Construction of Critical Thinking Model for Vocational Students in China: New Normal Perspective

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Abstract

The rise of artificial intelligence signifies a transition into the intelligent age, compelling educational institutions to design skills training initiatives for workers to adapt to AI-induced transformations. In this digital era, comprehensive cognitive skills, notably creativity and critical thinking, are prized attributes, less susceptible to automation, and fundamental for societal prosperity amid the era of rapid information dissemination. The purpose of this study is to develop a conceptual framework to understand the key factors of vocational student's critical thinking in Chinese vocational universities. We reviewed the related research published since 1930 and analyzed four factors (social culture, teaching methods, individual characteristics, and information literacy). Based on the Vygotsky's socio-cultural theory ,we identify the key factors related to critical thinking and formed a conceptual model of vocational student critical thinking. For further research, we will use stratified sampling to select 400 vocational students to conduct a questionnaire survey from 3 universities in Sichuan, China. The conceptual model and possible outcome will help us better understand the main factors of vocational student critical thinking and the impact of job seeking, which will provide implications for scholars and policymakers in this field.
Keywords: Vocational Student, Critical Thinking

Introduction

Aoun (2017)said as artificial intelligence progresses, many job positions will be replaced by automated machines. This will particularly affect jobs that require manual labor or involve data analysis and processing. To address this change, He suggested that we focus on developing individuals with innovative abilities and strong critical thinking skills. Critical thinking encompasses different aspects such as analyzing information, evaluating evidence thoroughly, reasoning effectively, and making sound judgments based on facts (Forum, 2021).

In today's society, critical thinking has been acknowledged as a fundamental skill for employment (Forum, 2020).Academic research consistently shows that students with strong critical thinking skills tend to perform better academically. Additionally, these skills enhance communication, creativity, problem-solving ability and teamwork proficiency (Fisher & Scriven, 1997; Tang, 2016; Young, 2015). In this highly interconnected digital world, it is easy to have information overload. Soft skills such as critical thinking, creativity, adaptability, cooperation ability and time management ability enable talents to master new information and make effective decisions. And the survey report from the World Economic Forum in 2020 ranks the demand for critical thinking skills as the top skill among companies surveyed worldwide. Critical thinking can be a useful tool for to get dream job among vocational students after graduation. It is found from literature that lack of critical think may have impacts to get good jobs which lead to unemployment rate among any country (Alharbi et al., 2022; Aydiner et al., 2023; Forum, 2020, 2021; Playter, 2023; Solutions, 2019).Therefore，based on theoretical imperfections and practical needs，many scholars have shown great concern about critical thinking.

Problem Statement

Survey of university levels based on general education : In an empirical investigation of critical thinking levels and gains in China, India, and Russia, with the United States as a benchmark, Indian, Russian, and American undergraduates had higher levels of critical thinking skills than Chinese (Loyalka, p.2021). Survey on vocational education based on a level below the general education : Evidence from two empirical studies conducted by Zhang Qinggen and Shen Hong in "2016 National Undergraduate Competency Assessment" and the 2018 Competency Assessment of Undergraduate Students in 83 Colleges and Universities in China shows that vocational students have lower critical thinking abilities compared to those receiving general university education. Therefore, in order to better promote the development of critical thinking among vocational students, a thorough investigation of the variables affecting critical thinking among Chinese vocational students is needed to narrow this gap.

Research Objectives

The objective of this article is to develop a conceptual framework to understand the key factors of critical thinking of vocational students in China.

Research Questions

Based on the existing research, this paper attempts to answer the following questions:
1) What are the key factors of critical thinking?
2) What is the relationship between these factors related to critical thinking?

