Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Toward a Better Understanding of Developmental Pathway of Cognitive Wisdom: Exploring Its Interplay with Openness, Reflectiveness, and Orientation-to-learning

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Abstract

Wisdom has emerged as a critical educational objective in higher education, yet inconsistent outcomes across university programs have cast doubt on formal education's ability to systematically cultivate wisdom—particularly in the cognitive dimension. This study investigated the dynamic relationships between key precursor factors (openness, reflectiveness, and orientation-to-learning) and wisdom scores in 305 university students enrolled in a wisdom-focused EFL program. Results demonstrated three key findings: (1) paired-samples *t*-tests revealed significant improvement in the judgment subdimension of cognitive wisdom; (2) structural equation modeling (SEM) identified openness and reflectiveness as foundational predictors of wisdom scores, with orientation-to-learning serving as a mediator; and (3) multi-group SEM confirmed the invariance of these relationships across gender groups. These results highlight the crucial role of creating optimal learning conditions that promote critical thinking for wisdom development, while offering practical guidance for designing gender-inclusive wisdom education programs.
Keywords: wisdom, openness, reflectiveness, orientation-to-learning, gender

1. Introduction

According to Russell (1956), possessing knowledge alone does not guarantee wise judgments or effective decision-making. In our current era of unprecedented technological disruption and geopolitical volatility, wisdom has assumed renewed importance as an

Received 10 July 2025, Revised 20 August 2025, Accepted 1 December 2025.

Citation: Xu, L., Ye, W., & Guan, Y. X. (2025). Toward a Better Understanding of Developmental Pathway of Cognitive Wisdom: Exploring Its Interplay with Openness, Reflectiveness, and Orientation-to-learning *Journal of Language*, *1(2)*, 1-31. https://doi.org/ 10.64699/25TTBD8605

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

essential resource for living the best of life (Grimm, 2014). This recognition has prompted a paradigm shift in education from viewing wisdom as merely an innate personal trait (Seligman, 2011) to recognizing it as a critical, teachable capacity essential for both personal development and the advancement of gender equity (Ardelt, 2018; Cheraghi et al., 2015; Ferrari et al., 2019).

Despite this conceptual importance, empirical research on wisdom teaching and learning remains strikingly limited. Moreover, the limited existing studies reveal inconsistent effects of university programs across different dimensions of wisdom. Of particular concern is the unresolved question of whether formal education can effectively cultivate the cognitive wisdom (Ardelt, 2018; Ardelt & Bruya, 2020; Bruya & Ardelt, 2018), the cornerstone of wisdom development in higher education (Brown, 2004).

To address this gap, the present study examined how key wisdom precursors identified in developmental models (Glück & Bluck, 2013; Glück et al., 2019; Greene & Brown, 2009) predict the wisdom scores of university students enrolled in a wisdom-fostering EFL program. The findings will offer insights into how wisdom can be taught and learned to maximize the potential of formal education in promoting learner development.

2. Literature

2.1 Wisdom Development and Wisdom Teaching

Although wisdom education has been in academic attention since the 1980s, it was not until the 21st century that it became a research focus in higher education (Jakubik, 2023). Brown (2004) pioneered an empirical approach to explore wisdom development at the tertiary level by interviewing ten recent graduates nominated for their wisdom development in college. This grounded analysis identified six dimensions that characterized wisdom development, including self-knowledge, understanding of others, judgment, willingness to learn, life knowledge and life skills.

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Accordingly, Brown and Greene (2006) developed a 66-item Wisdom Development Scale (WDS) based on data collected from 1,188 college students. This scale was later validated not only by Greene and Brown (2009) with working professionals (N=2715, Mean age=34.1) and university students (N=338, Mean age= 21.2) in the United States, but also by Ayoub and Ibrahim (2013) among 618 university students and Al-diabi (2017) in Arabian Gulf countries. Despite its demonstrated validity in measuring the wisdom scores of tertiary learners around the world, the WDS has received scant attention among wisdom researchers. One reason is that the WDS has a dominating focus on the cognitive aspects of wisdom. Yet, existing wisdom teaching and learning studies tend to regard wisdom as a more diversified concept, as demonstrated below.

To the best of our knowledge, wisdom teaching studies were initiated by DeMichelis et al. (2015), who examined the wisdom development of 10 elders and 13 adolescents using the five-dimensional Self-Assessed Wisdom Scale (SAWS) (Webster, 2003). Participants enrolled in an intergenerational high school English course, engaging in novel discussions totaling 4.5 hours over three weeks. Among older adults, results showed a decline in humor and critical life experience dimensions, an increase in the reminiscence dimension, and no significant changes in emotional regulation and openness to experience. In contrast, adolescents exhibited no changes in wisdom scores across all dimensions.

