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The impact of education trajectory, epistemological beliefs, and cultural beliefs on critical thinking disposition for East Asian learners

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Abstract: East Asian students in the West have been persistently perceived as lacking critical thinking skills, but research findings supporting this claim remain inconsistent. Some scholars argue that some East Asian students' attitude towards criticality is restrained by their adherence to Confucian concepts, while others contend that certain belief systems in the culturally diverse East Asian region support the cultivation of criticality. This study investigates the relationship between East Asian learners' educational trajectory, epistemological and cultural beliefs, and their critical thinking disposition. International East Asian students (n = 118) at UK universities completed a questionnaire via Qualtrics. Multiple regression analysis indicated that: 1) educational duration in the UK was a significant predictor of critical thinking disposition; 2) epistemological beliefs in simple knowledge, certain knowledge, omniscient authority, and quick learning significantly and negatively predicted overall critical thinking disposition; simple knowledge, certain knowledge, and omniscient authority were significant predictors of misconceptions in criticality, which can hinder the development of critical thinking; 3) Restrictive Confucianism significantly and negatively predicted confidence, misconception, and overall criticality disposition, whereas Benevolent Confucianism positively predicted confidence and valuing in criticality disposition. Additionally, 4) Taoism significantly predicted valuing in criticality, suggesting Taoist tenants like embracing contradiction, might be beneficial in cultivating criticality. These findings may have the potential to inform the development of culturally sensitive pedagogical practices, and contribute to the movement of education decolonization in the Western Anglo-Americano systems.

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1 Introduction

Despite the common perception of East Asian students' outstanding ability to thrive in Science, Technology, Engineering, and Mathematics (STEM) related subjects, this group of students have also been persistently alleged to be less competent in displaying critical thinking (CT) skills (Lun et al. 2010; Roether 2003). However, recent research challenges this narrative. A systematic review conducted by Fan and See (2022) suggested that cross-cultural studies comparing ethnically Chinese students' criticality with their Western counterparts not only present inconsistent findings but also suffer from methodological inadequacies. Crucially, their review highlights an important conceptual distinction – while evidence does not consistently support the claim that East Asian students have lower CT *skills*, it is more robust in suggesting that they exhibit lower *disposition* toward criticality (Fan and See 2022). Disposition is defined as the internal tendency that leads to one's beliefs or actions (Facione et al. 1995). In the context of criticality, Duro et al. (2013) suggested that to help students develop CT skills alone is not sufficient: cultivating a 'disposition' towards criticality is fundamental, as students must understand the value and expectations associated with CT first, before effectively applying it. So far, existing research is largely concentrated on interrogating factors influencing East Asian students' CT skills, but less research has investigated predictors of these students' disposition towards CT. Therefore, this study aims to investigate the underlying factors shaping East Asian learners' disposition towards CT.

This study aims to examine the influence of educational trajectory, epistemological beliefs, and cultural beliefs on their CT disposition, guided by prior literature. More specifically, the interests of education trajectory comes from the recognition that transitioning from an East Asian to a Western education system signifies a fundamental shift in learning environments, instructional styles, and academic expectations. Prior studies have suggested that engaging in cross-cultural studies can foster CT disposition (Kakai 2000), and Chinese students report experiencing a shift from having a habit of accepting a single correct answer to appreciating multiple perspectives and solutions after a one-year master degree in the West (Tao 2022). However, empirical evidence remains inconclusive on whether transitioning from an East Asian to a British education system, and prolonged exposure to it, influences CT disposition. Regarding the focus on cultural beliefs, most prior research has primarily framed Confucianism as a barrier to criticality, relying on theoretical assumptions rather than capturing cultural beliefs in a positivistic way and

empirically testing its influence on criticality. Additionally, these studies often overlook the potential influence of other East Asian cultural traditions, such as Taoism and Buddhism, which may foster critical thinking in different ways (Lin et al. 2021; Paton 2005; Tian and Low 2011). Regarding epistemological beliefs, previous research has extensively demonstrated a link between certain epistemological views, such as perceiving knowledge as fixed and absolute, and weaker two-sided thinking skills (Chan et al. 2011; Phan 2008). Similarly, numerous studies have shown that engaging in CT exercises can reshape one's perception of knowledge (Elhamifar and Farnam 2019; Ulu Kalın and Baydar 2020). However, far less research has examined epistemological beliefs as a predictor of CT disposition, rather than as an outcome influenced by CT engagement.

Overall, this research aims to address the aforementioned research gaps by capturing the unique trajectory of transitioning from an East Asian to a British education system, and the effects of varied degrees of prolonged exposure to it. The findings might offer insight into whether shifts in learning environments and academic expectations could foster a greater inclination toward CT or whether deeply ingrained cognitive and cultural patterns remain resistant to change. The findings from this research may have important implications for the development of culturally sensitive pedagogical practices, and contribute to the movement of education decolonization in the Western Anglo-Americano systems.