Critical Thinking

Critical thinking derives from the educational thinking of Socrates, who 2,500 years ago emphasised the significance of questioning and logical argumentation. John Dewey subsequently systematically expounded and popularised critical thinking as an educational concept and teaching tool. In "How We Think" (2022), Dewey defines reflective thinking, also referred to as critical thinking, as a rigorous and active process rooted in personal beliefs or implicit assumptions (Dewey, 2022). Following the works of Socrates and Dewey, the

cultivation of students' critical thinking emerged not only as a foundational educational goal but also as a burgeoning academic research field (Wu Yan & Lin Keqin, 2015). The definition of critical thinking has been a topic of considerable debate within academic literature. The concept was first introduced by the American philosopher Dewey and later translated in China as "critical thinking".Robert Ennis defined critical thinking as "reasonable and reflective thinking" with the aim of determining our beliefs and actions (Ennis, 1987). In addition, highly regarded experts in the field, Richard Paul and Linda Elder, described critical thinking as an art that improves our way of thinking through three interactive stages: analysing, evaluating and enhancing our thinking patterns (Paul & Elder, 2019). Other scholars have provided contrasting definitions and highlight the competency to assess, contrast, scrutinize, and amalgamate data (Coon & Mitterer, 2012; Fisher & Scriven, 1997; Moore et al., 2012). The wider academic and professional community also has different interpretations of critical thinking, with some emphasising its role in everyday life and others its importance in understanding the core of problems (Browne & Keeley, 2011; Paul & Elder, 2019). Vocational students' understanding of critical thinking is shaped by contemporary professional experience (Hyslop-Margison & Armstrong, 2004). It is more than an attitude; it is a skill that can be constantly refined (Mehta & Al-Mahrooqi, 2015). Geng (2014) conducted a content analysis of 64 definitions of critical thinking and concluded that scholars generally consider judging, arguing, questioning, processing information, problem solving, metacognition, skills and dispositions as the core elements of critical thinking. This comprehensive approach provides a fundamental understanding of the multifaceted nature of critical thinking. There have been calls for a more comprehensive understanding of critical thinking, particularly in discipline-specific contexts (Danczak et al., 2017).The definition of critical thinking is multifaceted and has evolved over time, influenced by different disciplines, cultural perspectives and educational philosophies. These views underscore the importance of a nuanced understanding of critical thinking, highlighting its multifaceted nature and the need for tailored approaches to teaching and application across disciplines.

Measurement of Critical Thinking

Critical thinking is a fundamental skill that is highly valued in various academic and professional settings. However, measuring critical thinking remains a complex and multifaceted undertaking. The tools for measuring critical thinking are extensive and varied. These are common measures of critical thinking. (1)The California Critical Thinking Skills Test (CCTST): Developed by Fei Xing et al. and distributed by the California Academic Press in 1990, this multiple-choice instrument is designed for university and high school students. It assesses explanation, analysis, evaluation of arguments, deduction and induction, including rudimentary statistical reasoning.(2) California Critical Thinking Dispositions Inventory (CCTDI): Another creation of Fei and colleagues in 1990, this multiple-choice instrument measures critical thinking dispositions. It is suitable for both self-assessment and research.(3) Cornell Critical Thinking Tests: Designed by Ennis and Millman J, these tests come in two levels. Level X is for students in grades 4-14, while Level Z is for college students, advanced high school students and adults. Both tests cover different facets of critical thinking, from induction to hypothesis generation. (4) Watson-Glaser Critical Thinking Appraisal: Developed by Watson and Glaser, this test is suitable for students in grade 9 and above. It covers induction, hypothesis generation, deduction, credibility judgement and evaluation of arguments. (5) Ennis-Weir Critical Thinking Essay Test: Compiled by Weir E. in 1985, this test is designed for a wide age range, from children to university students. The test assesses

various critical thinking skills, from identifying main points to recognising the use of emotive language. (6) Test of Daily Reasoning: This multiple-choice test was created by Fischer in 1998 and published by California Academic Press.(7) Reflective Judgement Interview (RJI): Developed by Kitchener and King, the RJI consists of both structured and unstructured questions designed to measure reflective judgement. Given the multifaceted nature of critical thinking, its assessment requires different methods. In the context of vocational education and training, this article will use the CCTST and the CCTDI. Both instruments have demonstrated reliability and validity, with the CCTST being particularly robust in measuring critical thinking skills and the CCTDI in assessing critical thinking dispositions (Lederer, 2007; Shin et al., 2015). Their broad applicability makes them suitable for different educational settings, including vocational education and training. Furthermore, the validation of the CCTDI in different cultural contexts highlights its adaptability (Gupta et al., 2012; Raymond et al., 2018). Despite some criticisms of multiple-choice tests, the combined use of the CCTST and CCTDI provides a comprehensive assessment of critical thinking (Norris, 1989). These instruments are suitable for vocational students due to their reliability, validity and adaptability across different cultural and educational backgrounds.