Ardelt (2018) showed that young people's wisdom could be cultivated at the tertiary level. In her study, participants in the experimental group (N=165) took introductory philosophy courses emphasizing psychosocial growth, while the control group (N = 153) took the same kind of courses but without such emphasis. Finding from the Three-Dimensional Wisdom Scale (3D-WS) (Ardelt, 2003) revealed that the experimental group showed significant growth in the reflective and compassionate dimensions, whereas the control group declined across all three dimensions (cognitive, reflective, and compassionate).

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Also using the 3D-WS, Bruya and Ardelt (2018) examined wisdom development among 308 university students across three instructional conditions. Their study design comprised: (1) a control group (57.1% of participants) enrolled in conventional courses; (2) an experimental group (29.2%) taking wisdom-promoting philosophy courses with summative assessment; and (3) a second experimental group (13.6%) completing similar courses with formative assessment. Once again, their study reported dimension-specific findings. The reflective dimension remained stable across all groups, while only the formative assessment group demonstrated significant growth in compassionate wisdom. Most notably, while the cognitive dimension remaining stable in both experimental conditions, it declined significantly in the control group, a pattern consistent with Ardelt and Bruya's (2020) longitudinal findings demonstrating the erosion of cognitive wisdom in conventional academic programs.

These findings consistently shows that while educational interventions can enhance reflective and compassionate dimensions, cognitive wisdom proves particularly resistant to change in specialized programs and often declines in standard curricula. This pattern directly challenges Brown's (2004) cognitive-centric model of wisdom development in higher education. Arguably, investigating the interplay between cognitive wisdom and its key precursors (as identified below) would provide a clearer understanding of its developmental pathway, thereby shedding new light on this unresolved issue.

2.2 Wisdom Precursors

Brown's (2004) foundational work identified four essential conditions for wisdom development in educational settings: (1) orientation-to-learning, (2) meaningful experiences, (3) social interactions, and (4) supportive environments. Among these, orientation-to-learning, defined as one's motivational disposition and cognitive engagement with learning (Greene & Brown, 2009), is considered the primary condition for wisdom development. Surprisingly,

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

this construct has received limited empirical investigation in wisdom research, despite related constructs like willingness-to-learn (Hu et al., 2023) and growth mindset (Alhosseini & Ferrari, 2019) have been found critical for wisdom development.

This research gap persists despite theoretical models of wisdom precursors have advanced. Glück and colleagues' MORE Life Experience Model of Wisdom (Glück & Bluck, 2013; Glück et al., 2019) identifies five key wisdom resources: Mastery (M), Openness (O), Reflectiveness (R), Emotional regulation (E), and Empathy (E). Among these, openness and reflectiveness, also conceptualized as critical thinking dispositions (Álvarez-Huerta et al., 2022), show particular relevance for higher education due to their alignment with academic emphases on analytical reasoning (Cheraghi et al., 2015). Specifically, openness encompasses the ability to recognize the limitations of one's knowledge and genuinely consider alternative perspectives (Glück, 2015). Empirical studies consistently support its role as a robust predictor of wisdom (Leeman et al., 2022; Wink & Staudinger, 2015). Meanwhile, reflectiveness involves the capacity to analyze events at deeper levels while transcending subjective biases (Ardelt et al., 2013). As a teachable disposition that can be cultivated from early adolescence, it is also regarded a critical precuror of wisdom development at college (Westrate, 2017).

The robust conceptual alignment between openness and reflectiveness – as both critical thinking dispositions and fundamental academic objectives – suggests promising synergies with Brown's (2004) learning conditions, though rigorous empirical investigation remains necessary to validate these theoretical relationships.

2.3 Wisdom Education and Gender

Research suggests gender may also influence wisdom development. Orwoll and Achenbaum (1993) drew on the socialization of men and women to propose gender-differentiated patterns, with men potentially excelling in cognitive dimensions and women in

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

interpersonal aspects, while also advancing the androgyny hypothesis that wise individuals integrate both masculine and feminine traits. This complexity of gender difference in wisdom was well-illustrated by a recent investigation of the wisdom profiles of 659 participants (Treichler et al., 2022). Women were found to score higher on compassion-related domains in the 3D-WS and on self-reflection in the San Diego Wisdom Scale (SD-WISE) (Thomas et al., 2019). In contrast, men scored higher on cognitive dimension in the 3D-WS and on emotion regulation in the SD-WISE. Moreover, while women generally scored higher on the 3D-WS, no gender differences were found in the overall SD-WISE scores. These variations may reflect measurement inconsistencies, yet they remain crucial considerations for wisdom education committed to gender equity.

Ferrari et al. (2019) identified three scenarios of wisdom education: formal education, which aims to foster wisdom by developing logical reasoning; non-formal education, which relies on religious teachings; and informal education, which emphasizes sociocultural norms and the social division of labor. Whereas non-formal and informal education may reinforce gender stereotypes by reproducing the traditional role expectations, formal education appears uniquely positioned to create equitable wisdom development environments. Supporting evidence comes from Cheraghi et al. (2015), demonstrating that in Iran, higher-educated young women demonstrated greater wisdom than less-educated older women. This pattern suggests formal education may serve as an equalizing mechanism for historically disadvantaged groups. However, these findings simultaneously raise critical questions about potential gender-differentiated pathways in wisdom development within higher education contexts.

