A Comparative Literature Review: Comparing Approaches to Teamwork Assessment in Engineering Education in the US and China

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Comparing Approaches to Teamwork Engineering Education in the U.S. and China: A Comparative Literature Review

Abstract

Teamwork is considered a critical learning outcome for engineering graduates. Despite the increasingly globalized nature of the engineering workforce and engineering education, there has not been much work comparing approaches to teamwork in different cultural contexts.

This study aims to conduct an exploratory comparative literature review to develop a preliminary understanding of how teamwork has been conceptualized and implemented in engineering education in different cultures, with a particular comparative focus on the U.S. and China.

This article will compare these two contexts based on a preliminary analysis of six papers from two prominent journals in engineering education in the two cultures: *Journal of Engineering Education* (U.S.-based) and *Gaodeng gongcheng jiaoyu yanjiu*（高等工程教育研究, Research in Higher Engineering Education) (China-based). First, we compare the motivations for teamwork in the two cultural contexts. Second, we summarize how teamwork is conceptualized and defined in these contexts. Third, we compare the methods and tools used to assess teamwork in engineering in the two cultures. Finally, we briefly discuss the implications of such a comparative literature review for constructing a more comprehensive, culturally responsive approach to defining, developing, and assessing teamwork.

1. Introduction

There has been increasing pressure on higher education institutions to be accountable for professional outcomes since approximately the mid-1980s [1]. Especially since the 1990s and the intensification of globalization, higher engineering education in the United States has experienced numerous calls for increased accountability due to public concerns about the quality of engineering and engineers [2]. The ABET (incorporated as the Accreditation Board for Engineering and Technology, Inc.) has significantly assessed and evaluated engineering education in the United States. Historically, ABET used input-based accreditation criteria, which were used to guide the overall evaluation of programs, including program curricula, facilities, faculty, and students. The input-based accreditation criteria mainly refer to evaluating teaching and course contents [3] corresponding to the traditional test-based education model [4]. Alongside demands for increased accountability, there have been arguments that conventional education methods, such as tests, exams, lecture courses, and semester grades, inadequately prepare engineering students for a rapidly changing world [5]. As a result, engineering education systems urgently needed new measures for assessing students' learning by focusing on learning outcomes rather than the courses students have taken—these demands for new assessment methods aligned with ABET accreditation's shift towards using outcomes-based criteria that allowed more diverse approaches to pedagogies and curricula in different engineering programs. As a result, ABET established a new set of outcomes-based standards instead of input-based measures: Engineering Criteria 2000 (EC2000). Unlike the input-based

criteria, which focus on what should be taught, EC2000 emphasizes what students learn and are expected to do and focuses on students' competency and performance assessment [6].

The transition from input-based to outcomes-based criteria mirrors the difference between traditional exam-based and competency-based assessment models. In the exam culture, the questions for learning assessment are approached by standardized methods or forms, which are the same for all students. In contrast, competence assessment focuses more on holistically describing the students' performances. The competence assessment of student learning has a much broader and global impact on engineering competence than just testing students and marking examinations or papers of students [7].

Under international accreditation agreements, engineering programs in many countries are now required to help students develop specific program outcomes [8] or competencies for assessment and accreditation. Furthermore, countries aiming to join the Washington Accord must adopt the competencies on ABET's list. Therefore, this situation suggests the need to analyze competence assessment across cultural contexts in the global context. The increasing globalization of engineering cooperation and competition highly impacts the demands on contemporary engineering competencies. One of the essential competencies for engineering graduates is teamwork skills.

2. Motivation for the study

Engineering and technical problems nowadays are very complex. Therefore, it is unsurprising that teams rather than individual engineers usually deal with engineering projects. Often these teams are interdisciplinary and composed of people from different countries and, therefore, different cultural backgrounds [9]. Thus, teamwork always emphasizes the importance of cooperation and negotiation among individuals. Regarding teamwork competence in global engineering education, we must consider cultural diversity and impact within team-based engineering practice [10].

