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The predictive effect of cultural orientations on Chinese gifted students' growth mindsets

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The study examined the predictive effect of cultural orientations on Chinese gifted students' growth mindsets. This study encompassed 378 gifted students from universities in mainland China. Gifted students' growth mindset beliefs and cultural orientations were assessed by using Dweck's growth mindset inventory and Hofstede's cultural value scale, respectively. Data analysis mainly leveraged Pearson correlation analysis and hierarchical multiple regression analysis to test the hypothesized role of gifted students' cultural orientations in predicting their growth mindsets. Pearson correlation analysis was used to assess the bivariate correlation between growth mindset and cultural orientations. Subsequently, Hierarchical multiple regression analysis was conducted to test the predictive effects of cultural orientations on growth mindset beliefs of gifted students. The results revealed that the cultural dimensions of long-term orientation can positively predict gifted students' growth mindset, but power distance and uncertainty avoidance negatively predict their growth mindsets. Collectivism (or individualism) and femininity (or masculinity) cannot predict growth mindsets. Theoretically, this study underscores the necessity of accounting for cultural contexts when applying the growth mindset framework. Practically, it highlights the need to incorporate cultural factors into growth mindset interventions targeted at gifted students.

KEYWORDS

cultural orientations, implicit theory, predictive effect, gifted students, mindset beliefs

1 Introduction

Dweck (2006) mindset theory divide human beliefs of intelligence into a growth mindset and fixed mindset, which include beliefs of effort and challenges. Individuals with a growth mindset regard basic qualities, such as intelligence and ability are malleable traits, and can be improved with effort and practice, while those with fixed mindset believe intelligence and ability are innate and not subject to much improvement (Dweck, 1999). Unlike normal students, developing a growth mindset is rather important for gifted students as they often manifest unique characteristics, such as asynchronous development (Silverman, 2017), heightened sensitivity (Wood and Laycraft, 2020), and overexcitabilities (Dabrowski, 1972; Mendaglio, 2021). There is little consensus among researchers regarding the definition of giftedness (Kroesbergen et al., 2016; Neihart, 1999; Lee et al., 2012). Two key perspectives underpin these definitions: one views giftedness as an innate quality, intrinsic to the individual from birth (Spearman, 1914), while the other emphasizes giftedness as dynamic, multifaceted, and context-specific (Gardner, 1993; Sternberg, 2000a; Renzulli and Reis, 2018). This study adopts two perspective, recognizing that giftedness involves exceptional abilities or innate potential but also acknowledges its malleability, which can be enhanced or diminished through internal factors (i.e., mindset beliefs,) and external influences (i.e., cultural orientations).

As mentioned above, gifted students typically possess unique characteristics that can hinder their potential without developing a growth mindset and supportive environment.

These traits, while often strengths, can also pose challenges that may hinder their potential if not supported appropriately. A growth mindset can help gifted students navigate these challenges more effectively, fostering resilience and a more adaptive approach to their abilities. Furthermore, research suggests that cultural orientations influence beliefs about intelligence, especially among gifted students who are more sensitive to external feedback compared to their peers (Dweck, 2012; Sternberg, 2000a; Ziegler et al., 2013; Dabrowski, 1972; Piechowski and Wells, 2021). However, there is still a significant gap in understanding the specific impact of different cultural orientations on mindset beliefs of intelligence among gifted students. The present study aimed to investigate the predictive effect of cultural orientations on the formation of gifted students' growth mindset. The present study highlights the importance of the dependent variable (i.e., growth mindset) and independent variable (i.e., cultural orientation) in gifted students' potential development.

1.1 Considering a growth mindset is a cue for navigating gifted students' unique characteristics

Developing a growth mindset is essential for gifted students' potential development, especially given their unique characteristics, such as inner vulnerability, asynchronous development, overexcitabilities and underachievement. Regarding inner vulnerability, gifted students are often labeled as "smart" or "genius," which constitutes a form of intelligence-based praise for their academic success (Mueller and Dweck, 1998; Mofield and Parker Peters, 2018). This type of praise can heighten their vulnerability to feelings of failure when success is not immediate, compared to normal students. This inner vulnerability may lead them to avoid challenges and resist effort, as they may perceive effort as a sign of inadequacy rather than genius, which can hinder their potential to transform into realized talent (Mueller and Dweck, 1998). This highlights the importance of developing a growth mindset in gifted students, assisting them understand that failure is valuable for learning, and common even among geniuses. Their gifts typically stem from years of passion and dedication rather than being a natural gift (Dweck, 2012). Thus, an educational goal should be to ensure that gifted students view learning as the development of their abilities (even extraordinary abilities can be further developed), rather than just demonstrating their ability by achieving high marks, or feeling vulnerable when faced with failure. It can reflect the importance to develop a growth mindset in gifted students, enabling them to view challenges as opportunities for growth rather than threats to their self-worth.

A growth mindset can enhance gifted students' potential development by addressing the challenges associated with their asynchronous development. Asynchronous development refers to the uneven development of cognitive, emotional, and physical abilities, which is common among gifted students (Columbus Group, 1991). This mismatch can create frustration and anxiety, as these students may struggle to reconcile their advanced intellectual capabilities with their less mature emotional and social skills (Silverman, 2017). By fostering a growth mindset, gifted students are encouraged to view their social-emotional abilities as adaptable and improvable through effort and persistence (Dweck, 2012). This perspective helps them

cope with the discrepancies in their development by emphasizing the importance of effort over innate talent (Parish, 2018). It may reduce the pressure to be perfect and alleviates the fear of failure, making them more resilient in the face of uneven development. A growth mindset would appear to enable gifted students to embrace learning opportunities, persist through difficulties, and ultimately, reach their full potential despite the inherent challenges of asynchronous development.

