The Cultivation of Critical Thinking in Philosophy Through Technology: A Systematic Literature Review

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Abstract

Technology has been widely employed to cultivate students' critical thinking (CT). Empirical research has been conducted to evaluate its effectiveness and address the current lack of a systematic literature review on the enhancement of critical thinking through technology in philosophy. Therefore, this review aims to uncover the impact of the philosophy course in fostering students' CT in the digital age and the challenges that teachers and students face in implementing technology. The study adheres to the PRISMA methodology (Preferred Reporting Items for Systematic Review). Relevant articles and materials were primarily sourced from three databases: Web of Science, Scopus, and ERIC. This article contended that a modern philosophy course should prioritize the cultivation of students' CT over the mere accumulation of knowledge. Through systematic analysis, this study has identified three main themes: (1) The philosophical origins of technology, (2) issues and challenges during the use of technology, and (3) critical use of technology. Future research implies the need to regulate the use of technology within ethical boundaries.

Keywords: *Critical Thinking, Philosophy, Technology, Literature Review*

INTRODUCTION

CT takes on critical significance in the cognitive development of individuals, such that individuals are enabled to make reasoned judgements. Higher education primarily aims to cultivate students' CT skills (Pronskikh and Sorina, 2022). Most educators have agreed that students should develop such skills when engaging in academic learning and participating in the workforce since they enable students to engage in purposeful understanding, judgment, and reasoning (Yan, 2022). Philosophy has a critical gene, such that it is capable of cultivating the CT, creativity, analytical ability, and social responsibility of students. The discipline of philosophy, with its stress on the critical analysis of fundamental questions, can complement the development of CT skills (Shestakova et al., 2022). For years, in the teaching practice of our universities, the philosophy courses, which should place a focus on cultivating students' philosophical thinking patterns, have been generally reduced to the transmission of philosophical knowledge, a single indoctrination, as well as lecture (Lavrynenko et al., 2020). The teaching method has abandoned the original intent of philosophy while hindering the cultivation of CT of students. Accordingly, philosophy education should be reformed, and more effective teaching methods should be developed to cultivate students' CT. Furthermore, in today's technologically advanced society, the above-described critical analysis skills are applied and generally tested in the realm of technology. The intersection of the above-mentioned three domains has been confirmed as an emerging area of study with potential implications for education, professional development, and social progress.

AI and other forms of technology have become more prevalent over the past few years. Technology has significantly altered how people live. Research has indicated that technology has a beneficial impact on students' CT (Shestakova et al., 2022, Chin-Yee et al., 2023). Previous studies have examined the effectiveness of technology-enhanced approaches in two main aspects: (1) their ability to promote CT tendency and skills, and (2) their effectiveness and challenges in improving students' cognitive, behavioural, and emotional engagement in the learning process (Zou et al., 2022). Besides, the cultural phenomena of AI is affecting people's way of

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life and way of thinking to a certain extent (Leung, 2019). AI serves as a cultural and philosophical framework that molds the present-day societal understanding of intelligence and the concept of thinking (Leung, 2019). This cultural and technological model has permeated throughout the life and education of modern society. However, when it is employed to transform man himself and the nature outside, it brings benefits and costs, which is termed 'setting-upon' by Heidegger. Technology refers to a contrivance among things and humans (Yan, 2022). Thus, humans should adopt a critical attitude towards the application of technology in the real world. The aim of ethical critique of technology is not to abolish or eradicate technology, but to scrutinize the rationality and legitimacy of the motivations and outcomes of technological innovation in the dual context of 'benevolent necessity' and 'malicious intent' (Yan, 2022). The application of technology does not fall into the inventor's understanding and control after its creation. When technology begins to serve the egoistic motives of individuals, organizations, and groups, its ethical and legal rules become incredibly complex, and the core issues of technological responsibility lie in responsibility exculpatory and responsibility transfer (Yan, 2022). Accordingly, scientists, philosophers, and educators are all required to adopt a cautious and rational attitude towards the duality of technology's value.

Despite some studies addressing CT, philosophy, and technology individually, there exists a significant research gap regarding their confluence (Dwyer et al., 2014, Chin-Yee et al., 2023). This insufficient understanding is likely to hinder the potential benefits that may be gained through their interplay, especially under technological advancements where CT and philosophical understanding can exert considerable effects.

The review aimed at filling the above-mentioned research gap by exploring and synthesizing the existing body of literature on the technology in philosophy. The objective was to present a thorough overview of the existing knowledge in this field, highlight the interconnections between the above-described domains, and identify avenues for subsequent research. The present review may particularly help educators and policymakers enhance CT skills and gain more philosophical insights in a technologically advanced context.