3. The Current Study

To address these research gaps, this study examined the connection among key wisdom precursors and wisdom development scores among university students participating

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

in a specially designed EFL program, “Insights into Classic English Films”. This program aimed to promote students’ interest in English learning by engaging them in examining universal life themes. The eight films chosen to facilitate learners’ critical thinking and cognitive engagement were Forrest Gump, Coco, The Shawshank Redemption, Mona Lisa Smile, Jane Eyre, Wonder, Pride and Prejudice, and The Sound of Music.

The 10-week intervention employed a structured blended learning approach, combining asynchronous online activities with synchronous online seminars, as illustrated in Table 1. At the end of the program, students completed an essay test that encompassed open-ended essay writing and reflective course summary.

This study investigated three core questions regarding wisdom development in higher education:

1. To what extent did participants’ wisdom scores change during a wisdom-fostering EFL course?

2. How did the hypothesized precursors, openness, reflectiveness, and orientation-to-learning, interact to predict wisdom scores before and after the intervention?

3. Did the relationships between wisdom precursors and outcomes remain invariant across gender groups?

Table 1 Wisdom-fostering Activities in “Insights into Classic English Films”.

Learning activities	Learning goals-Openness	Learning goals-Reflectiveness
Week 1: Online seminar	lecture, open-ended questions	reflective journal; open-ended questions
Week 2-4: Online learning	video clips, open-ended questions	
Week 5: Online seminar	group presentation, peer/teacher feedback	reflective journal, discussion, open-ended questions
Week 6-8: Online learning	video clips, open-ended questions	
Week 9: Online seminar	group presentation, peer/teacher feedback	reflective journal, discussion, open-ended questions
Week 10: In-person exam	summative test (open-ended essay item)	summative test (reflective course summary)

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Guided by the MORE Life Experience Model (Glück & Bluck, 2013; Glück et al., 2019) and Brown's (2004) educational framework, we advanced two key hypotheses:

H1: Openness and reflectiveness would demonstrate significant positive correlations in jointly predicting participants' wisdom scores.

H2: Orientation-to-learning would mediate the relationship between these wisdom resources (openness/reflectiveness) and wisdom outcomes, consistent with Brown's (2004) emphasis on learning conditions (see Figure 1).

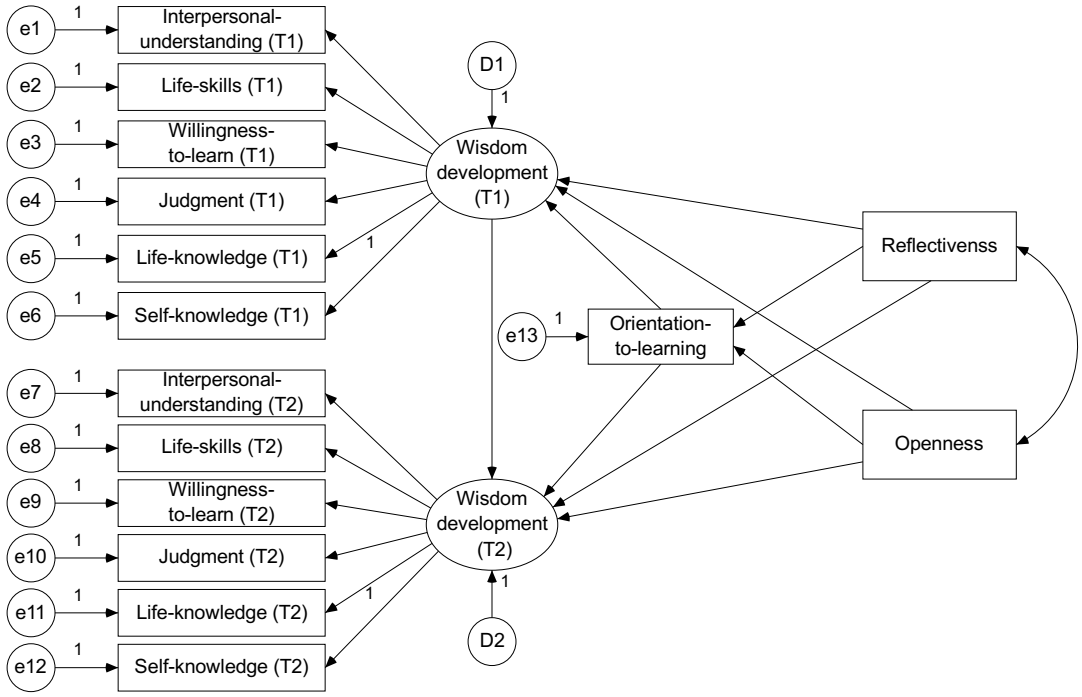

Fig. 1. The hypothesized model of the interrelationship among openness, reflectiveness, orientation-to-learning, and BWDS scores at Time 1 (T1) and Time 2 (T2).