In addition, adopting a growth mindset may reduce the potential negative impacts of overexcitabilities on the developmental potential of gifted students. Overexcitabilities refer to heightened responses to stimuli in various domains (such as intellectual, emotional, sensory, psychomotor, and imaginal), often found in gifted individuals, leading to intense reactions and behaviors (Dabrowski, 1972). Piechowski and Wells (2021) suggested that overexcitabilities is a "tragic gift," which can either promote potential development or cause psychological problems, such as depression, anxiety and even lead to suicide. An appropriate auto-psychotherapy, such as mindset reconstruction or self-reflection may assist gifted students to understand their unique characteristics, turn it into catalyst for potential development (Dabrowski, 1972). Thus, developing a growth mindset may encourage channeling their overexcitabilities into productive learning experiences. By understanding that persistence and effort are key to overcoming obstacles, gifted students can learn to harness their overexcitabilities in a way that promotes sustained engagement and perseverance.

Moreover, underachievement of gifted students is also a concerning issue that may be associated with a growth mindset. Siegle (2013) reported that there are as many as 50% of gifted students underachieve at some point. Compared to normally developing peers, gifted underachievers are more likely to manifest in low levels of self-efficacy (Alabbasi et al., 2023), a reduced capacity for perseverance (Gallagher, 2019), and unhealthy perfectionism (Siegle, 2013). A growth mindset is particularly crucial for these gifted underachievers, as it can help them overcome low self-efficacy by fostering the belief that they are capable to achieve their potential through effort and perseverance. It also helps cultivate resilience and the ability to persist in the face of challenging tasks, countering the tendency to give up easily. Additionally, a growth mindset can reduce unhealthy perfectionism by shifting the focus from achieving flawless results to valuing the learning process and continuous improvement (Mofield and Parker Peters, 2018).

Collectively, given that their unique characteristics of inner vulnerability, asynchronous development, overexcitabilities and underachievement, without comprehensive understanding and appropriated intervention, these traits may hinder their full potential development. A growth mindset could serve as one of the auto-psychotherapies, turn challenges into catalyst for talent development. Therefore, it is essential to develop a growth mindset in gifted students.

1.2 Considering cultural orientations matters on gifted students' growth mindset

The influence of contextual factors on gifted students' growth mindset beliefs of intelligence is an important area of concern, as gifted students often exhibit higher sensitivity to their external environment than normal students (Dabrowski, 1972; Piechowski and

Wells, 2021). It can be supported by several theoretical perspectives. For example, Sternberg's (1999) theory of successful intelligence emphasizes that gifted individuals' view of intelligence and their potential development are significantly influenced by the cultural context in which they live. Similarly, Renzulli's (1977) Enrichment Triad Model underscores the importance of creating a supportive and inclusive educational environment to nurture gifted students' intellectual abilities. This model posits that intelligence can be developed with the external support. Furthermore, Gagne (1997) Differentiated Model of Giftedness and Talent suggests that individual's views of intelligence and their potential development are shaped by both intrapersonal catalysts (e.g., physical and psychological characteristics) and environmental catalysts (e.g., culture and environment). Gagne (1997) stated that intelligence is a natural and genetic ability that requires the appropriate conditions to develop, highlighting the potential role that cultural context in either catalyzing or hindering the growth of intelligence. This perspective aligns with the broader understanding that intelligence is a product of dynamic person-context interactions, as recognized by scholars such as Sternberg (1999), Storfer (1990), and Csikszentmihalyi (1996). Ziegler (2005) Actiotope Model further supports this by emphasizing the ongoing interaction between gifted students and their cultural context, rather than viewing intelligence as a fixed, inherent trait. Instead, the model presents giftedness as a dynamic quality that emerges through interactions with various contextual factors (Ziegler, 2005). The Actiotope Model posits that gifted individuals actively engage with their environments, adapting and enhancing their abilities based on available resources and support, thus reinforcing the notion that giftedness is not solely an innate trait but rather a developmental process influenced by external conditions (Ziegler, 2005). This dynamic view of intelligence aligns with Dweck's (2006) theory of growth mindset, which posits that intelligence can be developed through both internal effort and external support. The Triadic Reciprocal Determination (TRD) theory, proposed by Bandura (1978) and serving as a foundation for Dweck's growth mindset theory, suggests that contextual influences (e.g., culture, environment), personal factors (e.g., beliefs), and behaviors interact dynamically. These interactions manifest in how different cultural backgrounds shape individuals' implicit views of intelligence, which in turn influence their engagement and behavior in specific contexts. Overall, these theories collectively highlight that an individual's cultural orientation plays a critical role in shaping their mindset beliefs about intelligence.