1.1 Critical thinking in education: an East-West divide?

While the definition of CT remains contested, it can be understood as 'purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, along with the explanation of the evidential, conceptual, methodological criteriological, and contextual considerations upon which that judgement is based' (Facione et al. 1995, p. 3). CT is highly valued in Western education, tracing its philosophical roots to ancient Greece with thinkers such as Socrates, Plato, and Aristotle who emphasised the importance of evaluating information to make reasoned judgments (Lewis and Smith 1993). This tradition has evolved into major frameworks that shape the rationale behind modern education practices, notably Bloom's taxonomy, which distinguishes lower-order thinking that involves understanding material and recalling facts, from higher-order thinking which encompasses analysis, evaluation, synthesis, and creation (Bloom et al. 1956; Miri et al. 2007). In addition, CT is also regarded as a significant part of civic literacy, contributing to Western ideals of democracy, where citizens are expected to make rational decisions founded on evaluation, rather than to unquestioningly deferring to authority (Kahne and

Bowyer 2017; Miri et al. 2007). As a result, educational approaches in the West are increasingly tailored to cultivate criticality.

East Asian students are often portrayed as the 'model minority' ethnic group due to their outstanding academic performances in STEM disciplines; however, they have also been repeatedly reported as lacking CT skills (Durkin 2011; Loyalka et al. 2021). This perception is partially derived from Western educators' observation of this demographic of students' poor performance in dialectical essays and reported challenges in engaging in tasks involving group reflexive discussions (Fakunle et al. 2016). In some other cases, cross-cultural studies were conducted to compare participants' performance on standardised CT assessments. For instance, in Lun et al. (2010), Chinese students performed worse than New Zealand European students on the Halpern Critical Thinking Assessment (HCTA). Similarly, Roether (2003) found that Korean students performed lower on the California Critical Thinking Skills Test (CCTST) than American students.

However, a systematic review conducted by Fan and See (2022) refuted such rhetoric to associate this demographic of students with criticality deficiency. Specifically, the review suggested, out of all the synthesised cross-cultural studies which focused on the comparison of CT skills, a third reported Chinese students to outperform other nationals. For instance, in Ku et al. (2006), American students performed worse than Hong Kong students in the HCTA. Similarly, Hu et al. (2020) found British students to underperform in inferential tasks in the Watson-Glaser Critical Thinking Appraisal, compared to their Chinese counterparts. However, Fan and See (2022) did identify that among the studies that focused on disposition towards CT, over half suggested Chinese students were outperformed by students in the West. Therefore, it is imperative not only to challenge the prevailing discourse around the East-West divide in criticality, but also to shift research attention towards examining CT disposition rather than solely skill possession. In addition, a more inclusive scope is needed, extending beyond the predominant focus on Chinese students to encompass learners from other East Asian contexts where similar difficulty in criticality have been purported.

1.2 Predictors of East Asian students' criticality

Disposition towards criticality can be understood as an internal tendency that guides individuals' beliefs and attitudes regarding CT (Facione et al. 1995). Several underlying factors influencing this tendency among East Asian students have been identified in past research, including English proficiency, belief systems, and institutional practices. Firstly, some researchers suggest that limited English proficiency is a significant barrier to developing CT for international students from regions like

Mainland China, Japan, and South Korea – areas without prominent colonial history necessitating English fluency (Floyd 2011; Huang 2008). This linguistic challenge, compounded by the ambiguous definition of CT, makes it difficult for these students to fully understand both the concept of CT and the specific expectations Western exam systems have for demonstrating CT in academic work (Johnson 1992; Paton 2005). Educational dialogue plays an essential role in supporting CT development; however, this process could be hindered with the language barrier (Fakunle et al. 2016).

1.2.1 Cultural beliefs

Another prominent factor that drew research attention is the impact of belief systems on CT acquisition. Developmental psychologist Clinchy (1994) contends that a main psychological mechanisms behind CT can be equated to detachment (or separate knowing), the ability to hold oneself aloof from the object of analysis. Atkinson (1997) asserted that cultural beliefs can significantly affect how individuals navigate such a psychological process, especially how they define themselves in relation to their social reality. In individualist cultures prevalent in the West, the concept of self is often defined independently of group identity, allowing for a distinct sense of individual autonomy and objective stands. Conversely, in collectivist cultures prevalent in East Asia, individual identity is more deeply intertwined with group identity, making it challenging for individuals to conceptualise their self-identity separately from their affiliations with groups (Matsumoto 1988). Clancy (1986) observed that Japanese infants are often socialised into adhering to social values of conformity derived from Confucianism, with their mothers showing a tendency to remind them when their behaviours are socially deviant. Similarly, Tam et al. (2023) drew evidence from Hong Kong and found that adherence to Confucian values like obedience to authority to have a direct negative impact on Hong Kong students' development of creativity, leading to knowledge fixation (over-reliance on pre-existing assumptions). While Tam et al. (2023) did not extend their research scope to criticality, knowledge fixation can be interpreted as contradictory to the detachment psychological mechanism behind criticality as theorised by Clinchy (1994).