3.1 Participants

The study initially recruited 400 Chinese first-year university students (Mean age = 18.69 years, SD = 0.745; range = 17-22 years) representing five academic disciplines: engineering (N = 156, 39%), humanities (N = 100, 25%), education (N = 88, 22%), science (N = 36, 9%), or arts (N = 20, 5%).

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

All participants provided informed consent after receiving full disclosure about the study's purpose and their voluntary participation rights. The final sample comprised 305 students who completed all study procedures, consisting of 164 males (53.8%) and 141 females (46.2%), completed all the data collection procedures.

3.2 Instruments

3.2.1 The Wisdom Scale

To ensure that participants remained focused while answering the questionnaire, we utilized the 18-item short-form of the WDS (see Appendix B), developed by Fung et al. (2020) based on the original 66-item scale (Brown & Greene, 2006). The brief WDS (BWDS) encompasses six dimensions: self-knowledge (item 1-3), interpersonal understanding (item 4-6), judgment (item 7-9), life knowledge (item 10-12), life skills (item 13-15), and willingness to learn (16-18). Each item in the scale is rated on a seven-point Likert scale ranging from 1 ("Strongly disagree") to 7 ("Strongly agree").

3.2.2 Openness and Reflectiveness

The Critical Thinking Disposition Scale (CTDS; Sosu, 2013; Appendix C) was administered to assess openness and reflectiveness. This 11-item scale was developed through rigorous validation involving two independent samples of tertiary students (N1 = 467; N2 = 371), demonstrating strong psychometric properties. In this scale, openness (item 1-5) is defined as the proactive inclination towards new ideas and the willingness to modify one's ideas based on critical thinking, and reflectiveness (item 6-11) is defined as the tendency to question evidence while maintaining a willingness to learn from one's experiences.

3.2.3 Orientation-to-learning

The Openness to Diversity and Challenge Scale (ODCS; Pascarella et al., 1996; Appendix D), was applied to measure orientation-to-learning. This unidimensional, seven-item scale was developed on a large sample of 3,910 university students, providing

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

information on respondents' attitudes towards learning from diverse ideas, different cultures, and different values, as well as their cognitive engagement in learning. Given its strong alignment with Brown's (2004) conception of orientation-to-learning, we decided to adopt this scale for the measurement of this key learning condition.

Items in both the CTDS and ODCS were rated on a five-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree").

3.3 Data Collection

On the first day of the program, students completed the BWDS, the CTDS, and the ODCS. They then filled out the BWDS for a second time on the last day of the program. The electronic questionnaire platform Wenjuanxing was used on both occasions.

3.4 Data Analysis

3.4.1 Preliminary Statistical Analyses

We utilized SPSS version 19.0 to conduct item parceling and to calculate descriptive statistics and Cronbach's alpha for each scale. Reliability estimates exceeding 0.70 for the overall scales were considered acceptable for measurement purposes.

For the SEM study, we examined the univariate normality assumptions of these variables, considering skewness and kurtosis values within the range of -1 to +1 as indicative of univariate normality (Kline, 2019).

3.4.2 Paired-sample *t*-test

To address RQ1, we conducted paired-sample *t*-tests on the overall BWDS and individual dimensions to identify changes between participant groups at T1 and T2. Additionally, we calculated Cohen's d using pooled standard deviations to evaluate effect sizes for these differences, with thresholds of 0.2, 0.5, and 0.8 used to define small, medium, and large effect sizes, respectively.

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

3.4.3 SEM

To address RQ2, we applied a multivariate SEM approach to analyze the relationship between the observed variables (as reported in the descriptive statistics) and the latent variables (as reported in the item parceling results). More importantly, we aimed to identify the pattern of interactions among the latent variables to reveal how openness, reflectiveness, and orientation-to-learning relate to BWDS scores over.

To establish a baseline model for the multi-sample analyses, we examined the goodness-of-fit indices of the SEM for each gender group. According to Kline (2019), a model is considered to have a good fit if it meets the following criteria: the Chi-square statistic ($\chi 2$), the Chi-square statistic each degree of freedom ($\chi 2/df$) ($\leqslant 2.5$), the comparative fit index (CFI) ($\geqslant .90$), the Tucker-Lewis index (TLI) ($\geqslant .90$), the root mean square error of approximation (RMSEA) ($\leqslant .08$), and standardized root mean square (SRMR) ($\leqslant .08$).