Empirical studies have evidenced that culture significantly influence the development of an individual's growth mindset (Dong and Kang, 2022; Sun et al., 2021; Zhang and He, 2024). For example, a large-scale study conducted by Sun et al. (2021), which surveyed 16,642 participants using questionnaires via Qualtrics to explore how variation in Chinese and US students' mindset beliefs might account for the cultural differences. It reported that US students endorsed a stronger growth mindset compared to Chinese students, highlighting the impact of cultural differences. Furthermore, Dong and Kang (2022) conducted comprehensive review of studies over the past decade, examining how culture influence the mindset beliefs and their impact on learning related outcomes. The study summarized that culture shapes the internalization of mindset beliefs. Moreover, Zhang and He (2024) carried out a quantitative study by exploring the predictive effect of cultural orientation and perceived school climate

on the formation of teachers' growth mindset. Their findings suggest that both teachers' cultural orientation and perceived school climate significantly predict their growth mindsets formation in a Chinese context. Although the participant were not students, this study reflects that different cultural orientations play a potential role in shaping individuals' mindset beliefs.

Despite these findings, there is a notable gap in research directly examining the impact of culture on the growth mindset of gifted students. Existing research indicates that culture influences gifted students' cognitive and psychological development, including aspects such as motivation (Dai et al., 1998) and self-efficacy (Alabbasi et al., 2023). Since mindset beliefs are a crucial component of the cognitive and psychological domain, they are closely linked to motivation and self-efficacy (Bai and Wang, 2023; Rhew et al., 2018). This evidence would appear to support the proposition that cultural factors play an important role in shaping mindset beliefs among gifted students.

Given that the importance of cultural orientations on mindset beliefs among gifted students, this study aims to examine the relationship between these two variables. Utilizing Hofstede's (1986, 2011) cultural dimension theory, previous research has explored individual levels of cultural orientation among various groups, such as teachers and students (Bianca Sulkowski and Kent Deakin, 2009; Zhang and He, 2024). Hofstede's theory comprises five dimensions of cultural orientations, including power distance, uncertainty avoidance, individualism versus collectivism, masculinity versus femininity, and long-term orientation versus short-term orientation (Hofstede, 2011). The present study adopted Hofstede's (1986, 2011) cultural dimension theory to elucidate how cultural orientations influence the development of a growth mindset in gifted students. The potential effects of these cultural orientations on shaping a growth mindset in gifted students are discussed in detail below:

Power distance: Power distance refers to the extent of individual's acceptance and expectation of the power is distributed unequally in a certain context (Hofstede, 2011). In a high power distance culture, such as China, key schools and key class were set for gifted students, generally adopt a clear hierarchy and authoritative structure (Fu, 2017). In contrast, low power distance cultures tend to adopt more inclusive and egalitarian approaches, fostering equal relationship throughout school environment (Hofstede et al., 2010). Compared to their non-gifted peers, gifted students are more likely to exhibit overexcitabilities, such as imaginal overexcitabilities (manifested as strong creativity) and intellectual overexcitabilities (manifested as strong curiosity) and emotional overexcitabilities (manifested as heightened sensitivity) (Piechowski and Wells, 2021), and uneven development. These traits naturally lead gifted students to be more sensitive, generate innovative ideas, question norms, and engage in independent thinking, and critical analysis (Dabrowski, 1972; Piechowski and Wells, 2021). However, in high power distance cultures, such behaviors can be perceived as disrespectful or inappropriate to authority figures, thereby facing suppression. This suppression can make gifted students feel less empowered to take initiative or make independent decisions, thereby limiting their ability to explore new ideas and develop problem-solving skills. These skills are essential for cultivating a growth mindset, which values learning and development through effort. Moreover, gifted students heightened sensitivity to external responses and criticisms can further exacerbate this challenge. In high power distance contexts, the fear of criticism or rejection by authority figures may lead gifted students to suppress

their curiosity and innovative thinking, hindering the development of their growth mindset.

Uncertainty avoidance: Uncertainty avoidance refers to the degree to which members of a culture feel uncomfortable with uncertainty and ambiguity (Hofstede, 2011). In cultures with high uncertainty avoidance, there is a strong preference for clear rules, stability, and structured environments (Li et al., 2013). Such cultures often discourage risk-taking and unverified methods due to a preference for predictable outcomes (Li et al., 2013). Compared to normal students, gifted students have an intense desire to take risks and explore the unknown (Mendaglio, 2021). However, in high uncertainty avoidance cultures, these behaviors may be seen as breaking rules and increasing risks. Consequently, the innovative abilities of gifted students may be discouraged due to the perceived risks associated with new and unverified methods, hindering the formation of a growth mindset. A growth mindset thrives on the willingness to take risks and knowledge exploration (Dweck, 2006; Krskova and Breyer, 2023). In high uncertainty avoidance environments, gifted students may avoid take risks and explore new experiences. This can significantly limit their growth mindset development, as they are less likely to take the necessary risks and face the challenges essential for growth and learning.

Moreover, Betts and Knapp (1981) developed the Autonomous Learner Model (ALM), a framework for gifted learners that underscores the importance of creating a supportive yet challenging environment to promote autonomy, self-directed learning, and lifelong learning. These elements are crucial for cultivating a growth mindset in gifted students. However, in cultures with high uncertainty avoidance, educational settings often favor rigid rules and highly structured learning environments. While a certain level of structure can provide guidance and stability, excessive rigidity can hinder gifted students' ability to explore their interests, think critically, and engage in creative problem-solving—skills that are fundamental to the development of a growth mindset. By limiting these opportunities, such environments may impede the ability of gifted students to embrace challenges, learn from failures, and see effort as a pathway to mastery, thereby stifling the development of a growth mindset.