With increasing globalization, foreign-born professionals comprise a growing share of any country's STEM workforce. Most of these foreign-born professionals have completed undergraduate degrees in their mother countries, which makes cross-cultural teamwork competence more significant in improving the efficiency of the global engineering workforce environment. Therefore, it is imperative and necessary for engineering education research to focus on understanding how teamwork skills are formulated and assessed in different contexts. More specifically, Chinese immigrant STEM workers comprise a high percentage of all foreign-born workers in the U.S. Therefore, comparing the Chinese and American teamwork assessment systems can be conducive to constructing a generalizable understanding of teamwork assessment in cross-cultural contexts [11].

In addition, much literature discusses how to develop and assess teamwork. For example, portfolios, reflections, observations, tests, rubrics, and questionnaires are common teamwork assessment methods. However, less literature outlines how teamwork in engineering education might be implemented in different cultural contexts. We must fill this gap because abundant literature already points to the importance and significance of teamwork assessment in cross-

cultural contexts. For example, researchers found that many teamwork assessment processes don't have universal global standards for various programs. Teamwork assessment is easily impacted by dynamic variables like cultural backgrounds, organization systems, and faculty culture [12]. Lucena pointed out the importance of considering generalizable assessment methods for different cultures by comparing three different cultural contexts [13].

This exploratory study aims to compare teamwork in engineering education in the U.S. and China and identify possible factors impacting how teamwork is implemented and assessed in different educational contexts. We hope our findings in this paper and similar studies can provide implications for developing more culturally inclusive teamwork assessment methodologies and foundations. Specifically, we explore the general motivations behind focusing on teamwork in the assessment of two cultural contexts. And then, we identify how teamwork assessment is defined or conceptualized in the two contexts, and doing so helps us better understand the possible cultural factors that affect teamwork assessment. Finally, we compare and summarize the similarities and differences in methods employed to assess student teamwork in the two cultures.

Therefore, in this preliminary study, we aim to answer the following research questions:

1. What are the motivations for teamwork in the two contexts?
2. How is teamwork defined and conceptualized in the two cultures? What are the components or characteristics of teamwork that are considered important?
3. What are the methods and tools to assess teamwork in engineering in the two contexts?

3. Literature review

Research on internationalizing engineering education started in the early 1950s [10]. However, this focus has intensified since the mid-1990s due to engineering practice's increasingly global and diverse character [14] . Numerous industry and academic reports indicate that engineers and other technical professionals are increasingly expected to work effectively across countries and cultures. In response, more and more studies are discussing global competency and competency assessment and comparing teamwork assessment, global competence, and cultural orientation in different cultures or contexts [14, 15] .

Based on Chowdhury and Murzi's systematic literature review, teamwork is "the student's capability to effectively work in engineering teams," a highly regarded trait that the global engineering workforce needs [16]. Teamwork has been a well-researched topic, and skills are taught and refined through university curricula and trained by working in the industry. Engineering education literature highlights teamwork as an essential skill in several systems engineering competency models [16]. Despite paradigm shifts with multiple changes in engineering education [17] , teamwork skills that involve communication, leadership, management, accountability, and interdependence on teams remain important competencies to be assessed in engineering education [16] .

Assessing engineering student teamwork skills with efficient tools or methods is significant to ensure the delivery of graduates with the necessary teamwork abilities and attitudes. There are

few comprehensive tools for measuring and evaluating teamwork across diverse educational disciplines, like CATME [18] and AAC&U VALUE rubrics [19]. However, although much information has been gathered on team performance, part of the difficulty in understanding team processes comes from the need for well-developed measurement tools [20]. Effective teamwork measurement tools or methods are more complex than traditional exam-based assessment [21], because they need to include observations on student teamwork performance. This difficulty of teamwork assessment presents problems for team-oriented research because the quality of the measurement often impacts the validity of findings based on the measurement. Therefore, a common goal of the existing studies is to develop a sustainable tool for assessing student teamwork, intending to refine and measure teamwork over time.