3.4.4 Multi-group SEM

To address RQ3, multi-group SEM was used to examine the cross-group invariance of the interrelationships among openness, reflectiveness, orientation-to-learning, and BWDS scores. We first examined an unconstrained model without equality constraints. We then evaluated models with equivalence in the following areas: a) model structure (configural invariance), b) factor loadings (metric invariance), c) factor loadings and item intercepts (scalar invariance), and d) factor loadings, item intercepts, and item residuals (residual invariance).

4. Results

4.1 Descriptive Statistics

As shown in Table 2, the skewness and kurtosis for the BWDS dimensions, openness, and reflectiveness were within acceptable ranges. The means for the seven-point BWDS

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

scores varied from 5.050 (interpersonal-understanding at T1) to 5.562 (judgment at T2). The means for the five-point antecedent variables ranged from 3.909 (reflectiveness) to 4.003 (openness). The subscale reliability ranged from .700 (life-knowledge at T1) to 0.875 (orientation) and overall reliability ranged from .804 (openness) to .951 (BWDS at T2), indicating satisfactory results. Both the skewness and kurtosis values were within acceptable range of -1 to +1. Correlation information for variables is presented in Appendix E.

Table 2 Estimates for key variables.

Scale	Variables	α	Mean	SD	Skewness	Kurtosis
BWDS (T1)	● Interpersonal-understanding	.728	5.050	.808	-.041	.247
	● Life-skills	.729	5.194	.876	-.100	-.218
	● Willingness-to-learn	.727	5.349	.873	-.188	-.227
	● Judgment	.770	5.352	.876	.085	-.372
	● Life-knowledge	.700	5.460	.882	-.289	.038
	● Self-knowledge	.729	5.375	.910	-.049	-.695
	Overall BWDS	.930	5.297	.736	-.051	-.221
BWDS (T2)	● Interpersonal-understanding	.777	5.143	.855	.064	-.345
	● Life-skills	.710	5.204	.867	-.044	-.363
	● Willingness-to-learn	.751	5.287	.912	.053	-.567
	● Judgment	.712	5.562	.886	-.235	-.495
	● Life-knowledge	.739	5.477	.887	-.085	-.599
	● Self-knowledge	.727	5.433	.858	-.069	-.414
	Overall BWDS	.951	5.351	.774	-.031	-.330
CTDS	● Openness	.804	4.003	.522	-.023	-.159
	● Reflectiveness	.813	3.909	.498	.242	-.017
ODCS	● Orientation-to-learning	.875	3.985	.598	-.041	-.557

The paired-sample t-test results presented in Table 3 showed that most BWDS variables did not change at different time points, except for the average judgment scores (T1 = 5.352, T2 = 5.562, Cohen's d = -.238, low-to-medium).

Table 3 Learners' overall and dimensional BWDS scores over T1 and T2.

	Paired-sample t-test				
	Mean	SD	t	*p*	Cohen's *d*
Interpersonal-understanding	-.093	.825	-1.931	.054	-.112

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Life-skills	-.010	.855	-.193	.847	-.012
Willingness-to-learn	.062	.882	1.202	.230	.070
Judgment	-.211	.922	-3.918	.000*	-.238
Life-knowledge	-.016	.891	-.316	.752	-.019
Self-knowledge	-.057	.914	-1.074	.284	-.066
Overall BWDS	-.054	.706	-1.317	.189	.072

* $p < .001$

4.2 The Antecedents of Wisdom Developments

Table 4 presents the fitness of the proposed SEM model, which posits that the two wisdom resource factors of openness and reflectiveness have both direct and indirect effects on BWDS scores at T1 and T2, with the indirect effects mediated by the learning condition of orientation-to-learning. Due to the unsatisfactory fit of the hypothesized model, we drew on the modification indices provided by Amos 17.0 to propose a modified model for the male and female students, as depicted in Figure 2 and Figure 3.

Table 4 Assessment of SEM model fits with two task groups.

	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA	SRMR
Male students							
Initial model	179.629	85	2.113	.953	.942	.083	.040
Modified model	129.030	80	1.613	.976	.968	.062	.037
Female students							
Initial model	234.223	85	2.756	.907	.885	.116	.047
Modified model	147.700	80	1.846	.958	.945	.080	.041