Individualism vs. Collectivism: This dimension highlights the tendency to prioritize either individual self-reliance or collaborative group efforts within educational environments (Hofstede, 2011). A culture with a strong individualism emphasize more on personal achievement, independent thinking and support for self-efficacy (Hofstede et al., 2010), these are important for facilitating a growth mindset. Specifically, gifted students usually have stronger independent thinking and self-reliance than normal students (Wood and Laycraft, 2020). Individualistic culture provide them opportunity to set personal goals, and take ownership of their learning (Hofstede, 2011). Their potentials seems can be maximized in such an individualistic cultural context, which fosters a growth mindset that values goal setting and autonomous learning. While individualistic culture may also hinder the development of a growth mindset in gifted students. Individualistic cultures often prioritize individual work over collaboration (Hofstede, 2011), which may deprive gifted students of opportunities for intellectual exchange and collaborative problem-solving. These interactions are crucial for developing a growth mindset. In addition, gifted students are often perceived as having higher potential, leading to elevated expectations from parents, teachers, and themselves (Colangelo and Kelly, 1983; Molapo and

Salyers, 2014). In an individualistic culture that prioritizes personal achievement, gifted students may experience excessive competition and pressure to consistently outperform others (Hofstede, 2011). This heightened pressure can lead to stress and anxiety, making them more fearful of failure (Molapo and Salyers, 2014). Therefore, it seems that individualistic cultures may either promote or hinder growth mindset development in gifted students.

In contrast, in a collectivism cultures, gifted students may be encouraged to work collaboratively and support their peers, which can foster a supportive environment where students feel safe to take risks and learn from mistakes, promoting a growth mindset. Moreover, gifted students are commonly manifested in emotional vulnerability and sensitivity, appropriate support from peers, teacher, and community is critical for their development (Mendaglio, 2021). It can suggest that a collectivist culture can benefit their growth mindset formation. Collectivist cultures often value effort and contribution to the group. Gifted students in these environments may be praised for their hard work and dedication, reinforcing the idea that effort leads to improvement and success. While in collectivist cultures, the emphasis on conformity and adherence to group norms often restricts individual expression and autonomy (Phillipson and Cheung, 2007). Additionally, within such cultures, societal concerns about “face” are prevalent; parents often perceive children's high academic achievements or acceptance into prestigious universities as a source of family honor (Chen et al., 2018). Consequently, gifted students in these contexts may feel pressured to excel academically, as they are typically labeled as inherently talented or “geniuses.” This perception can lead to the misconception that their academic abilities are innate, and that effort and hard work might be seen as indicators of incompetence, which is in-congruent with a growth mindset. In general, individualism and collectivism may either impede or promote the development of a growth mindset, as this mindset fundamentally revolves around the belief in the potential for growth, regardless of whether it is pursued through personal effort or collective support (Zhang and He, 2024).

Masculinity vs. Femininity: Masculinity versus femininity highlight the extent to which a culture values traditionally masculine traits such as competitiveness, ambition and material success, versus traditionally feminine traits such as cooperation, quality of life and nurturing (Hofstede, 2011). Gifted students often have a natural drive for excellence and a desire to push their limits (Piechowski and Wells, 2021). Masculine culture may promote their growth mindset development by providing an positive competitive environment to encourage them embrace challenges and view competition as an opportunity to enhance their skills and knowledge. However, gifted students are often sensitive to failure (Piechowski and Wells, 2021). The high emphasis on competition and performance in masculine cultures can exacerbate stress and intensify their fear of failure, which may hinder the development of a growth mindset. In this context, feminine cultures may reduce this by focusing more on individuals' well-being, value cooperation, and create a nurturing environment where gifted students feel safe to take risks and learn from their mistakes, fostering a growth mindset. Gifted students often need more understanding, empathy, and social-emotional support to some extent than normal students (Shechtman and Silektor, 2012). Thus, feminine cultures seems can benefit their well-being development and cooperative learning which are important for developing a growth mindset. However, gifted students, who often exhibit exceptional

talents and capabilities, the feminine culture emphasis on egalitarianism and the avoidance of standing out can conflict with their need for recognition and challenges that foster their unique abilities (Hofstede, 2011). Unlike ordinary students, who may thrive in environments that prioritize social harmony and collective success, gifted students require opportunities to push their boundaries and receive feedback that acknowledges their distinctive strengths. Therefore, neither masculinity nor femininity alone can definitively determine the development of a growth mindset in gifted students. It is because cultural orientations influence their preference for particular learning approach, which do not ensure the adoption of a growth mindset.