MATERIAL AND METHODS

Identification

This review fell into three primary phases that contributed to the selection of the eligible papers for investigation. The first phase was keyword identification, which comprised looking for pertinent terms using dictionaries, thesauri, encyclopaedias, and existing research. Search strings on Scopus, Web of Science and ERIC (Table 1) databases were created after the relevant keywords were identified. In this review, 151 papers were effectively recovered from the databases in the first phase of the systematic method.

Table 1: The search string

Scopus	TITLE-ABS-KEY (critical AND thinking AND philosophy AND technology) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))
Web of Science	https://www.webofscience.com/wos/alldb/summary/7b0a9ee9-c362-4bd1-8365-5b6b1698615d-8f2ddd32/relevance/1
ERIC	https://eric.ed.gov/?q=critical+thinking+AND+philosophy+AND+technology &ff1=dtySince 2019&ff2=pubJournal+Articles

Screening

-duplicate

Given the results of the first phase of screening, 28 duplicate papers were omitted from the second phase, and the researchers screened 123 papers following the inclusion and exclusion criteria.

Research papers served as the first criterion. Publications in several forms (e.g., systematic reviews, reviews, meta-analyses, meta-syntheses, serials, books, chapters, and conference proceedings) were excluded from this study. It is noteworthy that the schedule was selected for 5 years (2019-2023). Furthermore, only studies relevant to the topic were selected to conform to the objectives of the analysis. A total of 92 papers were excluded in accordance with the above- mentioned criteria (Table 2).

Table 2: The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2019-2023	< 2019
Literature type	Journal (only research articles)	Journal (book chapter, conference proceeding)
Subject Area	CT, Philosophy, Technology	Besides CT, Philosophy, Technology

Eligibility

A total of 31 papers conformed to the requirements in the eligibility review phase of the third phase. At this point, the respective paper was carefully examined for its title, topic matter, key content, and so forth to ensure that it conformed to the inclusion criteria and the study's research goals. Thus, all papers were purely science papers based on empirical evidence. Review copies of the final 31 papers were available (Figure 1).
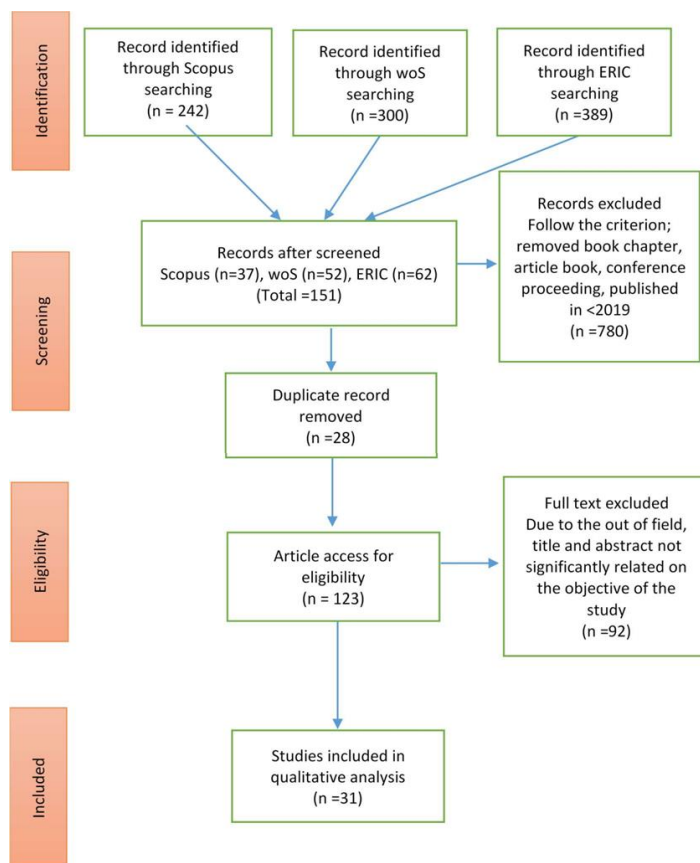
Figure 1: Flow diagram of the proposed searching study (Moher et al., 2009)

Data Abstraction and Analysis

An integrative analysis was conducted in this study, which is one of the research methods adopted to assess and synthesize a wide variety of study designs. The expert study placed a focus on creating pertinent themes and subthemes. The phase of data collection served as the initial stage in building the themes. For information on this review subject, a total of 31 papers were thoroughly analysed. In second step, to find and create relevant groups, the authors and subject-matter experts turned to their analysis of the connection between CT, technology, and philosophy. Awareness and comprehension, difficulties and problems, and tactics and possibilities were the three vital topics derived from the technique. The corresponding author worked with other co-authors to build themes in accordance with the findings of this investigation under this review. A log was kept during the review to record any analyses, remarks, and suggestions about the interpretation of the data.

To address problems that surfaced during the review, their findings were compared. The authors collaborated to address any contradictions that arose in the themes. To maintain coherence, the final produced themes were modified. Two experts—one in CT education and the other in technology philosophy—conducted the evaluation to ensure the veracity of the issues identified. The accuracy, significance, legitimacy, and validity of the respective sub-theme were assessed throughout the expert review process. Their work was adjusted by the authors in response to the suggestions and criticisms of the experts.