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

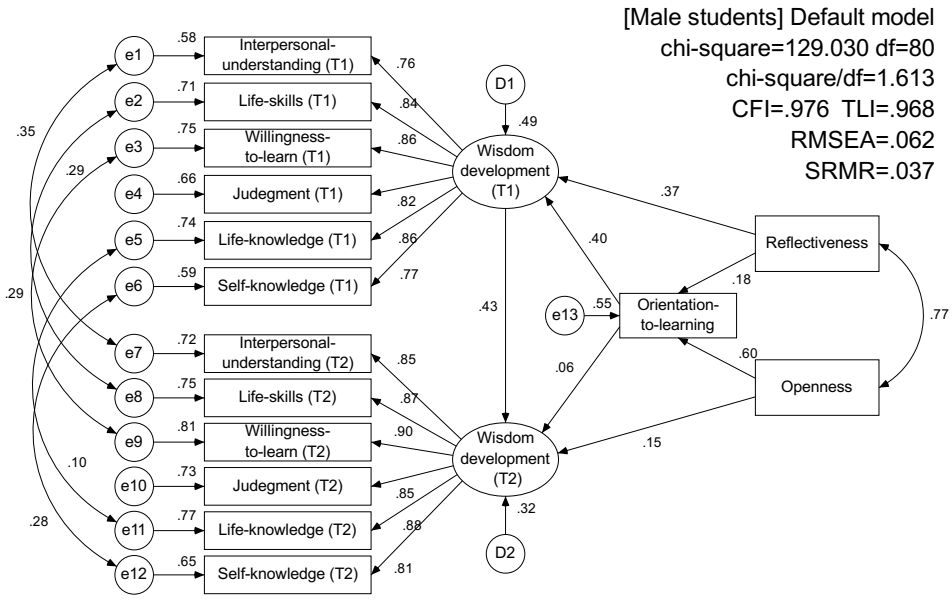

Fig. 2 The modified model of the interrelationship among openness, reflectiveness, orientation-to-learning, and wisdom development scores at T1 and T2 for male students.

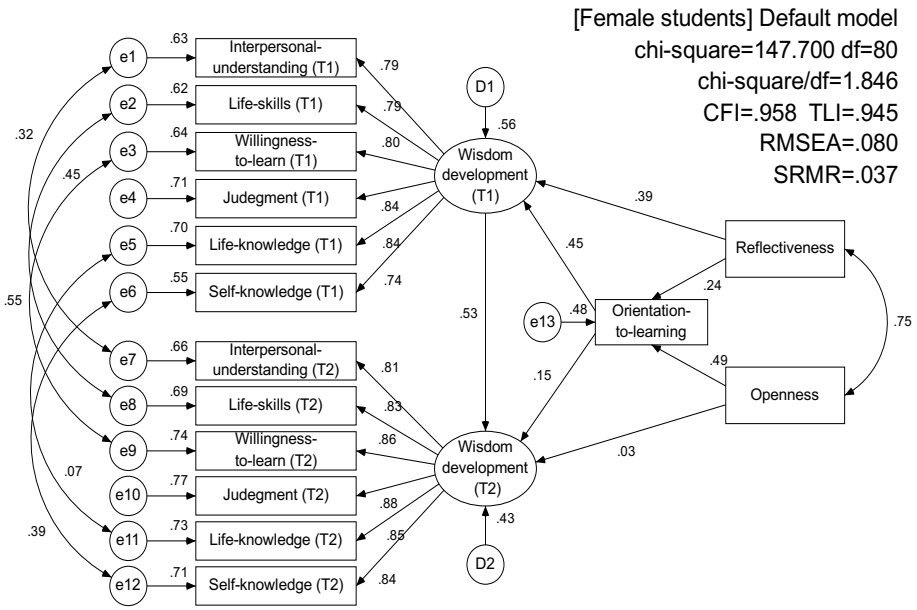

Fig. 3 The modified model of the interrelationship among openness, reflectiveness, orientation-to-learning, and wisdom development scores at T1 and T2 for female students.

This modified model assumes covariance among errors associated with BWDS variables measured at T1 and T2, except for judgment, which showed significant change at different time points. Additionally, the model assumes that openness only indirectly predicts

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

BWDS at T1, while reflectiveness only indirectly affects BWDS at T2. The modified model demonstrated an excellent fit for the male student group (χ2 = 129.030, df = 80, χ2/df = 1.613, CFI = .976, TLI = .968, RMSEA = .062, SRMR = .037) and the female student group (χ2 = 147.700, df = 80, χ2/df = 1.846, CFI = .958, TLI = .945, RMSEA = .080, SRMR = .041). Hence, it was chosen as the baseline model for the multi-group SEM.

4.3 The Multi-group SEM

We conducted cross-sample comparisons using the previously identified baseline model, which was freely estimated without parameter constraints. The results presented in Table 5 indicated a good fit for the data (χ2 = 106.89, df = 50, CFI = .990, TLI = .980, RMSEA = .050, SRMR = .050), suggesting that identified factor structure showed configural invariance between male and female learners.

Table 5 Assessment of structural model for cross-validation.

Models	χ^2	*df*	CFI	TLI	RESEA	SRMR	$\Delta\chi^2(\Delta df)$	$p(<.05)$
Baseline	276.763	160	.968	.958	.050	.037		
Configural	278.867	170	.970	.963	.047	.037	2.103(10)	.995
Metric	282.015	177	.971	.966	.045	.039	3.148(7)	.871
Scalar	289.046	180	.970	.965	.046	.043	7.032(3)	.071
Residual	301.933	183	.967	.962	.046	.047	12.887(3)	.005*

Next, we imposed constraints on the model structure across gender groups to assess the number and configuration of the factors. We further investigated potential differences in the model structure by constraining one clustering coefficient at a time in each round. These constrained models, each with one restricted clustering coefficient, were compared to the unconstrained model where all clustering coefficients were freely estimated. The overall factor structure remained stable (Δχ2/Δdf = 2.103(10), p = .995), suggesting that the gender difference was not observed in the structural model.