3.1 Teamwork assessment tools

There are two main categories of literature about teamwork assessment in engineering education. The first set of studies focused on the development of scientific teamwork measures. The second set of studies discussed the methodological foundations for measuring teamwork.

Regarding teamwork assessment tools, observations, portfolios, questionnaires, interviews, self-reflection, and peer assessment [22] are common and valuable approaches to assessing individuals' teamwork performance. Critical Team Behaviors Form (CTBF) measures teamwork skills in tactical decision-making teams, in which the critical skill dimensions and behaviors must be identified and presented in reports. Multiple raters strive for consistency in their judgments on assessment reports (David Kraus). Furthermore, the format for the measurement methodology must be readily understandable and usable [20]. Teamwork assessment tools used in engineering education have also been studied in the existing literature, for example, self-reflections [23], peer assessment [24], e-portfolio [25], online assessment tools [26].

3.2 Methodological Foundations for teamwork assessment

Regarding methodological foundations for teamwork assessment, some researchers summarized a series of general principles for teamwork assessment, including what counts as a good assessment theory, the need for assessment for various teamwork stages, and refined teamwork behaviors and assessment dimensions [20]. Some suggested that teamwork skills should be observed at various stages and in multiple situations to distinguish strong teamwork skills from those situationally determined or influenced by time [27]. In addition, the reliability and validity of teamwork assessments are essential. Internal consistency and temporal stability estimates must be calculated. Such information on teamwork assessment can determine the internal validity of the teamwork measurement scales and the extent to which teamwork skills can be consistently evaluated across time and situations [28]. Finally, interrater reliability must be considered as variations in observers' ratings do in the teamwork measurement process [20].

4. Methods

This exploratory study aimed to explore a methodology for performing a literature review on teamwork in engineering education across cultures. To this end, we followed a process with two phases:

Phase 1 identifying a small but representative set of recent articles.

We used the search terms “团队 (tuandui, team),” “小组 (xiaozu, group),” and “团队合作 (tuanduihezuo, collaboration)” to search Chinese literature in the journal *Gaodeng gongcheng jiaoyu yanjiu*（高等工程教育研究, Research in Higher Engineering Education) (RHEE), as RHEE is a leading journal for engineering education research in China. For comparison, we also searched for articles on teamwork assessment in the Journal *of Engineering Education* (JEE), using "teamwork measurement" and "teamwork assessment" as the search terms. JEE is a prominent international journal with a strong U.S. focus. We intentionally used much broader terms when searching for Chinese literature due to the scarcity of literature on teamwork (not to mention teamwork *assessment*) in engineering education in the Chinese context. Using broader terms to search in the Chinese context allowed us to include as many articles as possible, further providing flexibility for our analysis. For instance, due to the lack of problematization of teamwork assessment in the Chinese literature, discussions on collecting assessment evidence for teamwork might be found scattered in the paper, as compared to the papers found in JEE in which teamwork and teamwork assessment were always conceptualized clearly and findings were presented in a much more structured way.

We also reviewed each article's titles, abstracts, and part of full texts to determine whether it met the following selection criteria:

> Criterion 1: Is this study focused on graduate or undergraduate students in engineering? This criterion excluded teams in K-12 and practicing engineers in industries.
>
> Criterion 2: Does this study include discussions on the experience of team learning and teamwork assessment in engineering education?

Using this method for searching in the CNKI (China National Knowledge Infrastructure) database, we only found five articles from RHEE related to teamwork. Two talked about teachers' cooperative behaviors, partnership, and collaborative teaching rather than students’ teamwork performance, and these were excluded, leaving three RHEE articles for analysis. A reasonable comparative case study also requires us to choose three articles from JEE. We found 50 JEE articles using "teamwork," of which 19 included “teamwork assessment" in the abstracts. Finally, from these 19 articles, we selected the three most cited for use in this study.