RESULT AND FINDING

CT refers to a fundamental literacy that individuals should have in learning, life and work. As technology has been leaping forward and increasingly integrated into production, daily life, and education, a host of conveniences have emerged alongside several challenges. In response, humans have sought a range of solutions throughout the above process.

All papers were categorized (Appendix A) in accordance with three major themes, i.e., knowledge and awareness (10 articles), challenge and problem (11 articles), and methods and prospects (10 articles).

Knowledge and Awareness

The development of technology has led to profound societal transformations in the age of AI. Facing the challenges of the great changes in the 21st century, cultivating talents who are proficient in criticism and creation in various fields refers to a vital responsibility that universities should undertake. With the expansion of CT education and the deepening of research, people have further verified the significance of CT in a wide variety of fields in theory and practice. Philosophy is an interesting and necessary discipline for acquiring knowledge and fostering CT (Lavrynenko et al., 2020). Some researchers emphasize that by studying philosophy, one can enhance their ability to systematically organize their thoughts, ideas, and perspectives (Shestakova et al., 2022). Nevertheless, contemporary students frequently exhibit a deficiency in skills such as formulating inquiries, devising methodologies, establishing goals, and gathering and structuring data (Goldberg, 2008). Golberg suggested that the reason for the above-mentioned questions is that students have not been taught the above-described skills. Thus, in answering how philosophy can address the above-mentioned issues, the above-described gaps can be compensated through the rational use of information technology (Goldberg, 2008). Accordingly, in answering how philosophy can help solve the above-mentioned problems, the above-described gaps can be compensated by the rational use of information technology. Extensive research has stressed how technologies have transformed the landscape of CT (Shestakova et al., 2022). The integration of technology into educational spaces has allowed students to interactively engage with diverse perspectives and complex problems.

Philosophical Foundation of Technology

In philosophy education, technology constitutes a philosophical issue, not just a matter of engineering and ethics (Chin-Yee et al., 2023). Over the past few decades, the field of philosophy of technology has witnessed

significant expansion, primarily driven by the rapid pace of technological innovation and its profound ramifications across a wide variety of facets of society (Shestakova et al., 2022). Innovation has always existed throughout history, whereas today's rate of change is unprecedented. As technological innovation continues to advance at an accelerated pace, humans find themselves lacking sufficient time to fully acquaint themselves with the above- mentioned technologies and critically assess their societal implications, particularly the ethical interplay between technology and philosophy (Chin-Yee et al., 2023, Chen and Wang, 2022). There are no indications of this acceleration decelerating, making it exceedingly difficult to forecast which technologies will exert notable effects in the future. Educators can guide students to understand current and anticipated technologies. Yet, they face challenges in teaching about unforeseen technologies, as human predictive abilities have their limits. (Chin-Yee et al., 2023).

Currently, educational research predominantly concentrates on technologies that have already been implemented in practical (Chin-Yee et al., 2023, Shestakova et al., 2022). However, evaluating the effect of something that is pervasive and future-oriented can pose a significant challenge in its right. Thus, insights into the philosophy of technology, especially in evaluating its social effect, may be highly valuable. The different interpretations of technology are the first area that should be clarified. Researchers have distinguished three levels of technology (Chin-Yee et al., 2023, Bantwal Rao, 2022). The first level is the level of technical artifacts, including smartphones, computers, and so forth. The second level of technology refers to technique (e.g., AI). Technique also includes human skills, such as the use of AI for reading and teaching activities. In observing the correlation between human and technology, philosophers have explored a third level of technology, which we call technics (Stiegler, 1998). Technology has been referred to as the technosphere (in relation to the geosphere and the biosphere), or 'the technical condition', that is, the mutual influences of technology, culture, and human society (Swierstra et al., 2022). Technology shows a significant correlation with the basic way of human existence, i.e., from technical theory to technical rationality to technical practice. As a way regarding the world, it strives to achieve maximum output with minimal input. Some even assert that humanity originated from technicity (Heidegger, 1977). The above-described three levels are applied in a wide variety of fields respectively.

The incorporation of technology in education turns out to be a prevalent phenomenon (Wiid et al., 2020). Humans should not only be users of technology, but also be able to critically engage with technology, calling for technical training and philosophical direction. Empiricists suggested that technology is an extension of science, representing the tools of rationalism (Mitcham, 2020). Technology should be the rational application of scientific knowledge, striving to create a means for humans to effectively control their environment (Mitcham, 2020). However, technology combines rationality and morality, such that humans' use of technology should pay attention to its ethic value.

Application of Technology in Philosophy

In a world progressively stimulated by technology, CT has been reported to intersect with philosophy more than ever. Reviewing the history of technological development, humans tend to realize that the application of technology should conform to rationality and morality.