Throughout the literature review for this study, it was evident that few studies have directly examined the influence of Confucianism on students' criticality while explicitly controlling for adherence to Confucian values as a variable. A common practice has been to compare students' performance on criticality assessments, from an Eastern country and a Western country, as previously discussed in Fan and See (2022). However, the limitation of this approach is that merely collecting data from two cultures does not sufficiently isolate Confucianism as a variable. A more empirically robust practice might involve the utilisation of an instrument specifically designed to measure cultural beliefs as advocated by positivist researchers, that

objective reality can exist independently of the subject of examination (Guba and Lincoln 1994). Moreover, East Asia is composed of many cultural belief systems other than Confucianism, and that other prominent schools of thought to which East Asians are ascribed to may cultivate criticality (Paton 2005; Tian and Low 2011). For instance, in the Taoism tradition, it is emphasised that contradicting ideas can work together to promote growth (Lin et al. 2021). This tradition of embracing contradictions aligns with the concept of cognitive disequilibrium, which has been deemed an important precondition for developing CT and scientific reasoning (Lehman et al. 2011). Similarly, Zhang (2018) contends that significant overlaps exist between Buddhist ethics and CT ideologies, particularly through ethics that promote non-attachment to subjective views, which fosters openness to diverse perspectives. Even Confucianism, widely criticised for promoting obedience at the expense of originality, actually encompasses elements that could support the development of CT. Central to Confucian teaching is the concept of benevolence, which encourages empathy and consideration of multiple perspectives that is fundamental to developing CT (Lin et al. 2021). Therefore, the present study seeks to further explore how various cultural beliefs in East Asia might predict CT disposition.

1.2.2 Epistemological beliefs

Another crucial dimension in investigating how belief systems impact CT is the role of epistemological beliefs, which refers to students' understanding of knowledge and their perceived priorities in knowledge acquisition (Whitaker 2020). One of the leading frameworks in the study of epistemological beliefs was developed by Schommer (1990). This framework encompasses five distinct dimensions that address the structure, certainty, and source of knowledge, along with the control and speed of knowledge acquisition (Schommer 1990). Extensive research has demonstrated that engaging in CT exercises can serve to change epistemological beliefs (Elhamifar and Farnam 2019; Ulu Kalın and Baydar 2020). However, less research exists to examine how epistemological beliefs may predispose individuals to develop CT skills, when epistemic disposition has been suggested to be a 'neglected facet of critical thinking' (King and Kitchener 1994, p.1; see also Greene and Yu 2016). So far, Phan (2008) has found certain epistemological beliefs to positively predict reflective thinking. In addition, research from Hong Kong indicates that undergraduate students who perceive knowledge as certain tend to demonstrate weaker two-sided thinking and a more pronounced inclination to overlook counterarguments (Chan et al. 2011). Therefore, the present study seeks to further explore how epistemological beliefs might predict CT disposition.

1.2.3 Other factors of potential importance

Institutional practice is an additional factor affecting East Asian students' internal tendency to develop criticality. Scholars from South Korea argued that unlike the child-centred approach commonly practiced in the West, the reliance on teacher-centred, rote-memorization practices in Korean classrooms significantly hinders the valuing of CT in their educational system (McGuire 2007). Similarly, Zhang (2016) concluded from qualitative evidence that the heavily state-regulated education curriculums which disregards alternative sources of knowledge is potentially the main obstacle preventing Chinese students from developing CT. A recent cross-cultural research comparing longitudinal data on students' CT acquisition at university level revealed that first-year STEM-majored students in China exhibit similar levels of CT skills compared to their U.S. counterparts; however, by their senior year, they were significantly outperformed by U.S. students (Loyalka et al. 2021). While some might be surprised with the similar level of CT competency at baseline, considering the previously illustrated difference in East-West curriculums, it is important to note that Loyalka et al. (2021) only recruited students from STEM disciplines, meaning participants from both countries may possess comparable habits in scientific reasoning regardless of the influence of wider institutional practices, even at baseline. Nevertheless, the disparity in CT acquisition throughout the longer trajectory of undergraduate studies indicates American universities may be more effective at enhancing CT for students.

There is clearly great potential in interrogating how the change of education trajectory, from an Eastern context to a Western one, may affect East Asian learners' criticality. Kakai (2000) found engaging in cross-cultural study helps fostering CT disposition in Japanese students. In a qualitative research that tracked international Chinese students' subjective transformation throughout their one-year master in the UK, Tao (2022) found CT to be the most desired skill Chinese students wish to acquire from the UK education system at the commencement of their degree, and most of them experienced a noticeable shift from a single-perspective mindset to a CT-style mindset as the degree ended. Therefore, the present study seeks also to expand on Kakai (2000) and Tao (2022), to understand whether educational duration in Western education system affects international East Asian learners' criticality.

1.3 Summary, rationale, and research questions

To summarise, this research seeks to address the research gap in understanding the factors influencing East Asian students' disposition towards CT. The literature review identified a lack of robust research to holistically investigate the relationship

between criticality and prominent East Asian cultural traditions beyond the scope of Confucianism. In addition, while the impact of CT on epistemological beliefs are relatively well understood, the reverse (treating epistemological belief as a predictor of CT) is less addressed. Moreover, previous research has primarily concentrated on comparing students' criticality in an Eastern and a Western context, overlooking the potential impact of transitioning from an Asian educational system to a Western one on the critical thinking abilities of East Asian students. Taken together, this study investigates the impact of education trajectory, and epistemological and cultural beliefs, on international East Asian learners' CT disposition. Guided by previous literature, three research questions were formulated:

RQ1: To what extent does educational duration in the UK influence international East Asian learners' disposition towards CT?