Phase 2 was a comparative literature review based on the research questions. We reviewed the full texts and wrote summaries for each article that explored approaches to conceptualizing teamwork, characterized the goals or outcomes for teamwork assessment, and described methods or approaches.

The dataset of six articles is summarized in the following table:

Table 1 Summary of analysis articles

Article	Summary
Wang Lemei, Chen Hui, Xiong Zhang, Yu Liming, & Xu Ping. (2013). Research and Practice on the Training of Engineers' Comprehensive Quality Based on Team Spirit Training. *Research in Higher Engineering Education*, (6), 103-108.	Explored the relationship between teamwork and comprehensive quality training in French engineering education and discussed insights from the French tradition that could be useful for training Chinese engineers working in the global context
Duan Guijiang, & Xu Shixin. (2012). Improving students' teamwork ability by reforming a capstone design course. *Research in Higher Engineering Education*, (1), 132-137.	Reported experience of an instructional team in the program Manufacturing Management Information Systems in reforming a mandatory capstone design course by integrating various team training tools and modules and teamwork assessments
Wan Baikun, Li Qing, Yang Chunmei, & Ding Beisheng. (2004). Team Work: A Good Form to Cultivate Innovation Ability and Team Spirit. *Research in Higher Engineering Education*, (2), 83-84.	Reported a course reform project in a biomedical engineering program that incorporated open-ended questions and team-based learning, research, and communication activities
Besterfield-Sacre, M., Shuman, L. J., Wolfe, H., Clark, R. M., & Yildirim, P. (2007). Development of a work sampling methodology for behavioral observations: Application to teamwork. *Journal of Engineering Education, 96*(4), 347-357.	Developed a work sampling methodology to observe cognitive and behavioral processes in students of teamwork
Borrego, M., Karlin, J., McNair, L. D., & Beddoes, K. (2013). Team effectiveness theory from industrial and organizational psychology applied to engineering student project teams: A research review. *Journal of Engineering Education, 102*(4), 472-512.	Conducted a research review of the literature on teams in industrial and organizational psychology and explored the implications for practice and future research in engineering education
Tonso, K. L. (2006). Teams that work: Campus culture, engineer identity, and social interactions. *Journal of Engineering Education, 95*(1), 25-37.	Reported two teamwork cases from a large-scale ethnographic study of an engineering design program and described how campus culture was enacted in social interactions between teammates

Note: The authors have revised the translation of the RHEE articles' titles to represent the meanings for international readers better.

5. Findings

The dataset of six articles was analyzed using the three research questions as foci. The details of our analysis are represented below in Table 2.

Table 2 Analysis of Dataset

Article	Motivation	Conceptualization	Methods

Wang Lemei, Chen Hui, Xiong Zhang, Yu Liming, & Xu Ping. (2013). Research and practice concerning the training of engineers' comprehensive qualities based on team spirit cultivation. Higher Engineering Education Research, (6), 103-108.	Exploring the role of teamwork spirit in the cultivation of French engineers' comprehensive qualities and how such a reflection on French engineering education can be useful for teaching Chinese engineers working in the global context Teamwork building requires the cultivation of *multifaceted* abilities among engineers	Team spirit refers to the willingness among team members to collaborate between each other *for the interests and goals of the team*. An ideal state of teamwork is to reconcile personal and collective interests. Teamwork abilities include abilities to (1) listen to others, including different views; (2) respect the credit of collaborators; (3) address the relationship between the personal and the collective. All these contribute to a mechanism through which individual creation and team-based innovation are integrated.	No specific theory-driven, empirical methods for teamwork assessment were mentioned. A panel of three faculty assessed teamwork as a key competency in capstone design projects. The three faculty assumed different roles: the client, the academic/theoretical advisor, and the technical advisor. Other teamwork assessment opportunities included team reports and presentations in class.
Duan Guijiang, & Xu Shixin. (2012). Improving students' teamwork ability by reforming a capstone design course. Higher Engineering Education Research, (1), 132-137.	Capstone design courses are a critical practice component in the professional curriculum of engineering education. They are indispensable in helping students understand and synthesize all the technical knowledge they have learned. Incorporating teamwork training into capstone courses can help students practically develop, exercise, and improve teamwork abilities and awareness.	Teamwork was conceptualized as a process in which team members assume different roles in achieving group goals and tasks. The research team also conducted surveys with employers and graduate advisors and identified seven teamwork competencies, including team awareness, the ability to use teamwork collaboration tools, communication skills, planning ability, interpersonal relationships, and writing skills.	Developed a systematic rubric comprising two assessment dimensions: (1) teamwork performance; (2) individual contributions. Such a rubric measures both technical and teamwork competencies. Teamwork performance assessment items include (1) product development quality; (2) group report; (3) group presentation; (4) the use of teamwork tools such as icebreaking and brainstorming; and (5) team-building. Individual contributions assessment items include (1) individual contributions to product development; (2) individual reflection