In 1620, Bacon published Novum Organum, as an attempt to shift people's minds from a theology- based mutual slaughter to a broader and more beneficial ethical perspective. The advent of printing, gunpowder, and the compass changed the face and state of the entire world. What followed were innumerable changes, to the extent that their impact even surpassed empires and sects (Bacon, 1878). Over the next two hundred years, this emerging ethic of technology attempted to shift the focus from spiritual supremacy to the material interests of people's mortal lives (Mitcham, 2020). Bacon's efforts to redirect moral energy from introspective religious disputes towards a more significant focus on secular human power and wealth have laid a unique foundation for the ethics of modern technology. American pragmatists Dewey and Rogers (2012) advocated educational reform, with a particular aim at resolving the discord and injustice arising from technology. Dewey suggested that modern technology poses challenges to the human lifeworld, such that responses at political, conceptual, and individual levels are required. Marx believed that justice requires industrial production to be collectively managed by all those affected by technology, especially those who suffer its adverse effects (Xue and Tong, 2022). Dewey indicated that the separation or mediation introduced by technological forces in human

perception and action calls for a gradual shift of society towards a form of technological governance guided by democracy.

Philosophers have attempted to find a middle ground, achieving an organic integration of rationality and morality, theory, and practice. For a long time, philosophers have placed an extreme focus on the 'spiritual world' and a one-dimensional human, neglecting the real human. The CT of Marx's philosophy places practice at the core, using practice to bridge the long-standing division between the spiritual world and the material world, and the natural world and the human world. Technology is a way thinking inseparable form praxis (Bray and Hahn, 2022). The effect of the scientific revolution, while enriching people's material lives, also challenged the anchors of spirit and faith. People gradually shifted their focus from the 'other-worldly' to the 'this-worldly'. This shift has led to questions on how to realize life's ideals and societal responsibilities in 'this-worldly' realm. From the literature, it can be seen that human use of technology has also witnessed the development of CT, reflecting the critical nature of thought evolution.

Problems and Challenges

The cultivation of CT is neglected in philosophy

As indicated by existing research, the focus of modern philosophy is placed on the transfer of knowledge and the development of the student's personality (Shestakova et al., 2022). CT lays a foundation for nurturing personal growth. However, the instructional activities in philosophy courses overlook the cultivation of students' CT, a problem that also exists in Chinese philosophy class. It's generally believed that a review of pedagogical practices conducive to cultivating CT tends to exclude Confucian educational culture, system, classroom (Zhao, 2020). Some researchers believe that ancient Chinese philosophy mainly regards CT as a negative meaning, which is not conducive to the cultivation and comprehensive development of innovative spirit (Ma, 2021). It is argued that the introduction of Western teaching methods into Chinese classrooms can help cultivate students' CT. Meanwhile, intellectuals began to discuss that traditional Chinese philosophy could foster CT (Zhao, 2020, Chan et al., 2011). In the above-mentioned circumstances, people start seeking educational reforms to attain the objectives of education. China's call for a 'classroom revolution' in 2017 aims to transform the current teacher-cantered teaching methods with brand-new philosophies and technologies (Zhao, 2020). In the era of AI, it is undoubted that educational reform will leverage technology. However, a wide variety of problems and challenges arise during the use of new things.

In today's global context, many philosophy courses still adhere to pedagogical structures and standards established in the pre-digital era, necessitating significant revisions. The primary objective of this article is to elucidate the role of philosophy courses in the education of students trained in technical fields (Shestakova et al., 2022). To achieve this goal, a series of tasks need to be addressed, such as: identifying the main challenges faced by educators and students in philosophical education, analysing methods to tackle these challenges, establishing a secure technological environment, and formulating reasonable rules and regulations for the application of technology.

Ethical issues in Technology Use

Although technology have brought numerous changes to the contemporary society, it is also shaping our way of life and thinking as a cultural phenomenon. The rapid development of AI and the recent emergence of ChatGPT may introduce more uncertainties to the existing structural problems in society. ChatGPT serves as an AI platform that is capable of automatically completing text conversion (Thorp, 2023). Thus, considerable scholars have expressed anxiety and concerns about issues of morality, ethics, and social justice, especially the digital leap for socially vulnerable individuals (Gan and Bai, 2023). AI has disputed individual values and society's morals. Human fascination with AI may affect the emergence of CT. AI refers to a form of lifeless thinking (Leung, 2019). For the correlation between human thinking and AI, Descartes portrays it as a 'loss of life', detached from 'spiritual life' (Mays, 1952). In other words, according to Descartes machines cannot fully embody true thinking. Machines can't replicate moral conscience or ethics because they lack the life experiences possessed by humans. In fact, they can only become artificial moral agents(Doherty, 2021).