Long-term orientation vs. Short-term orientation: Long-term orientation and short-term orientation refers to how individuals and societies prioritize their goals and values overtime (Hofstede, 2011). Specifically, cultures with a long-term orientation value perseverance, patience, and sustained effort over time (Hofstede, 2011). Gifted students typically excel potential in different areas, but it requires persistent effort and challenges (Silverman, 2017). The long-term orientation placed on patience and perseverance, which supports gifted students in understanding that mastery and significant achievements require time and sustained effort (Silverman, 2017). This perspective can help them develop resilience and a growth mindset. For example, gifted students might engage in long-term projects or research, learning to appreciate the incremental progress and resilience needed to achieve high-level goals. Moreover, gifted students often have high intellectual curiosity and a deep passion for learning (Betts and Kercher, 2023). In a long-term oriented culture, the emphasis on sustained effort aligns well with their intrinsic motivation to delve deeply into subjects and refine their skills over time. This cultural support can reinforce their natural inclinations and help them view challenges as part of a long-term learning process (Hofstede, 2011). While short-term orientation cultures may not align with the traits of gifted students, such as their deep intellectual curiosity and desire to explore knowledge in depth. These cultures prioritize quick results over thorough exploration, which can frustrate gifted students. Their intrinsic motivation to understand and master complex topics may be stifled, hindering the development of a growth mindset that thrives on long-term learning and persistence. For instance, gifted students may feel pressured to produce immediate results rather than being allowed to delve deeply into subjects of interest, leading to superficial understanding and reduced intellectual satisfaction. Collectively, long-term orientation can foster a growth mindset by emphasizing perseverance, lifelong learning and the value of education, while short-term orientation by focusing on immediate results, which may hinder the development of a growth mindset.

1.3 The present study

Existing studies have primarily explored the mindset beliefs of gifted students and their relationship with traits such as underachievement (Taghinejad et al., 2019) and perfectionism (Chan, 2012; Mofield and Parker Peters, 2018). Increasingly, the literature has highlighted the significant influence of culture on mindset beliefs. Walton and Yeager (2020) use the 'seed and soil' metaphor to illustrate that, much like seeds need fertile soil to thrive, growth mindsets require a supportive social environment to develop. While previous

theories and studies (Dweck, 2012; Sternberg, 1999; Ziegler, 2005) have acknowledged that contextual factors are crucial in shaping mindset beliefs about intelligence, there remains a substantial gap in understanding how cultural orientations specifically influence the mindset beliefs of gifted students. The precise mechanisms through which cultural contexts impact the development of growth mindsets in gifted students are not yet fully understood. This understanding is particularly important for gifted students, given their unique characteristics, such as inner vulnerability, asynchronous development, overexcitabilities, and a higher risk of underachievement. A fixed mindset can exacerbate psychological issues and contribute to underachievement among gifted students, whereas a growth mindset can enhance their potential development (Dweck, 2012). Therefore, this study aims to investigate how cultural orientations may either support or hinder the growth mindset development in gifted students. The study proposes the following hypothesis:

H1: Long-term orientation positively predict gifted students' growth mindset.

H2: Power distance negatively predict gifted students' growth mindset.

H3: Uncertainty avoidance negatively predict gifted students' growth mindset.

H4: Individualism (or collectivism) cannot predict gifted students' growth mindset.

H5: Masculinity (or femininity) cannot predict gifted students' growth mindset.

2 Method

2.1 Participants and procedures

From the initial total of 399 questionnaires collected, 21 were removed due to incomplete responses, leaving 378 viable responses, consisting of 235 females and 143 males, aged between 21 and 23 years ($M = 21.77$, $SD = 0.49$). The study implemented purposive sampling to recruited gifted students who were identified based on exceptional intellectual ability ($IQ \geq 130$), nominated by teachers or parents based on their high academic achievement, or participation in recognized gifted programs. The study focused on students from ten universities located in Zhejiang Province, mainland China, known for their academic excellence and rigorous admission standards. These institutions typically admit students who rank in the top 10–15% citywide, as determined by the annual national undergraduate admission exam (Gaokao).

The participants' years of education ranged from 11 to 14 years. Data were collected using digital questionnaires administered through Sojump software during regular school hours. Participants was voluntary, and measures were taken to ensure that all responses remained confidential and under the students' control. On average, the questionnaire took approximately 20 min to complete per participant. Ethical approval for the study was obtained from the respective universities. Additionally, permissions were secured from

the principals of the key participating universities, and informed consent forms were distributed to gifted students. To uphold ethical standards, the researcher ensured the anonymity of all participants and maintained the confidentiality of the data collected.

2.2 Instruments

2.2.1 Growth mindset scale

Participants' mindset beliefs were assessed using 4-item Growth Mindset Scale (Dweck et al., 1995). This scale employs a six-point Likert format (1 = most strongly disagree, 6 = most strongly agree) to evaluate the mindset beliefs of intelligence among gifted students. An illustrative item from this scale, for instance, item 1 states, "you can change even your basic intelligence level considerably." This scale divided mindset beliefs into growth mindset (scores 5–6), fixed mindset (scores 1–2), and mixed mindset (scores 2.1–4.9) (Claro et al., 2016). Higher scores indicate a stronger endorsement of the growth mindset. Resent studies have demonstrated the scale's high reliability, with a reported Cronbach's alpha of 0.90 (Midkiff et al., 2017), and its applicability in the Chinese context for measuring students' mindset beliefs, where is achieved a Cronbach's alpha of 0.83 (Zeng et al., 2016). In the current study, the scale presented a Cronbach's alpha of 0.78, reflecting considerable reliability and acceptable internal consistency in assessing mindset beliefs among the participants.

