, ethical dilemmas, the role of ethics in engineering, morals and ethics, and training requirements on ethics. Students generally had positive perspectives on received engineering ethics education and recognized the importance of making ethical decisions in practice. Students expressed the need for additional practice to understand how to deal with more complex problems in the real engineering world.

In "In Our Own Little World: Invisibility of the Social and Ethical Dimension of Engineering Among Undergraduate Students", Lim et al. [16] investigated undergraduate engineering student understandings of engineering ethics within the sociocultural context of the profession and why these considerations are often left unexplored by undergraduate engineers. Utilizing frameworks of both micro and macroethics, this qualitative study looks at the broader implications of how students reflect on their engineering coursework and limited exposure to ethics education. Data was collected from 66 students through focus group interviews and 71 student reflective journal writings in the 2017 through 2019 academic years; overlap between these collections did take place in participating numbers. Data analysis revealed four emergent themes when students were asked how they interpret engineering ethics education: prevalence of microethics, emerging macroethics discourse, apathy and disregard, and searching for why. Findings indicate that while students were willing and adequate in engaging in critical self-reflection, students indicated that they felt ill-prepared to make ethical decisions involving technological advancements and often struggle with envisioning the greater societal implications of received ethics education.

TABLE II
SUMMARY OF ANALYZED REFERENCES AND CORRESPONDING STUDENT PERCEPTION THEMES

Identifier	Title	Author(s)	Year	Publication	Pedagogy Implemented	Student Perception Takeaways (Generalized)	
						Adequate	Poor
1	Assessing the Ethical Development of Civil Engineering Undergraduates in Support of the ASCE Body of Knowledge	Carpenter et al.	2014	Journal of Professional Issues in Engineering Education and Practice	Discrete	Confidence in complexity	Overexposure to material
2	Building students' nascent understanding of ethics in engineering practice	Valentine et al.	2020	European Journal of Engineering Education	Embedded	Multi-scale dilemmas	Career applicability
3	Creative Anticipatory Ethical Reasoning with Scenario Analysis and Design Fiction	York and Conley	2020	Science and Engineering Ethics	Global	Resource cognizance	Technological literacy
4	Ethical Responsibility Formation of Students in a Nuclear Engineering Course Through Inquiry Learning	Ha et al.	2020	Journal of Leadership, Accountability and Ethics	Embedded	Feedback as a resource	Responsibility to the community
5	Freshmen Engineering Students' Perspectives on Engineering Ethics – A Qualitative Study	Binani	2022	Journal of Engineering Education Transformations	Discrete	Foundational knowledge	Confidence in complexity
6	"In Our Own Little World": Invisibility of the Social and Ethical Dimension of Engineering Among Undergraduate Students	Lim et al.	2021	Science and Engineering Ethics	Discrete	Critical self-reflection	Technological literacy
7	Work in Progress: Embedded Ethical Inquiry and Reflection in a Biomedical Engineering Curriculum	Miller et al.	2020	ASEE Conferences	Embedded	Social responsibility (worth and emotion focus)	Decision practicality (design focus)

In "Work in Progress: Embedded Ethical Inquiry and Reflection in a Biomedical Engineering Curriculum", Miller et al. [17] explored the impacts of integrating reflective practices and embedding ethical inquiry into an undergraduate biomedical engineering (BME) curriculum. This study focused on connecting content of ethics assignments with foundational courses supporting student abilities to identify and reflect on ethical issues seen in engineering practice. Using the Markkula Center for Applied Ethics framework for ethical reasoning and the Describing, Examining, Articulating, and Learning (DEAL) model for critical self-reflection, this study collected pre-course and post-course reflections and collected ethics assignment data from 37 engineering undergraduate students enrolled in a BME course with ethics integrated into the curriculum. Analysis of student responses indicate five distinct student reflection points on engineering ethics: research design, treatment of animals, benefit to humans, worth, and emotion. Findings indicate that after course content completion students expressed more reflection responses that aligned with examples of worth and emotion in ethics and less on decision practicality.