Meanwhile, AI assists humans in learning and processing information, reasoning, and drawing conclusions at a fast speed, processing complex and considerable data (Pedersen and Johansen, 2020). However, the above-mentioned AI systems cannot be immediately supervised and comprehended due to their immense complexity. Going beyond the realms of oversight, control, accountability, and audit can have adverse effects and generate negative consequences. AI has been extensively covered in the media, humans have generated numerous feelings ranging from fascination to fear (Pedersen and Johansen, 2020). The mentioned fear originates from the unforeseen future effects of AI. Musk suggested that AI is the greatest risk to human civilization. To be specific, developers, in their pursuit of more advanced technology, may overlook the dangers of AI. For instance, robots are capable of initiating warfare by disseminating fake news, falsifying email accounts, and manipulating information (Romanchuk and Romanchuk, 2021), such that concerns regarding the potential misuse of AI are raised.

Heidegger reflects on technology from a philosophical perspective. In his view, modern technology has and will likely continue to dominate humans and determine the future fate of the world (Heidegger, 1977). Marx, at the early stages of technological civilization development, and Heidegger, at the time when the effect of technological civilization reached its climax, both saw the consequences triggered by technology. They suggested that the homogenization of humans and objects that arises from science and technology, the madness of technological competition, the loss of social morality, and the beginning of world history and the process of globalization, are several consequences triggered by technological civilization (Heidegger, 1977, Marx and Engels, 1967). Heidegger suggested that most of the time, humans are deeply embedded in our technological 'world', which unfolds without considerable conscious thought (Irwin, 2019). Humans have become tools of technology, losing their awareness of self-reflection. Heidegger suggested that technology is neither good nor bad essentially. However, the concern lies in the fact that technological thinking has become the dominant and exclusive form of thinking (Huttunen and Kakkori, 2021). As revealed by Heidegger, the essence of technology nowadays is enframing – Ge-stell. Enframing is truth for Heidegger. The danger of this way of thinking lies in its becoming the only truth, while other ways of understanding the world are overlooked (Huttunen and Kakkori, 2021).

The Matter of Proficiency in Technology

The misuse of technology has turned human into tools of machines. The agency of teachers has been progressively restricted by numerous daily accountability measures, such that examination and evaluation mechanisms are narrowly formulated, curricula are tightly prescribed, and little room is left for deviation or the cultivation of interests. Moreover, there is a mechanistic emphasis on the internet as the gateway to research, with teachers functioning as mere 'facilitators' of the internet rather than educated experts (Huttunen and Kakkori, 2021). Education has become a 'ticket' for student employment, instead of a means to develop creative, open, and CT. In this framework described by Heidegger, the authentic identities of teachers and students are nearly eradicated, reduced to being instruments of efficiency and rationality, tools of technology (Huttunen and Kakkori, 2021).

Technology is not infallible and capable of presenting erroneous and inaccurate information, such that students can be misled, and incorrect learning outcomes will be triggered (Irwin, 2019). Modern students are deeply immersed in the online environment, obtaining information through 'quick browsing', making it challenging to maintain focused attention (Shestakova et al., 2022). These characteristics pose additional challenges to their learning. Moreover, the use of AI technology involves the collection of considerable data, which can pose risks to privacy and data security if not properly protected and handled. The widespread use of AI can potentially give rise to a range of ethical and moral issues, such as algorithmic bias, unfairness, and discrimination, which can manifest in the field of education (Doherty, 2021). Technology changes ethics, challenging old beliefs. However, technology does not dispense with ethics, it maintains a dynamic relationship with moral philosophy or ethics (Odorcak and Bakosova, 2021). The good and evil of technology depends on the developers and owners of the technology. When rulers have AI they can have the power to contribute to society and also lead to absolute corruption (Huttunen and Kakkori, 2021).

Strategies and Prospects Educational Reform

In the present section, the strategies and future prospects for addressing the above-mentioned problems are elaborated based on the problems and challenges discussed previous section. The challenges posed by technology can be addressed through educational reform. For instance, Erol (2021) investigated the reflection of 21st-century skills in the curriculum of social studies courses. He elucidated the categorization of 21st-century skills, a classification that has been broadly accepted. In the above-described classifications, the inclusion of information, media, and technology skills (six sub-skills) along with learning and innovation skills (5 sub-skills) were the most extensive. However, the paper did not explain how the above-mentioned skills should be acquired, but considering the skills of the 21st century, the curriculum of the social studies course could be updated. Thus, it is evident that innovation and CT are the focus of all courses.

The improvement of students' CT requires joint efforts from families, educators, and students. To gain more insights into the utility of CT, Imad (2021) designed a method of self-reflection and asked students to interview a family member. Fear is considered a significant obstacle to CT. Moreover, it is proposed that in the educational process, educators should guide students to understand how fear impacts their decision-making and rational thinking. Imad emphasizes that educators should teach CT using everyday examples and avoid over-reliance on professional jargon, allowing students to understand and explain CT in everyday language. Lastly, the value of pursuing truth and facts was stressed, and it was highlighted that the teaching process should cover controversial topics, improving students' CT abilities by encouraging them to step out of their comfort zones and accept different perspectives.