Literature Review
Key factors influencing critical thinking: Social culture
The concept of "sociocultural" has undergone extensive analysis in academic literature, with its definition evolving over time (Brownstein, 1995). Some scholars, like Archer (1985), have noted challenges in its definition, while others emphasize its significance in cross-cultural differences, as argued by Fischer & Poortinga (2018), and in symbolic mediation, as argued by (Joerchel, 2012). Practical applications have been observed in domains like sustainable lifestyles, as discussed by Svensson (2012), and international trade, as explored by Townsend & Wan, 2007). In the context of critical thinking, Vygotsky's sociocultural theory is prominent. Vygotsky claimed that cognitive development is firmly rooted in social interactions and cultural contexts (Mahn, 2012). Accordingly, Vygotsky's perspective emphasises the paramount role of the sociocultural dimension in shaping consciousness and honing critical thinking skills (Wertsch & Rupert, 1993). On the relationship between socio-cultural and critical thinking. Manalo et al (2013) emphasised the influence of culture-related factors, such as self-construction, regulatory mode and self-efficacy, on students' critical thinking. Whilst highlighting cultural and linguistic differences, Jones (2005) found that international students' grasp of critical thinking was no different from their local peers'.

McBride et al (2002) suggested that individualism-collectivism could be a contributing factor to varying critical thinking dispositions among American and Chinese preservice teachers. Sobkowiak (2016) highlighted the significance of intercultural education while acknowledging the restrictions of EFL textbooks in Polish schools. Tan (2017) recognised cultural obstacles, including the perception of teachers solely as knowledge conveyors and the view of critical thinking as confrontational. DeWaelsche (2015); Tiwari et al (2003) both highlighted the impact of cultural, institutional, and communicative factors on critical thinking. While Tian & Low (2011) contradicted a unilateral attribution of inadequate critical thinking solely to culture and posed that prior acquirement of knowledge must also be significant. Durkin's (2008) study revealed that East Asian students in the UK combined their cultural approaches with Western styles of critical thinking.

Song and McCarthy (2018) scrutinised the dual use of 'critical thinking' as an attraction and an achievement measure for Asian students. Lim (2015) suggested that a wider comprehension of critical thinking is essential, highlighting its social and relational dimensions. Chen (2017) observed that Chinese students perceive critical thinking as multidimensional and shaped by their cultural context. In summary, critical thinking is significantly impacted by socio-cultural factors and presents both obstacles and prospects. It is essential to identify and acknowledge these influences to enhance critical thinking education.

