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In pursuit of the Dao in policymaking: Toward a cultural approach to understanding engineering education policy in China

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ABSTRACT

Approaching policy research from a cultural perspective, this paper proposes that understanding engineering education practice and policymaking in China requires considerable sensitivity to context. By adopting a *historical–philosophical analysis* methodology, this paper analyzes how three fundamental concepts (engineering, engineer, and education) are linked to a variety of beliefs, assumptions, and ideas that are partially unique to the Chinese cultural context. More specifically, these concepts are discussed in relation to three partially distinct philosophical frameworks: Confucianism, Marxism, and economic pragmatism. Our analysis in this paper draws on studies in comparative education and Chinese studies as well as policy reports released by the Central Government. Based on the analysis, the paper suggests taking a cultural approach to studying engineering education policy, with important implications for both Chinese and Western scholars and policymakers. This paper should be of interest to comparative education scholars, international engineering educators, and education policymakers with a global focus.

1. Introduction: context, concepts, and education policy

In comparative/international education and education policy studies, "context" has been considered as a central concept in many frameworks and theories. Comparative approaches to education policy often consider policy development and implementation as "highly contextualized" and "context-dependent" [40, p. 241]. Studying the "context" of education policy requires analysis of the "economic, social and political factors" [3, p. 12] that give rise to issues emerging in any given policy agenda. National differences become especially relevant when studying education policy in countries that have distinct economic, social, and political traditions.

With China gaining prominence on the global stage and becoming the world's second largest economy, the engineering education system and engineering profession in China have been paid increasing attention by some non-Chinese scholars. Nonetheless, the amount of scholarly activity in this area remains modest as compared to research focused on North America and Europe. Further, some prior studies have demonstrated that failing to pay close attention to the "Chinese context" may engender misunderstandings of China's engineering education policy [13,36,44].

Building on our previous research and a variety of other scholarly sources, this paper argues that the "Chinese context" shaping Chinese engineering practice and education policy is mainly rooted in three foundational

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philosophies: Confucianism (historical–cultural), Marxism (political-ideological), and economic pragmatism (economic-developmental). As the single most influential school of thought [32] in Chinese history, Confucianism had fundamental impacts on Chinese ways of thinking and social interactions before and after modern engineering was introduced to China in the 19th century. Today it still shapes people's understanding of relations among humans, nature, and society, and with technology playing a mediating role. It also shapes the fundamental values of Chinese people and cultivation of "superior persons (including engineers)" in society. As a national ideology, Marxism has also influenced nearly all social activities and national strategies since 1949, when the Chinese Communist Party (CCP) led by Mao Zedong took control of China. Marxism aims to ensure that engineering practice promotes socialist ideology and engineering education cultivates future engineers who are both technically excellent and politically qualified (or "red" and "expert"). Additionally, economic pragmatism as a guiding principle for economic and social policymaking was initially proposed by reformist leader Deng Xiaoping in the post-Mao period and further developed by his successors. Because of the interwoven relations between economic development and engineering, pragmatism is thus deeply embedded in engineering practice and education in contemporary China, and engineering education is often proposed and promoted with explicitly pragmatic goals. As a final point, it is important to note that these three philosophies should not simply be viewed in historical sequence, but rather as progressively intertwined and coproduced, with real and lasting implications for the culture and character of engineering education and practice in China.

Drawing on theories in the history of philosophy, this paper also adopts an analytic tool – *historical–philosophical analysis* [28] – to understand how China's engineering education policies are defined by distinct historical–cultural, political-ideological, and economic-developmental contexts. In doing so, this paper analyzes three fundamental concepts (engineering, engineer, and education) that are critical constituents for developing engineering education policies. Without more deeply understanding these concepts as "basic words" in the policy "vocabulary", it is impossible to understand larger units such as policy "sentences" and "paragraphs", much less complete "texts".

In fact, in policymaking processes these concepts are often not clearly defined and articulated, and therefore fundamentally constitute the "unspoken" and underlying assumptions in making policies. Understanding these fundamental concepts is crucial and meaningful for both *local* and *global* researchers and policymakers for at least two major reasons. First, these concepts are often not challenged or interrogated because they are deeply embedded in the everyday mindsets of Chinese researchers and policymakers. Analyzing these concepts can therefore help Chinese researchers and policymakers challenge the limitations of their "normal" ways of thinking in the policymaking processes, potentially leading to more informed policies. Second, these concepts are crucial for researchers and policymakers outside of the Chinese context who are attempting to understand Chinese engineering education policies. That is, these concepts are deeply linked to fundamental values and assumptions that are quite markedly distinct from that which non-Chinese researchers and policymakers often take for granted. In this sense, there are some critically important gaps between Chinese and Western understandings of the policymaking processes. In contrast to Western attempts to explore the "logos" - or the objective cosmic laws and decontextualized principles - underlying policymaking processes, Chinese policymakers tend to seek for the *dao* of the policymaking process, which is viewed as dynamic, ever-changing, and highly context-dependent. These gaps represent critical "barriers" that can limit non-Chinese researchers and policymakers from acquiring the "authentic" meanings of Chinese policies.

2. What is engineering?

In today's Chinese vocabulary, the translation of the English word "engineering" as "*gongcheng* (工程)" is a very general term that covers "engineering", "technology", and "applied science" in the Western sense. This broad understanding is partially due to the historical–cultural origin of the term *gongcheng*. Historically, modern engineering practice and education were formally introduced into China during the Self-Strengthening Movement (1861–1895). Yet even before it referred to engineering, *gongcheng* had already been used in Confucian texts as early as the book *Xin tangshu* [New History of the Tang] (c. 1060 CE) [39]. As historians Joseph Needham and Ling Wang point out, the two constitutive Chinese characters "*gong*" and "*cheng*" have specific *historical–cultural* meanings:

> From the earliest times the word *gong* implied work as an artisan, but technical as opposed to agricultural. This is perpetuated in the modern term for engineering, *gongcheng*, the second (*cheng*) of the two characters having originally meant measurement, dimension, quantity, rule, examination, reckoning, etc. [30]

In Confucian texts, the meaning of *gong* therefore extended from "artisan" to "technical work or instrument used in technical work" [6]. Hence, the term *gongcheng* means any technical/instrumental work involving systematic measurement and quantitative analysis. When modern engineering was introduced into China and the term *gongcheng* was used to refer to engineering, traditional technical/instrumental work was conceptually linked to modern engineering [23].

Therefore, *gongcheng* today serves as a very broad term that includes a wide variety of technical/instrumental activities, and Chinese policymakers even tend to use *gong* (the first character of the term *gongcheng*) to cover engineering, technology, and applied science. Recently, the Chinese Academy of Engineering (CAE) has also used the term "*gongcheng keji* (engineering science and technology)" to include all practical activities related to engineering at large [8]. Engineering, technology, and applied science programs are therefore not explicitly distinguished in developing education policies. In a recent "Catalogue on Undergraduate Majors in Higher Engineering Education Institutions" (2012), for instance, *gong* is one of the 12