Meanwhile, The CT in Chinese philosophy emphasizes a rationalistic method through seeking common ground thinking. Through a kind of transformative criticism, all thinking impurities that could potentially disrupt Hesheng are eliminated. Hesheng advocates for harmonious relationships between humans and nature, humans and other humans, and humans and society. In modern education, the integration of the concept of Hesheng with new methods in education reform further enhances students' CT. A phenomenological case study was conducted, revealing an overlooked but educational 'repair moment' in Chinese classroom. Zhao wanted to observe the invisible thinking of the students by observing their speech, gestures, and body movements through this 'repair moment' (Zhao, 2020). Through observations and interviews, the author explains the pedagogical significance of this 'repair moment', overturning teachers' localized (mis)belief, rescuing them from the moral-practical dilemma, and cultivating their critical pedagogical consciousness and students' CT (Zhao, 2020).

In modern education, Eastern and Western cultures stress the cultivation of CT. Carr-Chellman et al. (2020) suggested that education is not a standalone entity but intricately woven into the fabric of human society. Carr-Chellman proposed a curricular reform method rooted in constructivism, qualitative/interpretive research, systems theory, profound living/learning, and the notion of human flourishing. This method attempts to transcend the limitations imposed by technology on instructional design while breaking free from the intellectual barrenness of philosophy and theory.

Critical use of Technology

Today, Education is inseparable from digital technology. Educators should not reject digital culture; instead, they should adapt to it in accordance with the needs of more emancipatory learning. For instance, some teachers have begun to attempt gathering student feedback through methods such as written questionnaires, software, and videos (Roupa, 2021). Teachers use students' feedback to observe their learning effectiveness, deepen students' understanding and participation in concepts and debates, and improve CT skills through this process. Lindberg (2019) presents the idea that the new digital grammatisation has markedly transformed educational practices. It has progressively generated a context termed the posthuman situation, where digital technology in education is not just a tool but a part of an assemblage of human and nonhuman elements. Simply modernizing learning tools (or refusing to do so) is insufficient for nurturing individuation. The key is manifested in understanding how the above-described tools produce novel psychological and collective structures, such that new cultural and political contexts can be formed. Accordingly, digital technology should be constantly examined as an object of study, with attention and critical reflection.

In philosophy course, it is important for individuals to not only enhance CT based on technology but also to use technology critically. Krutka et al. (2022) suggested that technology is often used as a tool to explain social phenomena. Krutka suggests drawing on perspectives from technology criticism and proposes a framework of techno skepticism that educators and scholars can use to question narratives of technological progress and encourage comprehensive thinking about the effect of technology on human society. However, there is limited research in social studies on what and how students should learn about technology.

Technologicalization, from work to education, can be seen as inducing a loss of immediacy and a sense of rootlessness in human society, leading to a loss of knowledge and beliefs accumulated over millennia (Sakun and Mordous, 2019). Thwaites (2020) particularly emphasizes the changes brought about in our lives by AI and other advanced technologies. However, humans also should be vigilant about their impact on privacy, self, and identity. Humans should critically consider technology, understand its profound impact on our lives and ethical value, and find reasonable ways to respond(Cruickshank, 2020). For instance, TU Delft adopts a method that revolves around responsible research and innovation, design for values, and risk ethics. The above-mentioned theoretical frameworks are founded on the idea that technology inherently embodies values, thereby having the capacity to either advance or impede ethical values. Such methods encourage students to be proactive, think innovatively, and assume accountability for mitigating harm and promoting societal good through the technologies they contribute to developing (Van Grunsven et al., 2021, Veluwenkamp et al., 2022).

The absence of life experiences for machines and the inability to acquire human virtues through practical wisdom may explain the lack of humanness. It seems to confirm that virtues are unique to humans (Doherty, 2021). In Chinese Philosophy, a different relationship exists between cosmic technology (the unifications between cosmic and moral order) and morality, suggesting that our use of technology should conform to its numerical attributes while indicating its ethical essence. Besides, subsequent research encompasses a philosophy of thought as the future has already intertwined with our present existence by anticipating what lies ahead (Martini, 2022).

DISCUSSION

Overall, the research findings showed that technology contributed to the enhancement of CT tendency and CT skills in philosophy courses (Romanchuk and Romanchuk, 2021). Yet, the integration of technology was not without its challenges. Educators grappled with issues such as insufficient training, while students often struggle with discerning accurate information and an over-reliance on technological tools.