RQ2: After controlling for educational duration in the UK, which (if any) of the epistemological belief facets predict CT disposition among international East Asian students?

RQ3: After controlling for educational duration in the UK, which (if any) of the cultural beliefs predict CT disposition among international East Asian students?

2 Methods

2.1 Design

The present study employs a cross-sectional, correlational design, using an online questionnaire disseminated via Qualtrics (https://www.qualtrics.com/). The criterion (outcome) variable of this research was international East Asian learners' CT disposition measured by the Critical Thinking Toolkit (Stupple et al. 2017). Based on the literature review, there were three principal predictor variables: education trajectory, epistemological beliefs, and cultural beliefs. Educational trajectory was measured by the educational duration East Asian learners' had spent in the UK (hereafter educational duration in the UK). Taking a positivist approach which emphasises the objective, quantifiable reality of belief systems (Guba and Lincoln 1994); epistemological beliefs was measured by the Epistemological Belief Inventory (Schraw et al. 2012) and cultural beliefs was measured by the Three Teachings of East Asia (Lin et al. 2021).

2.2 Sample and procedures

A total of 118 international students enrolled in UK universities who identify as ethnically East Asian were recruited through a combination of convenience and self-selective sampling techniques, given the sampling method's advantageous affordability and quick accessibility (Etikan et al. 2016). Specifically, a participant recruitment poster comprising the study's aim, inclusion criteria, the researcher's contact information, and a QR code leading to a Qualtrics survey, was disseminated via online platforms such as X (formerly Twitter), LinkedIn, Instagram, and on the university's departmental research participation pool. The poster was also physically disseminated around the university campus. The Qualtrics survey commenced with an information sheet outlining the objectives of the study, expectations from participants, and their rights. This was followed by a consent form. After signing informed consent, participants were expected to answer four demographic questions about their student status, gender, primary ethnicity, and years spent in UK education systems. Following that, there were 28 items on their epistemological beliefs, 36 items on their cultural beliefs, and 27 items on their CT disposition. Participants who failed to complete the questionnaire were excluded (n = 19), leaving a relatively reduced final sample for data analysis (n = 99). The sample consisted of international East Asian students identified as ethnically Chinese (n = 87), Korean (n = 4), Japanese (n = 3), Singaporean (n = 3), Burmese (n = 1), and Mongolian (n = 1). Participants studied in the UK for between 1 and 8 years (M = 3.01, SD = 1.81). Approximately 80.5 % were female (n = 81), and 19.5 % were male (n = 18).

Ethical approval was obtained from the Institute of Education Research Ethics Committee at UCL. Prior to the study, all participants provided informed consent. Upon completion, participants received a debriefing. Participation was anonymous, and participants had the right to withdraw from the study at any point prior to clicking the survey "submit" button. All data were strictly used for research purposes and were accessible solely to the researchers.

2.3 Measures

2.3.1 Demographic questions

Demographic questions captured participants' gender, primary ethnic identity, student status, and educational duration in the UK.

2.3.2 Critical thinking disposition

Critical Thinking Toolkit (CriTT). Disposition towards CT was measured by the CriTT developed by Stupple et al. (2017), which indicates student perceptions of and attitudes towards CT across three dimensions: *confidence* (e.g., 'I can identify the structure of arguments without being distracted by their content'), *valuing* (e.g., 'critical thinking is essential in higher education'), and *misconception* (e.g., 'critical thinking is when you describe what is wrong with something'). The scale consisted of 27 items; for each item, a Likert-scale response format was used, with participants rating themselves on a scale of 1 (strongly disagree) to 10 (strongly agree). The overall disposition towards CT is indicated by calculating the sum of the three factors, with high scores indicative of greater levels of positive perceptions towards CT, which is the foundation for developing greater competency in CT. Subscales were calculated by computing the mean of all affiliated items, and analysed separately to explore whether they could separately contribute to the understanding of variance in CT. Higher scores on CriTT *Confidence,* CriTT *Valuing, and* CriTT *Misconception* respectively reflect greater belief in self-competency in CT, higher recognition of the importance of CT, and stronger avoidance of misapprehension of CT. Prior research has demonstrated the validity of the CriTT via confirmatory factor analysis (Lailiyah and Wediyantoro 2021). In this study, Cronbach's alpha for the overall scale was 0.81; Cronbach's alpha for the confidence scale was 0.90; Cronbach's alpha for the valuing scale was 0.63; Cronbach's alpha for the misconception scale was 0.64.

2.3.3 Epistemological beliefs

Epistemological Belief Inventory (EBI). Epistemological beliefs were measured by the EBI developed by Schraw et al. (2012), following the five-factor framework that Schommer (1990) created to depict epistemic beliefs, from naive to sophisticated, on a continuum.[1] The EBI consists of 28 items to assess beliefs in *simple knowledge* (e.g., 'most things worth knowing are easy to understand'), *certain knowledge* (e.g., 'absolute moral truth does not exists'), *innate ability* (e.g., 'people's intellectual potential are fixed at birth'), *omniscient ability* (e.g., 'parents should teach their children all there is to know about life'), and *quick learning* (e.g., 'Students who learn things quickly are