We then examined metric invariance by imposing constraints on factor loadings in

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

addition to restricting the model structures. Chi-square test results ($\Delta\chi2/\Delta df = 3.148(7)$, $p = .871$) indicated that the metric invariance was maintained.

Subsequently, we examined the potential difference between the scalar and metric models. The insignificant p value ($\Delta\chi2/\Delta df = 7.032(3)$, $p = .071$) showed that scalar invariance was maintained despite the additional constraints on item intercepts alongside the factor loading restrictions.

Finally, to assess the residual model, we imposed additional constraints on the item residuals. The findings suggested that residual invariance did not hold, as indicated by the significant chi-square difference ($\Delta\chi2/\Delta df = 12.877(3)$, $p = .005$). However, since item residuals are not considered part of a latent factor, their variance was not further investigated.

In summary, openness, reflectiveness, and orientation-to-learning interacted similarly across gender groups to predict wisdom development at T1 and T2.

5. Discussion

Wisdom represents a paramount educational objective that empowers young people to deal with complex existential challenges in this rapidly evolving world (Baltes & Kunzmann, 2003). Yet persistent inconsistencies in educational outcomes across wisdom dimensions have cast doubt on formal education's capacity to foster comprehensive wisdom development while ensuring gender-equitable learning environments.

Focusing on the particularly resistant cognitive dimension of wisdom (Ardelt, 2018; Bruya & Ardelt, 2018), this study sought to unravel the dynamic interplay among three theoretically-grounded precursors, i.e., openness, reflectiveness, and orientation-to-learning (Brown, 2004; Glück & Bluck, 2013; Glück et al., 2019) and BWDS scores. This study provides preliminary evidence that a wisdom-fostering EFL program may enhance cognitive wisdom, as indicated by improved judgment scores. The SEM results revealed stable associations between critical thinking dispositions and wisdom scores across time points,

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

with orientation-to-learning serving as a consistent mediator. The multi-group SEM confirmed that the developmental pathway of wisdom remained consistent across gender groups.

5.1 Wisdom Teaching

Existing research has established the malleability of wisdom's reminiscence (DeMichelis et al., 2015) and affective dimensions (Ardelt, 2018; Bruya & Ardelt, 2018), yet consistently demonstrates the cognitive dimension's resistance to change (Ardelt, 2018; Bruya & Ardelt, 2018) and even decline in standard curricula (Ardelt & Bruya, 2020). Our EFL intervention produced measurable gains in cognitive wisdom's judgment dimension, marking the first empirical evidence of cognitive wisdom's responsiveness to educational efforts.

In addition to the BWDS's precise measurement of cognitive wisdom, the positive outcome of the EFL intervention could also be attributed to our innovative pedagogical design. Unlike previous research which has documented wisdom development in L1 context (DeMichelis et al., 2015) and introductory philosophy courses (Ardelt, 2018; Bruya & Ardelt, 2018), our EFL program implemented an interdisciplinary approach designed to optimize cognitive load and enhance learning engagement. Through scaffolded instructional sequences, including presentations, feedback sessions, and guided discussions, students cultivated analytical competencies to interpret characters' decision-making across sociolinguistic boundaries, and critically evaluate their life-altering choices. This pedagogy operationalizes Ferrari and Kim's (2019) conception of wisdom exemplars, allowing learners to see ideas in carefully curated film narratives. It also aligns with Skehan's (2015) Limited Attention Capacity Hypothesis, enabling learners to devote more cognitive resources to higher-order processing to achieve development in the judgement dimension.

In summary, these findings provide the first empirical validation of university

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

programs' capacity to foster cognitive wisdom development, substantiating Brown's (2004) qualitative finding that emphasizing cognitive wisdom development at the tertiary level. Moreover, our study demonstrates how an EFL-based pedagogical approach that provides curated wisdom exemplars and scaffolded activities can create optimal conditions for wisdom growth.

5.2 Wisdom Precursors

Among the range of wisdom precursors nominated in the theoretical models of wisdom development (Brown, 2004; Glück & Bluck, 2013; Glück et al., 2019), we focused on openness, reflectiveness, and orientation-to-learning due to their (a) theoretical primacy in wisdom development, (b) established links to wisdom development (Leeman et al., 2022; Wink & Staudinger, 2015; Weststrate, 2017), and (c) alignment with our program's mechanisms to facilitate cognitive engagement. The SEM results revealed that reflectiveness and openness, conceptualized both as wisdom resources in the MORE model (Glück & Bluck, 2013; Glück et al., 2019) and as critical thinking dispositions (Álvarez-Huerta et al., 2022), were significantly correlated and jointly related to participants' BWDS scores. Importantly, this relationship was mediated by orientation-to-learning, which Brown (2004) conceptualized as a fundamental learning condition for wisdom development.