The enhancement in CT primarily manifests in terms of CT tendency and CT skills. This aligns with the main goals of philosophy, which include improving cognitive abilities such as the search for truth, open-mindedness, analytical skills, systematic thinking, self-confidence, curiosity, and cognitive maturity; the ability to analyze, interpret, reason, evaluate, and self-regulate. The ability to critically assess and synthesize information, reason logically, and question one's assumptions and biases, lies at the heart of both domains. This overlap reinforces the argument that philosophy, at its core, is a discipline fostering and encouraging CT (Lavrynenko et al., 2020).

Next, a significant impediment for educators in harnessing technology effectively in philosophy courses is their limited proficiency with these tools. The literature suggested that educators, already burdened with extensive responsibilities, often lack the time and resources for adequate technology training. To address these challenges, enhancing technology training and the proper use of technology are essential for effective classroom management (Irwin, 2019). Furthermore, for students, the challenges of using technology include a lack of information filtering ability and excessive reliance on technology. Online information varies widely, making it difficult for students to accurately discern and filter. Students' excessive reliance on technology platforms, such as AI, diminishes their ability for independent thinking, which is detrimental to the cultivation of CT (Romanchuk and Romanchuk, 2021).

The research suggested that establishing rules for technology use should be considered to overcome the challenges faced by educators, students, and society. Teachers should actively seek more training, especially in their roles as facilitators and in the methods for conducting philosophical discussions. Additionally, a safe technological environment is crucial for technology use. Creating a secure environment allows students to use

technology more freely and fairly, while also using this secure technological environment to set boundaries for students, preventing excessive use and becoming tools of technology.

CONCLUSION

Technology has emerged as a potent educational tool for bolstering CT. Research indicated that the most effective pedagogical strategies encompass the establishment of a secure technological milieu, the formulation of clear guidelines for technology utilization, and robust classroom management. However, it's imperative to strike a balance; while technology can be a boon, overdependence can be detrimental, reducing individuals to mere appendages of the very tools they employ. Future studies advocate for the adoption of technology-supported instructional models, facilitating their seamless integration into classroom settings. Furthermore, it's paramount to cultivate a technological environment that resonates with students' cultural nuances and cognitive stages, thereby optimizing the enhancement of their CT capabilities.

Conflicts of Interest

The authors do not have conflicts of interest related to this study.

REFERENCES

BACON, F. 1878. Novum organum, Clarendon press.

BANTWAL RAO, M. 2022. The Use of Examples in Philosophy of Technology. Foundations of Science, 27, 1421-1443.

BRAY, F. & HAHN, B. 2022. 'The Goddess Technology is a polyglot': a critical review of Eric Schatzberg, Technology: critical history of a concept. History and Technology, 38, 275- 316.

CHAN, N.-M., HO, I. T. & KU, K. Y. L. 2011. Epistemic beliefs and critical thinking of Chinese students. Learning and Individual Differences, 21, 67-77.

CHEN, L. & WANG, C. 2022. The Influence of Virtual Space on Contemporary Identity: The Perspective of Philosophy. Filosofija, Sociologija, 33, 32-39.

CHIN-YEE, B., NIMMON, L. & VEEN, M. 2023. Technical Difficulties: Teaching Critical Philosophical Orientations toward Technology. Teaching and Learning in Medicine, 35, 240-249.

CRUICKSHANK, J. 2020. Solidarity, critique and techno-science: Evaluating Rorty's pragmatism, Freire's critical pedagogy and Vattimo's philosophical hermeneutics. Human Affairs, 30, 577-586.

DEWEY, J. & ROGERS, M. L. 2012. The public and its problems: An essay in political inquiry, Penn State Press.

DOHERTY, L. 2021. Can Aristotelian virtue theory survive Fourth Order Technology? An ethics perspective. South African Journal of Philosophy, 40, 213-227.

DWYER, C. P., HOGAN, M. J. & STEWART, I. 2014. An integrated critical thinking framework for the 21st century. Thinking skills and Creativity, 12, 43-52.

EROL, H. 2021. Reflections on the 21st Century Skills into the Curriculum of Social Studies Course. International Journal of Education and Literacy Studies, 9.

GAN, F. & BAI, Q. 2023. Karl Marx's thoughts on critical pedagogy, reproduction, and aesthetic literacy in STEAM education and praxis. Educational Philosophy and Theory, 1-13.

GOLDBERG, D. E. 2008. What engineers Don't learn and why they Don learn it: And how philosophy might be able to help.

HEIDEGGER, M. 1977. The question concerning technology. New York, 214.

HUTTUNEN, R. & KAKKORI, L. 2021. Heidegger's critique of the technology and the educational ecological imperative. Educational Philosophy and Theory, 54, 630-642.

IMAD, M. 2021. What Would Socrates Think? Change: The Magazine of Higher Learning, 52, 17-21.

IRWIN, R. 2019. Heidegger and Stiegler on failure and technology. Educational Philosophy and Theory, 52, 361-375.

KRUTKA, D. G., METZGER, S. A. & SEITZ, R. Z. 2022. "Technology inevitably involves trade-offs": The framing of technology in social studies standards. Theory & Research in Social Education, 50, 226-254.