Key Factors Influencing Critical Thinking: Teaching Methods
Teaching methods are a defined collection of approaches and strategies designed to foster learning. Marín et al (2013) have recognized distinct teaching profiles, revealing variation within these methods. Hora & Ferrare (2013) emphasise the extensive scope of teaching and discourage a narrow outlook. Moskovkin (2017) stresses the significance of precise conceptualisation. In this study, teaching methods refer to a varied collection of approaches and strategies employed in teaching, encompassing distinct pedagogical profiles and emphasising the breadth and depth of teaching as expounded by (Marín et al., 2013; Hora and Ferrare, 2013; Moskovkin, 2017). Critical thinking is a highly valued skill in vocational education due to its significance in problem-solving and decision-making within professional settings. Nevertheless, there is ongoing concern regarding the efficacy of varying teaching methods in enhancing critical thinking among vocational students. van Peppen et al (2018) observed that the most effective pedagogical techniques for fostering critical thinking abilities, especially in preventing biased reasoning, remain largely undetermined. Marin and Halpern's (2011) study revealed that explicit instruction proves to be a proficient approach in cultivating critical thinking abilities among high school students. Loes et al.'s (2015) findings propose that the impact of student comprehension of structured teaching on their critical thinking abilities has a similar effect, regardless of their academic preparation or pre-college critical thinking level. Swart (2016) stated that instructional approaches and technology-facilitated learning can enhance the acquisition of critical thinking skills. In their study, Cáceres Cáceres et al (2020) discovered that educators primarily attempt to cultivate critical thinking skills by integrating them into their respective subjects rather than teaching them in isolation. El Soufi and See (2019) argue that the research on the effectiveness of explicit teaching in enhancing critical thinking skills is still in its infancy, and more large-scale, replicable studies are required. Terenzini et al (1995) found that both instructional and extracurricular experiences positively contribute towards improving critical thinking skills. As per Tuzlukova et al (2017), incorporating practical aspects of critical thinking within education can help in preparing students for their future careers. Chee Choy et al (2012) observed that teachers have minimal practice of critical thinking, indicating a disparity between theoretical understanding and practical application. Shin et al (2006) underscored the necessity of pedagogical approaches that foster both critical thinking skills and dispositions in nursing students. The literature suggests that while multiple teaching methods have been researched, there is currently no standardized approach to enhancing critical thinking abilities in vocational students. Explicit instruction, technology-assisted learning, and subject integration present as promising options, yet further research is necessary to establish their effectiveness and relevance in vocational settings.

Key factors influencing critical thinking: Individual characteristic

The concept of individual characteristics is multifaceted and diverse, spanning various academic fields. According to Fleuren et al (2016), it involves the interplay between personal, work, and contextual factors. Kandler & Rauthmann (2021) highlight the expression of integrated personal variables in one's environment. Shogren et al (2014) suggest that individual values affect these characteristics, while Long et al (1966) associate it with differentiation within social contexts. Individual characteristics are perceived as a dynamic blend of personal traits and their wider context, emphasizing their potential influence on critical thinking, as indicated by the mentioned scholars. Critical thinking is a multifaceted cognitive skill that involves the abilities to analyse, evaluate, and integrate information. Its importance in educational and professional domains is widely recognised, but the factors contributing to its development are not fully understood. According to West et al (2008), cognitive biases and heuristics play a role in this process, which can either facilitate or obstruct the development of critical thinking depending on an individual's level of self-awareness. Celuch, Black, and Warthan (2009) discovered that students who possess a positive outlook on critical thinking and are exposed to it develop resilient normative beliefs that shape their self-perception as critical thinkers. Additionally, Rapps and Glaser (2001) emphasized the critical role of dispositions towards critical thinking in cognitive developmental stages, while skills and experience act differently at varying levels. Contrarily ,Facione (2000) rejected the proposed connection between internal motivation and critical thinking skills. Bolger et al (2014); Chan (2019) emphasise the influence of individual differences, including cognitive abilities, education and cultural background, on critical-analytical thinking. Gelerstein et al (2016); Nygren et al (2019) suggest that an individual's critical thinking skills may be shaped by their socioeconomic status and the specificity of the subject matter. However, Loes et al (2015) andargue that instructional quality is equally important regardless of individual characteristics. Sosu's (2013) Critical Thinking Disposition Scale provides a potential means of measuring the impact of these factors. However, Zuriguel Pérez et al (2015) have noted that existing research, especially in the university context, lacks guiding conceptual models. Meanwhile, Bensley et al (2016) have posited the need for further research on the impacts of explicit instruction on critical thinking. In essence, individual characteristics, encompassing cognitive biases and cultural factors, hold a significant role in shaping critical thinking. This highlights the need for a comprehensive approach to improving critical thinking within educational settings.