V. RESULTS

Whether perceived by students as adequate or poor as key takeaways from engineering ethics education, the prevailing themes for preparedness were (A) varying confidence in complexity, (B) limited technological literacy, and (C) disconnected professional roles and responsibilities. The three themes reported in this paper were curated from analysis of scoped literature and informed by recurring patterns and concepts that were emphasized across the selected studies.

A. Varying Confidence in Complexity

Confidence in complexity is defined as how students perceive their ability to make complex ethical engineering decisions. 2 of the 7 studies analyzed reveal direct implications on student confidence levels for carrying out the complex process in which to make ethical engineering decisions [11], [15]. Both papers proceeded in collecting and analyzing data in different capacities. Carpenter et al. [11] aims at understanding the student perspective from students who have received formal curricular education in engineering ethics whereas Binani [15] aims understandings through workshop participation as the only formal primer for ethics knowledge development. It is noted that both adequate and poor perspectives of ethics preparedness were presented by students through engineering ethics instructional methods of discrete pedagogy.

Indirect implications in student perceptions of confidence in complexity emerge from sub-themes of resource cognizance, feedback as a resource, foundational knowledge, and material overexposure. York and Conley [13] present adequate perceptions on confidence when students received engineering ethics education through structured formats that allowed them to practice ethical decision making. Ha et al. [14] found the role of feedback to be pivotal in contributing to positive student perceptions of preparedness and that student confidence in complexity was established through reinforcement in foundational ethics decisions. While

Carpenter et al. [11] emerges as reporting adequate student perceptions of confidence, corresponding poor perceptions from material overexposure are also reported by lower-level undergraduate students. The inverse relationship can be seen in Binani [15] with the perception of students perceiving ethics foundational knowledge as adequate but lacking exposure to complex material thus creating a gap of varying confidence in handling complex decisions. Sub-themes noted as adequate and poor perceptions within student varying confidence in complexity existed when engineering ethics education was received from all types of pedagogical instruction (global, embedded, and discrete pedagogy).

B. Limited Technological Literacy

Technological literacy is defined as how students perceive their ability to make ethical decisions rooted in the advancements of technologies and what these advancements may bring to the engineering industry in the future. 2 of the 7 studies analyzed reveal direct poor implications on student perceptions of making ethical decisions related to technological advancements [13], [14]. Both papers analyzed how students were able to identify that technological advancements were an area of ethical concern but did not feel equipped with the right background information to make ethical decisions around these progressions. Secondary themes on student perceptions of technological literacy emerge as the sub-theme of career applicability. Valentine et al. [12] specifically highlights the poor student perception that engineering ethics education does not translate well to ethical engineering problems faced by those in industry. This negative perception pairs with the overall concept of students feeling ill-prepared to make ethical decisions from a poorly structured background knowledge base. All themes noted for poor perceptions on limited technological literacy were presented by students when engineering ethics education was received from all types of pedagogical instruction (global, embedded, and discrete pedagogy).

C. Disconnected Professional Roles and Responsibilities

Disconnect from professional roles and responsibilities is defined as how students perceive the context of their responsibility as an engineer to make ethical decisions in the best interests of the local and global community. 2 of the 7 studies analyzed reveal direct implications on student perceptions in their ability to make informed ethical decisions within the greater context of engineering responsibility [14], [17]. Both examples gauge this contextual responsibility by placing importance on an engineer's role and impact on society through embedded pedagogy methods. Miller et al. [17] noted adequate student perceptions by making ethical decisions based on worth and emotions and less centered around decision making purely based on practical design efforts. Ha et al. [14] reported poor perceptions of student preparedness when making ethical engineering decisions around engineering design efforts in the community. Direct implications of this theme are noted as both adequate and poor perceptions and were presented by students when ethical engineering education was received as embedded pedagogical instruction.