1 There are other measures of epistemic beliefs, such as the 63-item Epistemological Questionnaire (EQ; Schommer 1990) and the 38-item Epistemological Beliefs Survey (EBS; Wood and Kardash 2012). However, for this study EBI was chosen over EQ and EBS because prior research suggest EQ does not fully align with the five-factor framework and EBS has reliability inconsistencies (DeBacker et al. 2008; Whitaker 2020). In addition, the length of EBI is more suitable for the non-incentive nature of the study. Longer surveys could contribute to decreased data quality and increased respondent fatigue (Rolstad et al. 2011).

the most successful'). Items are presented as 5-point Likert scales from 1 (Strongly Disagree) to 5 (Strongly Agree), and responses for each of the five scales on the EBI are summed to create a score for each individual factor. The EBI has been well-validated by previous research in multiple cultural contexts (Cam et al. 2012; Teo 2013; Wang et al. 2013). In this study, Cronbach's alpha for the *simple knowledge* scale of EBI was 0.64; Cronbach's alpha for the *certain knowledge* scale of EBI was 0.53; Cronbach's alpha for the *innate ability* scale of the EBI was 0.73; Cronbach's alpha for the *omniscient authority* scale of EBI was 0.54; and Cronbach's alpha for the *quick learning* scale of EBI was 0.65.

2.3.4 Cultural beliefs

Three Teachings of East Asia (TTEA). Cultural beliefs were measured by the shortened version of the TTEA inventory created by Lin et al. (2021). The scale consisted of 36 items to assess belief in *Buddhism* (e.g., 'Strove to behave in a way that would promote positive karma'), *Taoism* (e.g., 'Different points of view can be equally valid'), and *Restrictive Confucianism* (e.g., 'I keep silent about disagreements to avoid conflict with others'), and Benevolent Confucianism (e.g., 'I strive to take the higher ground and be the better person'). Each item is a statement of cultural belief, and participants indicate the extent they agree with each statement on a Likert-scale of 1 (Not at all) to 6 (Completely). TTEA was chosen over other measures of cultural beliefs due to its unique scope to capture all three major schools of thought prevalent in East Asia.[2] It has not undergone additional confirmatory factor analysis beyond those conducted by its developers where over 2,000 sample participants from Japan, Mainland China, and Taiwan were recruited (Lin et al. 2021). Nonetheless, the present study reports high Cronbach's alpha values for all facets, indicating robust internal consistency: Cronbach's alpha for the Buddhism scale of TTEA was 0.82; Cronbach's alpha for the Taoism scale of TTEA was 0.78; Cronbach's alpha for the Restrictive Confucianism scale of the TTEA was 0.83; and Cronbach's alpha for the Benevolent Authority scale of TTEA was 0.85.

2.4 Data analysis

A priori power analysis was performed to predict an effect size of 0.15, power of 0.80, and an alpha level set at $p < 0.05$. This analysis determined that a total of 118

2 Alternative measures of Asian cultural beliefs such as the Eastern–Western Perspective Scale (EWPS; Kim 2004). However, the present study did not employ the EWPS because its items are limited to capturing only certain dimensions of Confucianism.

participants were needed for the study. However, due to data loss caused by participants' incompletion of questionnaire, only 99 data were used for data analysis, which was performed using IBM SPSS Statistics version 29, at the 5 % significance level. Analyses for central tendency and dispersion were performed for all core variables. Simple linear regression analyses were used to explore the impact of educational duration in the UK on CT dispositions. Multiple regression analyses were subsequently employed to explore the extent to which epistemological and cultural belief significantly influence CT dispositions of international East Asian students, after controlling for the variance accounted for by educational duration in the UK. Prior to analysis, it was confirmed that the data satisfied the assumptions of multiple regression, including linearity, homoscedasticity, independence of errors, and normality of residuals.

3 Results

This study set out to examine the impact of educational duration in the UK, epistemological beliefs, and cultural beliefs on East Asian learners' critical thinking disposition. Descriptive statistics for all substantive variables are presented in Table 1.

Table 1: Summary of descriptive statistics of substantive variables.

Variable	Mean	SD	Skewness	Kurtosis
Educational duration in the UK	3.02	1.80	1.24	0.87
CriTT (overall)	15.65	1.38	0.26	−0.22
CriTT (confidence)	3.77	0.54	0.08	−0.48
CriTT (valuing)	4.27	0.49	−0.94	0.99
CriTT (misconception)	7.60	1.12	−0.12	−0.78
EBI (simple knowledge)	2.86	0.71	0.03	−0.16
EBI (certain knowledge)	2.13	0.51	0.24	−0.34
EBI (innate ability)	3.10	0.70	−0.10	−0.30
EBI (omniscient authority)	2.54	0.64	−0.14	−0.58
EBI (quick learning)	2.29	0.66	1.01	1.83
TTEA (buddhism)	2.87	0.79	−0.09	−0.77
TTEA (taoism)	3.98	0.76	−0.19	−0.20
TTEA (restrictive confucianism)	3.10	0.74	−0.45	0.41
TTEA (benevolent confucianism)	4.53	0.91	−0.35	−0.82

Skewness and kurtosis values suggest the degree of asymmetry and tail heaviness in the distribution, with values close to zero indicating a normal distribution and values exceeding the absolute value of 1 reflecting a moderate deviation from normality. This is relevant for the choice of statistical tests.