Key factors influencing critical thinking : Information literacy

Information literacy extends beyond acquiring skills; it entails comprehending information within various contexts. It is a process through which individuals interact with information within specific fields (Lloyd, 2012). This necessitates reflecting on and discriminating information based on its context (Grafstein, 2017; Walton, 2017). Such a comprehensive outlook, blending expertise and knowledge generation (Forster, 2015), is indispensable in examining its influence on critical thinking. This comprehensive viewpoint results in a well-rounded investigation into the impact of information literacy on critical thinking procedures. Information literacy, extending beyond mere library skills, has emerged as a pivotal foundation for nurturing independent learning and critical thinking. Gunasekara (2008) underscores its significance, while Weiner (2011); Reed (2006) emphasize its potential to bolster critical thinking instruction and habituate active learning. However, Ganley et al (2013) identified a concerning disparity, as numerous higher-level students were found to be

deficient in information literacy skills that could potentially impact their critical thinking abilities.

Williams & Wavell (2007) discourage concentrating solely on mechanistic skills and advocate for a more comprehensive approach that integrates information literacy with lifelong learning. Saglam et al (2017) uncovered an alarming pattern whereby teachers were exhibiting poor performance in critical thinking and information literacy skills. Moradi et al (2014) established direct correlations between critical thinking and information literacy. According to Swart (2016); Pucer et al (2014), technology-supported learning plays a significant role in fostering these skills. Knight (2006) proposed assessing information literacy outcomes through tangible measures, such as student academic work. However, the literature presents gaps. A predominant focus on higher education neglects the vocational student demographic.

Longitudinal studies, crucial for understanding long-term influences of information literacy on critical thinking, are sparse. While the conceptual relationship between the two is discussed, there's a dearth of research on pedagogical strategies for vocational education integration (Gunasekara, 2008; Reed & Stavreva, 2006).
The impact of technology on critical thinking through information literacy lacks empirical study and limited assessment methods (Goodsett, 2020; Knight, 2006). Cultural and geographical perspectives are often disregarded. Additionally, previous research has predominantly reflected Western contexts (Ávila & Moore, 2012; Din, 2020). In summary, although information literacy is acknowledged as a catalyst for critical thinking, there is an imperative requirement for focused research, notably in vocational education. Rectifying these gaps can facilitate the implementation of strategies that comprehensively promote critical thinking through information literacy.

Conclusion limitation and suggestions for Further study
This study presents a framework outlining key factors that shape critical thinking in vocational students: socio-cultural elements, teaching approaches, individual characteristic , and information literacy.
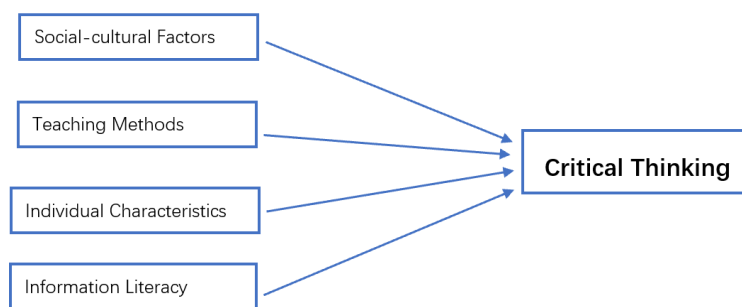

Figure 1. Conceptual model

This framework is foundational for an upcoming empirical investigation aiming to delve deeper into these determinants. The paper sheds light on the current research landscape, pinpointing areas needing further exploration. As a subsequent step, a survey will be conducted among 400 students from three vocational universities in Sichuan Province, China, using stratified sampling. This empirical phase aims to validate the proposed framework.

However, it's important to note a limitation: the study doesn't capture all possible influencing factors on critical thinking.

Critical thinking, essential for academic success, is influenced by various factors. Online course design and technology-enhanced learning can shape learners' perceptions and their critical thinking abilities(Varenina et al., 2021) . The integration of critical thinking within subjects, rather than teaching it separately, affects its development (Cáceres et al., 2020). Interestingly, a student's critical thinking in one subject doesn't guarantee proficiency in another(Nygren et al., 2019). Moreover, broad curriculum efforts to enhance critical thinking don't always yield long-term improvements(Huber & Kuncel, 2016) .Due to space limitations, this article does not discuss each of these factors. Future research can focus on these factors to make in-depth demonstrations, identify which factors are main factors, incorporate them into the conceptual framework of critical thinking ,and further promote the development of research.

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