Many engineering ethics studies note the greater social implications of teaching engineers how to make ethical decisions but did not discuss student ethical preparedness. Indirect implications on student perceptions from disconnected professional roles and responsibilities emerge from the sub-themes of critical self-reflection and multi-scale ethical dilemmas. Lim et al. [16] provides positive student perceptions on ethical engineering decision making efforts when students can engage in deep self-reflection. Valentine et al. [12] reports positive student perceptions of responsibility by reporting that students understand ethical engineering dilemmas can take place within small- and large-scale decisions in practice. Sub-themes noted as adequate perceptions of professional roles and responsibilities were presented when engineering ethics education was received from embedded and discrete types of pedagogical instruction.

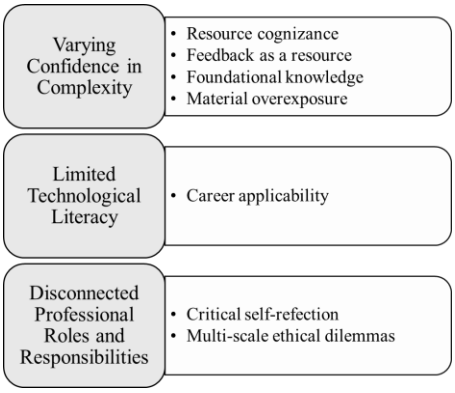

Fig. 1 Visual for Grouped Themes of Student Perspectives of Preparedness from Engineering Ethics Education.

VI. DISCUSSION

In addressing RQ1, this scoping literature review finds that exiting literature communicates a fragmented understanding of how engineering undergraduate students perceived their preparedness to make ethical engineering decisions. This review also highlights the existing gap in the field where engineering recognizes the importance of ethics in engineering education but lacks research that explicitly focuses on student perceptions of preparedness as an outcome of ethics instruction. This gap is further defined by the absence of studies in major engineering education databases of IEEE, JEE, and ASEE PEER that directly align with this topic. As such, a scoping review on this topic was needed to establish a baseline understanding of the gaps in this topic and establish a foundation for future targeted research.

Within the studies of this scoping review, student perceptions of ethical preparedness were reported as mixed between positive and negative impacts with heavy influence coming from the structure and delivery of ethics education. Prior literature in engineering ethics education generally points to the importance of the inclusion of ethics education within the higher education engineering curriculum. The findings of this review complicate that traditional narrative. Similar to existing understandings, students recognize ethics as a critical component to the engineering practice and express satisfaction with exposure to ethical engineering decision making prior to entering industry [11], [12], [15]. However, this review diverges from these general claims of effectiveness of education and demonstrates that perceived preparedness in students is not uniform but is shaped by differences in instructional type, application of taught material, and contextual relevance of ethics education.

A direct response to RQ1 emerges from students reporting that they feel more prepared to make ethical engineering decision when they are supported by foundational knowledge understandings [15], opportunities to practice ethical decision making skills, and are equipped with resources like feedback and supporting frameworks to use a guide in the future [14]. These findings align with exiting literature with the emphasis on reflective practices being used to strengthen ethical reasonings. This review differs from existing literature by identifying key areas where student perceptions differ from previous assumptions. Most notably, students report feeling unprepared to navigate complex real-world ethical engineering dilemmas particularly when these decisions involve emerging technologies or social impacts [12], [13], [16]. These attitudes suggest that while current engineering ethics education may succeed in fostering awareness of ethics and promoting initial engagement in the topic, it falls short in fostering ethical reasoning skills around complex engineering topics and fails to implement skills that allow for contextual transferability needed to carry these decision-making skills into professional practice.

This review also highlights student struggles with the ability to connect ethical principles to future role and responsibilities of the engineering industry. This emphasizes the disconnect between technical engineering training efforts and the lack of sociotechnical awareness integrated into the curriculum [12], [16], [17]. Some literature suggests that integrating ethics into the engineering curriculum can improve student perceptions of engineering ethics [14], this scoping review indicates that this integration alone is not sufficient enough as it does not address ethical complexity, technology context, or professional responsibility application.