It can be seen from Table 1 that the mean educational duration in the UK was approximately 3 years (M = 3.02, SD = 1.80). This aligns with the typical duration of undergraduate studies at British universities. Skewness measure of 1.21 shows a moderately positively skewed distribution, indicating there are more participants with educational duration below the mean. This was anticipated by the research team as convenience sampling was employed for the recruitment of participants to the study. The mean EBI scores suggest participants had relatively higher beliefs in *Innate Ability* (M = 3.10, SD = 0.70), compared to other EBI facets. The mean TTEA scores indicates participants had relatively higher beliefs in *Benevolent Confucianism* (M = 4.53, SD = 0.91), compared to other TTEA facets. All other variables displayed skewness values within a reasonable range, indicating that their distributions approximate normality.

To address RQ1, four simple linear regression analyses were conducted. Educational duration in the UK served as the predictor variable, whereas the various facets of the CriTT – *overall, confidence, valuing, and misconception* – were assessed as criterion (outcome) variables. Findings are presented in Table 2.

It can be seen from Table 2, that educational duration in the UK was a significant positive predictor of CriTT *overall*, $\beta = 0.27$, t (1, 97) = 2.77, p < 0.01, CriTT *confidence*, $\beta = 0.23$, t (1, 97) = 2.27, p = 0.03, and CriTT *misconception*, $\beta = 0.23$, t (1, 97) = 2.32, p = 0.02. However, educational duration did not significantly predict CriTT *valuing*, $\beta = -0.00$, t (1, 97) = −0.07, p = 0.94. Taken together, the results indicate that more time spent studying in the UK was associated with heightened CT.

To answer RQ2, multiple regression analyses were conducted to predict the *overall* and sub-facets of CT disposition (*confidence, valuing, misconception*) from epistemological beliefs, controlling for the educational duration in the UK. The rationale behind controlling for educational duration was to ensure that any significant findings regarding cultural beliefs are not confounded by the educational duration in UK, providing a more accurate depiction of how epistemological beliefs might impact on CT dispositions.

Table 2: Summary of simple linear regression analyses predicting critical thinking dispositions from educational duration in the UK.

	B (SE)	β	t	p
CriTT overall	0.21 (0.08)	0.27	2.78	0.007[b]
CriTT confidence	0.07 (0.03)	0.23	2.27	0.03[a]
CriTT valuing	−0.00 (0.03)	−0.01	−0.07	0.94
CriTT misconception	0.14 (0.06)	0.23	2.32	0.02[a]

CriTT = Critical Thinking Toolkit. B = Unstandardized regression coefficient; SE = Standard Error; β = Standardised Beta coefficient; [a]$p < 0.05$. [b]$p < 0.01$.

It can be seen from Table 3 and Figure 1, that while educational duration in the UK (when considered alone) was a significant positive predictor of CriTT *overall*, *confidence*, and *misconception* (Model 1), it was unable to explain unique variance in any of the CT dispositions when considered alongside epistemological beliefs (Model 2). Moreover, among epistemological beliefs, *simple knowledge* was a significant negatively predictor of CriTT *overall* (β = −0.22, p = 0.03) and *misconception* (β = −0.32, p < 0.01). *Certain knowledge* was a significant negative predictor of CriTT *overall* (β = −0.19, p = 0.05) and *misconception* (β = −0.24, p = 0.02). *Omniscient authority* was a significant negative predictor all facets of CT disposition except *valuing*, with the strongest negative impact on CriTT *overall* (β = −0.25, p < 0.01). In contrast, *Innate ability* showed no significant predictive value for any of the CriTT facets at the 0.05 level. *Quick learning* was only predictive for CriTT *overall* (β = −0.23, p = 0.05).

To answer RQ3, another multiple regression analyses was conducted to predict the *overall* and the sub-facets of CT disposition (*confidence, valuing, misconception*) from East Asian cultural beliefs, after controlling for educational duration in the UK (see Table 4 and Figure 2).

It can be seen from Table 4, that educational duration in the UK was able to explain unique variance in CriTT *overall* (β = 0.24, p = 0.02) and *confidence* (β = 0.19, p = 0.04) when considered alongside cultural beliefs (Model 2). Moreover, among cultural beliefs, Buddhism was found to have minimal impact across all facets of CT disposition, with non-significant beta coefficients (*overall* β = −0.03, p = 0.78; *confidence* β = 0.00, p = 0.98; *valuing* β = −0.02, p = 0.84; *misconception* β = −0.03, p = 0.80). Taoism showed a mixed influence. It was not a significant predictor of CriTT *confidence, misconception*, and *overall*, but was a significant positive predictor of CriTT

Table 3: Standardised beta coefficients predicting criticality from epistemological beliefs.

	CriTT overall	CriTT confidence	CriTT valuing	CriTT misconception
Covariate				
Educational duration in the UK (model 1)	0.27[b]	0.23[a]	−0.01	0.23[a]
Educational duration in the UK (model 2)	0.06	0.15	−0.02	0.02
Epistemological beliefs				
Simple knowledge	−0.22[a]	−0.07	0.20	−0.32[b]
Certain knowledge	−0.19[a]	0.06	−0.07	−0.24[a]
Omniscient authority	−0.25[b]	−0.15	−0.12	−0.18[a]
Innate ability	0.07	0.05	0.10	0.02
Quick learning	−0.23[a]	−0.18	−0.17	−0.13

CriTT = Critical Thinking Toolkit. [a]p < 0.05, [b]p < 0.01.