			summaries; (3) individual credit in teamwork; (4) participation in teamwork activities; and (5) individual ability to use teamwork tools. The research team also surveyed the employers of the students who participated in the course reform project about employers' perceptions of these students' teamwork skills.
Wan Baikun, Li Qing, Yang Chunmei, & Ding Beisheng. (2004). Team Work: A Good Form to Cultivate Innovation Ability and Team Spirit. Higher Engineering Education Research, (2), 83-84.	Compared with engineering education in the West, Chinese engineering education is not weak in teaching textbook knowledge or theoretical knowledge. However, Chinese engineering education is much behind in teaching innovation and practical competencies (assuming teamwork is one of these competencies). Cultivating team spirit to ensure that students develop abilities to achieve shared goals through collaboration and coordination.	Teamwork ability was not conceptualized in the paper. Based on the activities designed to develop teamwork abilities among students, we made assumptions about how the authors conceptualized teamwork. Therefore, teamwork ability is highly related to (1) independent, self-learning ability on teams; (2) communication skills, including writing group reports and team presentations; (3) team coordination; and (4) assigning and managing team roles and resources.	No explicit teamwork assessment tools or strategies were used. Assessment evidence was informally collected through (1) instructors' observations of students' group work and deliverables; (2) in-class feedback from instructors and other teams; and (3) students' reflections on their experience.
Besterfield-Sacre, M., Shuman, L. J., Wolfe, H., Clark, R. M., & Yildirim, P. (2007). Development of a work sampling methodology for behavioral observations: Application to teamwork. *Journal of Engineering*	Assessing teamwork outcomes is better accomplished by focusing on the process rather than the result. Methods for observing students' teamwork performance, such as 100 percent behavioral observation, is ideal but expensive.	Teamwork performance consists of distinct, observable, and comprehensive attributes. These attributes include: (1) working together; (2) disrupting distractions; (3) coming to conclusions; (4) reporting results of independent (subgroup) work; (5) managing team responsibilities; (6)	Based on the work sampling methodology, which is a statistically based method, developed an observation tool to assess students' process-oriented outcomes in teamwork at substantially less cost than a full behavioral assessment. Such a method only randomly observes