2.2.2 Cultural value scale

This study employed Cultural Value Scale (CVScale, Hofstede et al., 2010) to measure participants' orientations toward cultural values. It employs a 5-point Likert scale, spanning 1 to 5, symbolizing 'Strongly Disagree' to 'Strongly Agree', correspondingly. An exemplary item from this scale, such as item 1, "People in higher positions should make most decisions without consulting people in lower positions." The scale interprets cultural dimensions: power distance (PD), uncertainty avoidance (UA), long-term (LT) vs. short-term orientation (ST), masculinity (MA) vs. femininity (FE), and collectivism (CO) vs. Individualism (ID). Higher scores (on a scale of 1–5) on power distance and uncertainty avoidance signify stronger affiliations to those dimensions (Hofstede et al., 2010). For the dimension of long-term versus short-term orientation, scores above 3 indicate a long-term orientation, while scores below 3 suggest a short-term orientation. Similarly, for masculinity versus femininity, scores above 3 imply masculinity, whereas scores below 3 denote femininity. In the case of collectivism versus individualism, scores above 3 indicate collectivism, and scores below 3 indicate individualism. The CVScale has demonstrated good validity across a variety of studies and diverse national contexts, consistently achieving Cronbach's alpha coefficients greater than 0.70 (e.g., Yoo et al., 2011; Zhang and He, 2024). In the current study, the scale achieved a Cronbach's alpha of 0.83, indicating strong internal consistency and reliability.

2.3 Data analysis

The present study aims to test Hypotheses 1 to 5 using SPSS version 28 for statistical analysis. The initial step involved a comprehensive data screening process to identify and address potential issues inherent within the data-set. This process involved

meticulous examination to ensure normal distribution, identification of uni-variate and multivariate outliers, and detection of any missing data (Tabachnick and Fidell, 2018). Following the data screening, Pearson correlation analysis was conducted to reveal the bivariate correlation between growth mindset and cultural orientations.

After the correlation analysis, Hierarchical multiple regression analysis was conducted to evaluate the predictive effect of five cultural orientations on gifted students' mindset beliefs. The results indicated that all variables were within the acceptable range for normality, with skewness values ranging from -0.88 to 1.10 ; Kurtosis values ranging from -1.77 to -0.12 . Homoscedasticity was assessed by the Durbin-Watson statistic, with the value of 1.83 , within the acceptable range of 1.50 to 2.50 (Witte and Witte, 2017). This suggests that there was no significant correlation between residuals, indicating independence of error terms and compliance with regression analysis assumptions. Additionally, multicollinearity was evaluated using variance inflation factor (VIF) statistics. The VIF values for variables (e.g., Variable A with $VIF = 1.12$, Variable B with $VIF = 1.08$, Variable C with $VIF = 2.12$) were all below the commonly accepted cutoff 2.5 (Johnston et al., 2018), indicating that the independent variables were sufficiently independent and capable of providing stable and reliable estimates of regression coefficients.

To address the potential impact of missing data, which accounted for no more than 5% of the total value, multiple imputation was employed. This method was used to enhance the precision of the data analysis and mitigate the potential impact of missing data on the study's results (Ren et al., 2023). The multiple imputation process involved three key steps: imputation, analysis and pooling (Ren et al., 2023). During the imputation phase, missing values were replaced with plausible estimates using statistical models, such as regression or Bayesian methods. In the analysis phase, each imputed data-set was analyzed independently using the same statistical analysis, allowing the variability between datasets to reflect the uncertainty of the missing data. In the final pooling phase, the results from these analyses were combined, or pooled, to produce overall estimates, including means and variances, which account for both within- and between-imputation variability, providing more robust and reliable results.

The Hierarchical multiple regression analysis involves two steps. In the first step, control variables, including demographic factors such as age, gender and educational experience were introduced to establish a baseline for the analysis to control for their potential impact on the results. In the second step, the predictor variables of five cultural orientations were added to assess the predictive effects on the growth mindset of gifted students. According to H1 to H5, it was expected that long-term orientation would be positively correlated with growth mindset, while power distance and uncertainty avoidance would be negatively correlated. It was hypothesized that individualism/collectivism and masculinity/femininity would not have no significant relationship with growth mindset. Effect sizes were assessed using Cohen's f^2 , where f^2 values ≥ 0.02 indicate a small effect, ≥ 0.15 indicate a medium effect, and ≥ 0.35 indicate a large effect (Marshall and Jonker, 2011). Statistical significance was set at a p value less than 0.05 , indicating that the results were statistically significant (Marshall and Jonker, 2011).

The study utilized a Likert scale to assess cultural orientations and mindset beliefs, generating ordinal data that reflects the degree of agreement or disagreement with a given statement. Although these scales technically produce ordinal data, they are frequently treated as interval data based on the assumption that the distances between scale

points are consistent (Brockett and Golden, 1992; Sarabia et al., 2008). This decision facilitates the use of parametric tests, such as bivariate correlation and multiple regression analysis, which are justified by the assumption that the underlying distributions of the latent constructs are approximately normal. Treating Likert-scale data as interval data is further supported by existing literature; for instance, Norman (2010) argues that this practice is valid for statistical analysis, as the Central Limit Theorem permits an approximation to normality. Therefore, the methodological framework employed in this study allows us to draw meaningful inferences regarding the relationships among variables.

3 Results

3.1 Bivariate correlations

Table 1 offers descriptive data and the intercorrelations of the study variables, specifically gifted students' mindset beliefs, gifted students' cultural orientations. The results revealed a general tendency toward a growth mindset within the sample, with a mean score of 4.01 (SD = 0.10). Regarding cultural orientations, gifted students exhibited a strong preference for long-term orientation, underscored by the mean value of 4.19.