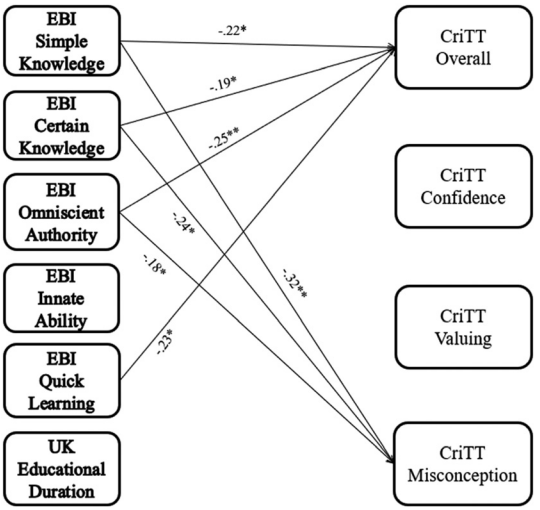

Figure 1: Predicting critical thinking dispositions from epistemological Beliefs.

Table 4: Standardised beta coefficients predicting critical thinking dispositions from cultural beliefs.

	CriTT overall	CriTT confidence	CriTT valuing	CriTT misconception
Covariate				
Years in UK (model 1)	0.27[b]	0.23[a]	−0.01	0.23[a]
Years in UK (model 2)	0.24[a]	0.19[a]	0.03	0.18
Cultural beliefs				
Buddhism	−0.03	0.00	−0.02	−0.03
Taoism	−0.15	0.15	0.23[a]	0.01
Restrictive confucianism	−0.32[b]	−0.32[b]	0.04	−0.26[a]
Benevolent confucianism	0.18	0.36[b]	0.24[a]	−0.05

CriTT = Critical Thinking Toolkit. [a]$p < 0.05$; [b]$p < 0.01$.

valuing (β = 0.23, p = 0.03). Restrictive Confucianism was found to be a significant negative predictor of CriTT *overall* (β = −0.32, p < 0.01), *confidence* (β = −0.32, p < 0.01), and *misconception* (β = −0.26, p < 0.05). Benevolent Confucianism was found to be a significant positive predictor of *confidence* (β = 0.36, p < 0.01) and *valuing* (β = 0.24, p = 0.03) in CT dispositions.

To summarise, after controlling for educational duration in the UK, higher epistemological beliefs in *simple knowledge, certain knowledge, omniscient authority,* and *quick learning* led to lower overall CT disposition. Higher beliefs in *simple knowledge, certain knowledge* and *omniscient authority* also led to lower tendencies to spot misconceptions in CT. As for cultural beliefs, higher adherence to Taoism led to

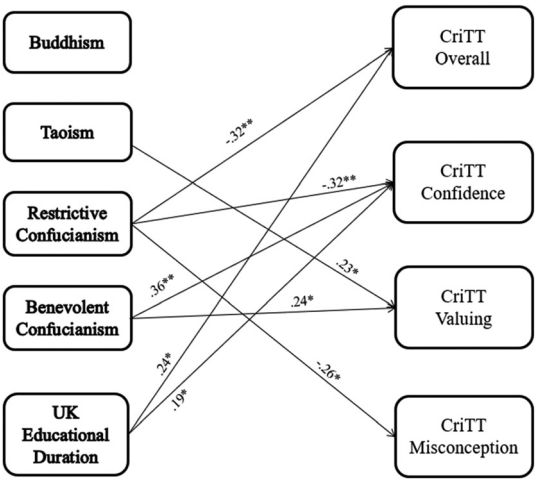

Figure 2: Predicting critical thinking dispositions from cultural beliefs.

higher recognition of CT's importance; higher adherence to Restrictive Confucianism led to lower overall CT disposition, lower confidence in CT and lower tendencies to spot misconceptions in CT; higher beliefs in Benevolent Confucianism led to more confidence and valuing in CT.

4 Discussion

This study set out to examine the influence of educational duration in the UK, in addition to epistemological and cultural beliefs, on international East Asian students' disposition towards CT. In relation to RQ1, it was found that educational duration in the UK was positively associated with CT dispositions. These findings are similar to that of Tao (2022), who demonstrated through longitudinal qualitative data that international Chinese students experienced a noticeable transformation from a single-perspective mindset to a CT-styled mindset throughout the duration of their one-year UK masters. The present study provides quantitative evidence to support Tao's (2022) work, with a special focus on CT disposition and with participants from a wider demographic in addition to a longer time-span, supporting the idea that as time spent in the UK increases, students who are originally from East Asia become more disposed to engage with criticality. In addition, the findings of this study showed that educational duration in the UK was not a significant predictor of participants' valuing in CT. It is reasonable to deduce from this finding that the recognition level of CT's importance does not apply in vastly different ways to newly arrived students and those who have been in the UK for a longer duration. This again

concurs with Tao's (2022) findings, whereby even at the beginning of their study, nearly half of the international Chinese students deemed CT to be a top desired skill to acquire in the UK education system.