Education, *96*(4), 347-357.	Work sampling is a commonly used statistically-based method for assessing physical work that is more economical than full behavioral assessment.	working individually; (7) the researcher cannot tell (e.g., difficult to view or listen to the team member); and (8) other (e.g., outside distractions such as fire alarm or knock on the door).	students' activities to determine their time investment in tasks.
Borrego, M., Karlin, J., McNair, L. D., & Beddoes, K. (2013). Team effectiveness theory from industrial and organizational psychology applied to engineering student project teams: A research review. *Journal of Engineering Education*, *102*(4), 472-512.	Industrial and organizational (I/O) psychologists have studied teams in industry settings. However, such research has not been incorporated into engineering education research. Researchers also attempted to employ findings and theories from I/O psychology to better understand the negative student team behaviors and find ways to minimize these behaviors and help students improve team effectiveness.	Team effectiveness constructs include: (1) social loafing; (2) interdependence; (3) conflict; (4) trust; and (5) shared mental models.	There were no specific assessment methods analyzed in the paper. Teamwork assessment should avoid students' negative team behaviors, like social loafing conflict.
Tonso, K. L. (2006). Teams that work: Campus culture, engineer identity, and social interactions. *Journ al of engineering education*, *95*(1), 25-37.	Teamwork has rarely been studied qualitatively in engineering education as quantitative methods cannot well capture why teamwork has the impact that it does. This paper has implications for how qualitative data and methods can be employed to assess teamwork, especially its cultures, such as gender relations.	Student teamwork and peer-group interactions are embedded in a larger culture. Teamwork was conceptualized in the tradition of cultural anthropology. It refers to cultural interactions between team members. Team members of sense of themselves are developed in peer-group relations. These relations are generated and evolve from the enculturated practices of learning settings. Team members use campus cultural	Ethnographic and participatory observations were used to qualitatively understand (instead of assessing) team effectiveness and dynamics. No quantitative measures were used.

		expectations to understand and shape their everyday lives.	

6. Discussion

Motivations for teamwork in engineering education

Our review of the three articles from RHEE showed that all of them offered the motivation to focus on teamwork stemming from the context of engineering education reforms in China. These articles note that China's engineering education systems are predominantly focused on rigorous book knowledge and systematic theoretical knowledge. Chinese engineering educators recognize a significant gap in innovation and practical ability training [29]. Therefore, these authors consider bringing teamwork into engineering programs in China will be an important aspect of necessary curriculum reform. Teamwork in the Chinese articles is considered as a critical venue thorough which students are able to develop and synthetize multifaceted engineers, despite that teamwork is often perceived as providing some kind of *context* for technical skills (therefore teamwork skills are inferior to technical/specialty skills). The primary principle of using teamwork models in engineering education is "specialty (technical) course ability training as the main focus, teamwork ability training as the supplementary" principle [30] (Page 136). The essential background of student teamwork learning is keeping the main priority of specialty (technical) courses instead of using teamwork learning to substitute lecture-based techniques [30]. Quote:

> The primary goal for engineering students' teamwork training is to **reform** the mode of applying specified theoretical laws and formulas and referring to fixed standard answers in traditional teaching practice. Exploring and creating innovative practice modes can broaden students' thinking, encourage students to learn independently, and update knowledge. [emphasis added]

Our review of the three articles from JEE suggests that, by contrast, teamwork in engineering education is more well-established in the U.S. higher education system, and the focus on teamwork did not need much motivation in itself. Rather, these articles sought to develop a more fine-grained set of tools for identifying various outcomes and characteristics of teamwork effectiveness [31]. For example, Borrego writes:

> Engineering faculty sought to achieve various outcomes through team projects, including teamwork, communication, sustainability, and consideration of global/ societal design context. It is significant to identify the main characters for effective student teamwork. Teamwork effectiveness should avoid social loafing and conflict while building trust to ensure equal team effort.

Conceptions of teamwork

One important aspect that might explain the different orientations in these articles is that the authors of these Chinese articles are engineering teamwork model practitioners from traditional

engineering departments, like electronic engineering and mechanical engineering. On the contrary, the authors of JEE articles are established engineering education researchers. Therefore, these Chinese articles about teamwork assessment are less theory-driven and offer more experiential reflection than systematic research or studies. For example, Baikun writes:

> Each member will have a strong sense of belonging and make sense of destiny. Training teamwork spirit can enhance the cohesion and centripetal force of the team and inspire team members' initiative, enthusiasm, and creativity. Furthermore, a teamwork spirit is conducive to cooperation among members, which can help students strengthen cooperation and enhance the core competitiveness of collective teamwork [32]. (Page 83)

In addition, the Chinese articles we reviewed are focused more on individual student competency, while the U.S. articles we reviewed focus more on the teamwork processes. Based on these articles, we saw no consistent conceptualization of teamwork in Chinese contexts. Some programs emphasize the combination between individual creation and team-based innovation, which includes (1) listening to others, including different views; (2) respecting the credit of collaborators; (3) addressing the relationship between the personal and the collective. By contrast, in the U.S. context, as represented by these articles, the essential teamwork attributes are the ability to work working together, problem-solving ability, responsibilities of managing the team, and individual contributions.