As hypothesized in H1, a significant positive correlation was found between long-term orientation and growth mindset belief ($r = 0.63, p < 0.001$). Conversely, as hypothesized in H2 and H3, power distance and uncertainty avoidance were negatively correlated to growth mindset, with correlations of $r = -0.59$ and $r = -0.57$, respectively, both statistically significant at $p < 0.001$. As hypothesized in H4 and H5, no significant relationships were found between growth mindset and the cultural dimensions of collectivism or femininity, suggesting that these orientations do not significantly influence the mindset beliefs of gifted students in this sample.

3.2 Multiple regression analysis

Table 2 presents the results of the multiple regression analysis conducted to test hypotheses H1 to H5, focusing on the predictive

roles of cultural orientations in relation to gifted students' growth mindsets. The findings showed that demographic variables, including age, gender and educational experience contributed minimally to the variance in mindset belief [$R^2 = 0.01; F(3, 374), n.s.$]. Moreover, none of the individual demographic variables had a statistically significant effect on the mindset beliefs of gifted students.

In response to H1 to H5, the analysis controlled for demographic variables in Step 1. In step 2, the cultural orientation variables were entered, which revealed a statistically significant increase in predictive power for gifted students' growth mindset belief [$\Delta R^2 = 0.56, p < 0.001; \Delta F(5, 368), p < 0.001$]. Specifically, long-term orientation was a positive predictor of growth mindset beliefs ($\beta = 0.44, SE = 0.05, p < 0.001$), whereas power distance ($\beta = -0.41, SE = 0.05, p < 0.001$) and uncertainty avoidance ($\beta = -0.39, SE = 0.01, p < 0.001$) were negative predictors. Moreover, collectivism ($\beta = 0.01, SE = 0.03$) and femininity ($\beta = -0.03, SE = 0.02$) did not significantly predict on gifted students' growth mindset. These results are consistent with the predictions of H1 to H5, confirming the expected relationships between cultural orientations and mindset beliefs.

4 Discussion

4.1 Theoretical implications

This study evidenced the role of cultural orientations in the development of a growth mindset among gifted students, supporting Gagne (1997) Differentiated Model of Giftedness and Talent and Ziegler's (2005) Actiotope Model, which highlighted the influence of culture on the beliefs of intelligence among gifted students.

Distinctively, this study explores the predictive effects of gifted students' cultural orientation on their growth mindset formation—a gap in the existing literature. Specially, the positive relationship between long-term orientation and gifted students' growth mindset aligns with cultural values of perseverance, patience, and sustained effort, which are critical in nurturing growth mindset beliefs. Gifted students often display unique characteristics such as overexcitabilities, asynchronous development and underachievement, making them more sensitive

TABLE 1 Descriptive statistics, reliability estimates and intercorrelations of gifted students' mindset and cultural orientation.

Variable	Mean (SD)	1	2	3	4	5	6	7	8	9
Age	21.8 (0.50)	-								
Gender	-	-0.05	-							
Edu	12.2 (0.06)	-0.03	-0.01	-						
MB	4.01 (0.10)	0.01	-0.04	-0.04	(0.78)					
PD	3.11 (0.79)	-0.05	0.04	-0.02	-0.59***	(0.83)				
UA	3.15 (0.80)	-0.06	0.06	0.01	-0.57***	0.43***	(0.92)			
ID	3.03 (0.37)	-0.03	-0.06	0.01	0.02	-0.08	-0.14**	(0.88)		
MA	2.70 (0.24)	0.01	0.02	-0.04	-0.04	-0.01	0.01	0.24**	(0.86)	
LT	4.19 (0.88)	0.03	-0.04	0.02	0.63***	-0.19**	-0.16**	0.01	-0.06	(0.93)

N_{students} = 378, the diagonal values in parentheses represent the alpha-reliability coefficients.

** $p < 0.01$; *** $p < 0.001$.

Edu, educational experience; MB, mindset belief; PD, power distance; UA, uncertainty avoidance; ID, collectivism; MA, Femininity; LT, Long-term orientation.

TABLE 2 Results of hierarchical regression analysis regarding the effect of cultural orientation on gifted students' growth mindset beliefs.

	β	SE	f^2
Model 1			
Age	0.01	0.02	0.01
Gender	-0.02	0.01	0.00
Edu	-0.01	0.03	0.02
R ²	0.01		
F(3, 374)	1.22		
Model 2			
Step 1			
Age	0.01	0.02	0.01
Gender	-0.02	0.01	0.00
Edu	-0.01	0.03	0.02
Step 2			
PD	-0.41***	0.05	0.10
UA	-0.39***	0.01	0.01
ID	0.01	0.03	0.02
MA	-0.03	0.02	0.12
LT	0.44***	0.05	0.03
ΔR^2	0.56***		
$\Delta F(5, 368)$	101.82***		

N_{students} = 378. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Edu, educational experience; MB, mindset belief; PD, power distance; UA, uncertainty avoidance; ID, collectivism; MA, Femininity; LT, Long-term orientation.

and prone to challenges in natural settings (Rinn, 2024). Long-term orientation can be beneficial for these students by reinforcing the understanding that success requires time, persistence, and patience with failure—key elements in cultivating a growth mindset. Conversely, cultural orientations of power distance and uncertainty avoidance negatively affect gifted students' growth mindset belief, suggesting that cultural orientations can either reinforce or challenge gifted students' mindset beliefs.