VII. Implications

The importance of the student perspective on engineering ethics preparedness within engineering ethics education lies in the growing demand for engineers to act as both technical experts in their discipline and socially responsible decision-makers. Findings of this scoping review suggest that gaps in student perspectives of ethical preparedness are connected to the themes identified from literature. A varying student confidence in complexity of ethical decisions (theme A) indicates that students may struggle to navigate ethical dilemmas that involved multiple layers of decision making if they are not given sufficient opportunity to apply learned materials to practice. Limited technological literacy (theme B) notes the growing gap in engineering students' abilities to engage with ethical challenges linked with elements of emerging technologies and future developments in the industry. Disconnected professional roles and responsibilities (theme C) suggests that ethics education limited to a student's time in higher education may be an insufficient timeline for students to fully understand how ethical decision-making is embedded within their future as engineers. These themes point to the broader issue that students may graduate from higher education institutions with ethical awareness but without the necessary tools to apply ethical knowledge within complex and real-world contexts.

Given these identified gaps from literature, the implications for instructional design and curriculum development in engineering education are substantial. Addressing student confidence in complexity requires instructional strategies that break into higher levels of taxonomy and provide students with repeated opportunities to engage in ethical decision-making. Addressing limited technological literacy may involve integrating discussion of technological advancement (like artificial intelligence) into ethics education to ensure students can critically evaluate the ethical impacts and implications of innovation in the engineering field. Addressing professional roles and responsibilities of ethics in engineering could see the connection of ethics education with professional engineering identify formation to help students situate ethical reasoning within the broader impact engineering has society.

Implementing changes to engineering ethics education that address these three key themes of this scoping review has the potential to impact student preparedness by directly targeting student weak points where current preparedness perceptions fall short.

VIII. Limitations

The primary limitations of this study are (1) evaluated results examined the combination of engineering ethics education and overall student perceptions of preparedness from instruction. This evaluation did not consider overall levels of student engagement with material and to what degree technical content was integrated within the type of pedagogy implementation. (2) this study only examined published journal articles and conference proceedings from the recent decade of scholarly publications at the time of data search. Work outside of these parameters may exist that could broaden student ethical preparedness understandings. (3) the pedagogical instruction methods noted were used as general

encompassing terms for specific teaching methods. There are many sub-categories within pedagogical instruction methods that can be used to further establish development within student ethical engineering understandings. (4) this narrative scoping review was completed as in interpretive overview of engineering student perspectives of ethics preparedness. All literature was scoped and themed primarily by the first author.

IX. Future Work

This review presents a broad overview of student perspectives of ethical preparedness from engineering ethics education. Future work could evaluate specific student perspective themes as they correspond with certain types of pedagogical instruction. The need to better understand what students feel they get out of an engineering ethics education also opens the door for the need to further examine how education translates into industry practice. Some papers omitted from this study focused on faculty and shareholder perspectives. Future work could examine how these perspectives tie into student ethical preparedness to create a better understanding of current instructional practice outcomes and how these practices may pivot based on perceptions from all parties.

X. Conclusion

This narrative scoping literature review identified three main themes around the student perspective of ethical preparedness from engineering ethics education: varying confidence in complexity, limited technological literacy, and disconnected professional roles and responsibilities. The themes found across the scoped studies range from formal and informal ethics education that encompassed both interdisciplinary and single disciplinary studies. Based on the quantity of sub-themes revealed within the limited quantity of studies evaluated, there is a need for future in-depth analysis of student perceptions and the role these perceptions play in the future development of engineering. Looking to the future, it is imperative to continue to establish an understanding of student perspectives to integrate ways to promote positive perceptions and to continue to learn from poor student perceptions within engineering ethics education efforts.

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