Assessing teamwork

The articles from RHEE showed that in the Chinese context, teamwork assessment requires faculty to spend much more time observing, reflecting, and weighing student teamwork performance than traditional exam-based assessment models. In addition, each program has different teamwork assessment rubrics. In the U.S., the teamwork assessment also faces a similar difficulty in capturing information regarding student performance. Some universities provide student observers with thorough training involving behavioral observation as part of verbal protocol analysis.

The similarity of team assessment in the two contexts can be seen in the use of rubrics for the overall performance of the team and individual contributions. The all-around performance of the group includes the quality of the team project, project report, defense, team tool use ability and team atmosphere, team culture, and team spirit construction. Individual contribution includes project quality and workload personally responsible for, personal report and reflection summary, team contribution of individual members, participation in team activities, and ability to use team tools. For example, Lemei writes:

> Teamwork assessment requires the student to be creative in team projects. Teamwork assessment focuses not on the final result but on the entire process of completing the teamwork. In teamwork, students fully develop the spirit of teamwork and cooperation, understand and master the knowledge and skills required by the course, experience the hardships and joys of innovation, and develop ideas and methods for analyzing and solving problems. These skills and abilities are the main dimensions of teamwork assessment. (Page 106)

7. Conclusion

Teamwork is a core competency that nowadays needs to be shown to be developed and assessed in engineering programs worldwide, with the extra impetus for programs that are part of global accreditation systems. There is a growing literature in engineering education on this topic. It might be assumed that teamwork is a universal construct, and universities in different places might have similar approaches to building teamwork into their curricula.

This study aimed to conduct a preliminary investigation to explore whether there might be differences in how teamwork in engineering education is approached in different cultural contexts. To this end, we identified three papers focused on teamwork in engineering education in RHEE, China's flagship engineering education research journal. For comparison, we found three papers in JEE, also a prominent journal based in the USA.

Our analysis aimed to compare the articles in three aspects: 1. their motivation for focusing on teamwork, 2. their conceptualization of teamwork, and 3. their methods for assessing teamwork. Regarding motivations, the RHEE papers contextualized their focus on teamwork with international comparisons and a view that Chinese engineering education needs to catch up. They were arguing from scratch about the necessity of teamwork competencies for engineers. The three JEE papers we surveyed did not engage much in arguments about why teamwork mattered but rather put forward a view that there was a need for more sophisticated tools for assessing teamwork in the classroom. The importance of teamwork was taken as a given. Regarding conceptualizations, the RHEE authors mostly drew on classroom experience to come up with descriptions of teamwork. The JEE authors drew on theories of teamwork from disciplines outside engineering education and put forward quite distinct and established lists of attributes of effective teamwork. Regarding assessment tools, there were various approaches across all the articles. This is an area still with much scope for development in the field.

This is only a preliminary study highlighting the limitations of this approach. With the topic of teamwork newly emerging in the Chinese engineering education context, while well established in the US context, it is not easy to make comparisons. Our findings are very tentative and should not be taken to be generalizable. For future work, we believe that more work is needed to analyze Chinese literature on its terms before we can make significant comparisons in the US context. We also propose that there would be value in going beyond journal articles to look at actual classroom artifacts, such as rubrics, to discern the conceptualizations and approaches used in different contexts. Our analysis of these Chinese articles can help us identify and formulate effective analytic strategies that allow us to extract data from the engineering education scholarship that is not necessarily inspired by the Western-centric methodological paradigm. Such an exercise can further help us develop some contextual knowledge that will prepare us to conduct qualitative research in Chinese engineering classrooms.

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