LAVRYNENKO, S. O., KRYMETS, L. V., LESHCHENKO, A. M., CHAIKA, Y. M. &

HOLOVINA, O. V. 2020. Purpose and features of teaching philosophical disciplines at tertiary educational institutions while training specialists of various knowledge areas. International Journal of Higher Education, 9, 321-331.

LEUNG, K. H. 2019. The Picture of Artificial Intelligence and the Secularization of Thought. Political Theology, 20, 457-471.

LINDBERG, S. 2019. Politics of digital learning—Thinking education with Bernard Stiegler. Educational Philosophy and Theory, 52, 384-396.

MA, H. 2021. Critical Thinking Dispositions of Undergraduate College Students in A Comprehensive University of Mainland China. International Journal of Higher Education, 10.

MARTINI, E. 2022. A quintuple helix model for foresight: Analyzing the developments of digital technologies in order to outline possible future scenarios. Front Sociol, 7, 1102815.

MARX, K. & ENGELS, F. J. T. S. M. L. P. 1967. The communist manifesto. 1848. 15, 9780822392583-049.

MAYS, W. 1952. Can machines think? Philosophy, 27, 148-162.

MITCHAM, C. 2020. The Ethics of Technology: From Thinking Big to Small—and Big Again. Axiomathes, 30, 589-596.

MOHER, D., LIBERATI, A., TETZLAFF, J., ALTMAN, D. G. & GROUP*, P. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine, 151, 264-269.

ODORCAK, J. & BAKOSOVA, P. 2021. Robots, Extinction, and Salvation: On Altruism in Human-Posthuman Interactions. Religions, 12, 17.

PEDERSEN, T. & JOHANSEN, C. 2020. Behavioural artificial intelligence: an agenda for systematic empirical studies of artificial inference. AI and Society, 35, 519-532.

PRONSKIKH, V. & SORINA, G. V. 2022. Expert Text Analysis in the Inclusion of History and Philosophy of Science in Higher Education. Science and Education, 31, 961-975.

ROMANCHUK, O. & ROMANCHUK, V. 2021. Artificial intelligence: «experimental philosophy» or a requirement of reality? Journal for Educators, Teachers and Trainers, 12.

ROUPA, V. 2021. Closing the Feedback Loop. Teaching Philosophy, 44, 319-338.

SAKUN, A. & MORDOUS, I. 2019. Digital Re-Evolution: Learning to be Human at Contemporary Society. Philosophy and Cosmology-Filosofiya I Kosmologiya, 22, 129-136.

SHESTAKOVA, I. G., BEZZUBOVA, O. V. & RYBAKOV, V. V. 2022. Philosophy in a technical university: development strategies in the digital age. Perspektivy Nauki i Obrazovania, 55, 186-199.

STIEGLER, B. 1998. Technics and time, 1: The fault of Epimetheus, Stanford University Press.

SWIERSTRA, T., LEMMENS, P., SHARON, T. & VERMAAS, P. 2022. The Technical Condition: The Entanglement of Technology, Culture, and Society, Amsterdam: Boom uitgevers.

THORP, H. H. 2023. ChatGPT is fun, but not an author. Science, 379, 313.

THWAITES, T. 2020. Technologizing the human condition: hyperconnectivity and control. Educational Philosophy and Theory, 53, 373-382.

VAN GRUNSVEN, J., LAVINIA;, M., STONE, T., ROESER, S. & DOORN, N. 2021. How to Teach Engineering Ethics A Retrospective and Prospective Sketch of TU Delft's Approach to Engineering Ethics Education.pdf>. Advances in Engineering Education, 1-11.

VELUWENKAMP, H., CAPASSO, M., MAAS, J. & MARIN, L. 2022. Technology as Driver for Morally Motivated Conceptual Engineering. Philosophy and Technology, 35.

WIID, J. A., CANT, M. C. & DU BRUYN, M. 2020. The relevance of traditional personal teaching theories in a technological advanced educational environment. Pertanika Journal of Social Sciences and Humanities, 28, 1663-1674.

XUE, J. & TONG, Z. 2022. The implications of the thinking paradigms of British neo- Marxism. Educational Philosophy and Theory, 54, 1796-1802.

YAN, H. 2022. Reflective, Critical, and Reconstructing Contemporary Chinese Ethics. Frontiers of Philosophy in China, 17, 98-133.

ZHAO, W. 2020. Epistemological flashpoint in China's classroom reform: (How) can a 'Confucian do-after-me pedagogy' cultivate critical thinking? Journal of Curriculum Studies, 52, 101-117.

ZOU, D., XIE, H. & WANG, F. L. 2022. Effects of technology enhanced peer, teacher and self-feedback on students' collaborative writing, critical thinking tendency and engagement in learning. Journal of Computing in Higher Education.