In relation to RQ2, it was found that after controlling for educational duration in the UK, simple knowledge, certain knowledge, omniscient authority, and quick learning were significantly (and negatively) associated with overall CT disposition, and fewer misconceptions in CT. These findings were in line with Phan (2008), who found that naïve epistemological beliefs of sophisticated knowledge can predict reduced motivation to engage with reflective thinking. Furthermore, in accordance with findings of Chan et al. (2011), which suggest that students' beliefs in certain knowledge can lead to a tendency to overlook counterarguments, a key indicator of criticality, this study asserts that other naive beliefs about knowledge, such as viewing it as simple, quickly gained, and primarily delivered by authority figures, can also impede criticality disposition. This study contributes to the scholarly exploration on the relationship between epistemological beliefs and criticality, echoing Greene and Yu's (2016) argument for treating epistemic disposition as an integral part of CT cultivation.

In relation to RQ3, it was found that after controlling for educational duration in the UK, Buddhism was unable to predict (significantly) any CT disposition facets. This finding contradicts Zhang (2018), who contends that Buddhism ideologies cultivates criticality. However, it is important to note that the measurement used for Buddhism belief (TTEA) in this study may not fully capture the essence of Buddhism philosophy, especially the ethics with the theoretical potential to dispose criticality. In particular, Zhang (2018) emphasised that non-attachment to subjective views in Buddhism is essential for criticality. However, the item in TTEA measuring this ideology was worded as "there is no I". Although one might argue for their equivalence, it is also plausible to interpret this phrasing as an over-simplified representation. Participants who adhere to non-attachment to subjective views may not necessarily recognise that this is what the TTEA is attempting to assess, leading to a potentially inaccurate reflection of the relationship between Buddhism tenets and criticality disposition in this study. It is important for future research to continue to explore the link between Buddhism and criticality with alternative measures.

In addition, Restrictive Confucianism notably presented as a significant negative predictor for overall CT disposition, confidence in CT, and fewer misconceptions in CT. In line with Tam et al. (2023), this study further elucidates the negative impact of Confucian beliefs emphasising proprietary pressure, relational hierarchy, and social conformity on the formation of the internal tendency towards criticality. However, interestingly, this study also found Benevolent Confucianism to be a significant positive predictor for confidence and valuing in CT, indicating that Confucian beliefs

in self-cultivation and leading by example may support the cultivation of a criticality disposition. This study presents a more nuanced and evidence-supported relationship between Confucianism and criticality. Moreover, Taoism significantly predicted valuing in CT, suggesting that beliefs in Taoist thoughts such as embracing contradiction may lead to a higher recognition of the importance of CT. This study encourages future researchers to expand on the aforementioned findings and those of Lehman et al. (2011) to empirically investigate the potential interactional impact of Taoist beliefs and cognitive disequilibrium on criticality. Overall, these findings echoed Atkinson (1997), supporting the idea that cultural beliefs can have a substantial impact on the psychological processes behind criticality development.

4.1 Limitations and future directions

There are several limitations of this study worth discussion. First, the sample size could be considered insufficient. Although the researcher successfully recruited 118 individuals as directed by G*Power, the study experienced data loss due to a substantial number of participants leaving significant portions of the questionnaire unanswered. This could be somewhat attributed to the voluntary nature of the study, as participants were not provided with any incentive for fully engaging with the questionnaire. While this did not completely prohibit the demonstration of significant effects, this study could have benefitted from a larger sample size. Second, the sample was relatively homogeneous in terms of ethnicity, with 87 out of 99 participants being Chinese students. Although not surprising given Chinese students is the largest group of international students in the UK, accounting for approximately one-third of all non-European students (Higher Education Statistics Agency 2021); this does impede the generalisability of the findings from this research with limited representation of other East Asian demographics in the sample. We also acknowledge here, that adopting broader recruitment strategies, such as targeted outreach across multiple universities or random sampling techniques, would enhance the generalisability of the findings from the present study. Third, the measure of education trajectory is not robust in this study, primarily reflected through self-reported educational duration in the UK. Although a range of duration from 1 to 8 years were reported, a longitudinal design similar to Tao (2022), to collect data from the same sample at multiple points throughout their degree would have been more optimal. In addition, collecting data on the type of school participants attended before coming to the UK would allow for a more comprehensive assessment of their educational trajectory, given students attended public and private schools may vary in criticality (Talebi and IranNejad 2020).

4.2 Conclusions

The current study investigated the relationship between East Asian learners' CT disposition, and their education trajectory, epistemological beliefs, and cultural beliefs. Findings indicated that as educational duration in the UK increases, East Asian learners' criticality disposition also increases. This may indicate that immersion in a Western education system is beneficial for East Asian learners' criticality development. In addition, adherence to certain East Asian cultural traditions may contribute to the cultivation of criticality disposition, whereas some others may bring an adverse impact. These preliminary findings, certainly if supported by future attempts at replication, could inform the development of culturally sensitive pedagogical practices and contribute to the movement of education decolonization in the Western Anglo-Americano systems. Additionally, educators might utilise the findings on epistemological beliefs from this study to develop classroom activities that promote a more sophisticated understanding of the nature of knowledge and priorities in knowledge acquisition, with the aim of enhancing students' disposition towards CT.

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