Despite above findings, current theoretical frameworks for growth mindset do not adequately account for contextual factors, even as recent research highlights the context sensitivity of a growth mindset (Dong and Kang, 2022; Sun et al., 2021; Yeager and Dweck, 2020; Zhang et al., 2019). Additionally, the development of psychological theories should consider contextual sensitivity to ensure universal applicability (Henrich et al., 2010). Unlike previous studies predominantly conducted within Western contexts, this study contributes to the growth mindset framework by applying it to gifted students in a Chinese context. It advocates for broader applications of growth mindset theory that include contextual factors, extending to diverse groups such as special needs, gifted, and marginalized students, to address equity gaps in educational outcomes.

4.2 Practical implications

This study suggests that cultural orientations play a significant role in shaping the development of a growth mindset

among gifted students. Despite the growing recognition of cultural factors in growth mindset training for gifted students (Murphy et al., 2021; Sternberg, 2000b; Ziegler, 2005), practical application often falls short of integrating local cultural contexts into curriculum design, instructional strategies, and growth mindset interventions. This study introduces the concept of leveraging cultural values, such as long-term orientation, to better cultivate a growth mindset in gifted students, which can enhance their resilience and ability to navigate challenges and setbacks in their learning journey. Additionally, the study highlights that cultural orientations like high power distance and uncertainty avoidance can negatively impact the growth mindset of gifted students. This finding underscores the need for educators to recognize and address the diverse cultural backgrounds and specific needs of gifted students, providing personalized support that aligns with their cultural context. This approach aligns with Betts and Knapp (1981) Autonomous Learner Model (ALM), which emphasizes fostering autonomy through a supportive yet challenging environment tailored to individual learners. The study also advocates for expanding the growth mindset framework to include a broader range of contexts and diverse groups, including students with special needs, gifted learners, and marginalized populations, to address educational equity gaps. Therefore, educators are encouraged to design growth mindset interventions that are culturally responsive and inclusive, ensuring equitable opportunities for growth and development for all students. This approach not only supports the unique needs of gifted students but also contributes to a more

equitable educational environment that values diversity and inclusion.

4.3 Limitations and future directions

The first limitation concerns the sample selection. The participants were gifted adolescents from universities in a specific region of mainland China, which may not be representative of gifted adolescents from other countries or regions. Cultural perceptions of giftedness and responses to cultural orientations, such as collectivism and individualism, vary across countries (Neihart, 1999), meaning the findings are context-specific to gifted Chinese students. For example, in mainland China, giftedness is often defined by academic achievement and societal contribution, with an emphasis on collective success, whereas in the US, it tends to focus more on individual talent and personal achievement (Hofstede et al., 2010). Similarly, Chinese collectivism prioritizes group interests and family honor, while American individualism values personal independence and self-expression (Hofstede et al., 2010). These cultural differences suggest that the study's results may not be generalized beyond the Chinese context. Therefore, future research should aim to include participants from diverse geographical regions, developmental stages, and socioeconomic backgrounds to provide a more comprehensive understanding of giftedness across cultures. Additionally, the modest sample size ($N=378$) further limits the generalizability of the findings. Increasing the sample size in future studies could improve the robustness and applicability of the results.

The second limitation involves the study's reliance on a single data point, which, while adequate for predictive analysis and addressing the research questions, inherently limits the ability to infer causal relationships and precludes the longitudinal examination of the effects of cultural orientations on growth mindset among gifted students. Future research should consider adopting longitudinal, experimental, or interventional designs to enable more robust inferences regarding the dynamics among the variables.

The third limitation concerns the exclusive use of self-reported questionnaires to assess growth mindset beliefs and cultural orientations among gifted students. Self-report surveys have inherent limitations, as they may not fully capture the underlying reasons and mechanisms that shape participants' perceptions of intelligence as either fixed or malleable, nor the formation of their cultural orientations. Additionally, the accuracy of self-reported data can be compromised by socially desirable responding or inaccuracies in self-assessment. Self-reports, in particular, tend to be less reliable in identifying externalizing issues compared to observer reports. Future research should consider employing a mixed-methods approach, incorporating interviews, classroom observations, and self-report questionnaires to investigate the variables in a more holistic manner. Furthermore, integrating external assessments from sources such as parents or teachers could provide more accurate and reliable evaluations, particularly in identifying externalizing problems.

Finally, a notable concern is the use of hierarchical multiple regression analysis, which, while effective in testing the specified

hypotheses, revealed a modest R^2 value of 0.56 for the cultural orientation predictors. This suggests that there may exist unexplained variance in gifted students' growth mindset beliefs, indicating that other influential factors were not considered in the model. Future investigations could explore additional variables, such as emotional intelligence, intrinsic motivation, or family and school climate, which may better account for the remaining variance and provide more insights into the dynamics of growth mindset among gifted student.

5 Conclusion

This study highlights the predictive effects of cultural orientations on the growth mindset beliefs of gifted students, underscoring the critical role of contextual factors in shaping these beliefs. The findings suggest that growth mindset applications and interventions for gifted students should account for cultural sensitivity to better support their developmental potential. Future research should further explore the influence of cultural contexts to refine and adapt growth mindset frameworks, ensuring that interventions are more effective and inclusive for diverse groups of gifted students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Faculty Research Ethics Committee, The University of Hong Kong. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HJ: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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