Our findings extend previous cross-sectional research on openness and reflectiveness (Leeman et al., 2022; Wink & Staudinger, 2015; Weststrate, 2017) by demonstrating their close correlation and their relations with the BWDS scores over different time points. This provides empirical validation for Glück and colleagues' theoretical framework while revealing the crucial mediating role of orientation-to-learning. This novel contribution distinguishes our work from studies of related constructs like growth mindset (Alhosseini & Ferrari, 2019) and willingness-to-learn (Hu et al., 2023).

The temporal patterns of mediation revealed important nuances in the relationships

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

among wisdom precursors and wisdom scores. While reflectiveness showed direct effects at baseline (T1), these became fully mediated by orientation-to-learning at post-test (T2), suggesting the program's structured guidance was necessary to help students bridge sociolinguistic gaps in the film materials. Conversely, openness transitioned from fully mediated associations at T1 to direct associations at T2, indicating that the rich, diverse life experiences portrayed in the wisdom exemplars eventually enabled students to engage in independent open-minded reflection.

The dynamic interplay between these wisdom precursors advances the current understanding of wisdom development, demonstrating how carefully crafted educational interventions can effectively cultivate cognitive wisdom.

5.3 Wisdom Growth across Gender

Among the three wisdom scenarios identified by Ferrari et al. (2019), formal education provided by schools and universities is more likely to contribute to gender equality in wisdom growth than informal and nonformal education, both of which emphasize traditional gender roles. However, until now, the critical question of whether university programs provide a gender-neutral development environment for both genders has remained unanswered.

The multi-group SEM analysis revealed that openness, reflectiveness, and orientation-to-learning interacted in the same way in relating to the BWDS scores for both male and female students, thereby demonstrating that university education does not privilege one gender's developmental pathway over another. This is significant because it suggests that educational institutions, at least in the current case of EFL program, can effectively support the development of wisdom in both male and female students without favoring one gender over the other.

6. Conclusion

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Against the background of the growing importance of wisdom education, this study presents a focused study on cognitive wisdom, a wisdom dimension that has been found to be resistant to educational effort, by investigating its associations with key wisdom precursors. Paired-sampled *t*-tests revealed, for the first time, evidence of growth in the cognitive wisdom of judgment. Multi-group SEM study revealed associations between wisdom precursors and BWDS scores, with orientation-to-learning mediating the connections between the BWDS scores and the two wisdom resource factors of openness and reflectiveness at both time points and across gender groups. These findings offered three key insights to advance our understanding of wisdom development in the formal educational context.

First, the application of the BWDS, which offers an accurate measurement of the cognitive wisdom enabled us to demonstrate that cognitive wisdom growth is achievable when pedagogical approaches align with cognitive load principles. The EFL program's use of curated wisdom exemplars and structured learning activities scaffolds judgment development, challenging the presumed limitations of formal education in fostering cognitive wisdom (Ardelt, 2018; Bruya & Ardelt, 2018; Ardelt & Bruya, 2020).

Second, we have empirically validated and extended Glück and colleagues' (2013, 2019) MORE model by demonstrating how the immediate educational condition of orientation-to-learning operates as the critical mechanism through which dispositional traits translate into wisdom scores. The temporal dynamics of mediation effects, particularly the shift from mediated to direct effects for openness, reveal that orientation-to-learning serves as both a gateway and an adjustable scaffold in the developmental process. The dynamic interplay among wisdom precursors and wisdom scores reveals valuable information on the mechanism of wisdom development, suggesting that disciplinary context and the mediating role of orientation-to-learning may be crucial variables in fostering cognitive wisdom.

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

Third, our multi-group analyses confirm that formal education can create gender-equitable pathways for wisdom development. This finding suggests that well-designed educational programs can effectively support the development of wisdom in both male and female students, thereby promoting a more balanced and equitable society. Specifically, we included both films that cover both typical male perspectives (e.g., Forrest Gump and The Shawshank Redemption) and female perspectives (e.g., Pride and Prejudice and Jane Eyre) in life. Future research should continue to explore the mechanisms through which formal education can engage both male and female students to facilitate their wisdom development, ensuring that educational practices are inclusive and effective for all learners.

This study has several limitations. First, while the observed improvement in the judgment dimensions offers promising preliminary evidence of cognitive wisdom development, a dimension notably resistant to educational interventions, we acknowledge the limitations of this isolated finding. Given the insignificant changes in the other five BWDS dimensions and composite scores, we cannot definitively exclude the possibility that this result occurred by chance. Since this is probably due to the relatively brief duration of intervention, future research should examine whether extended implementations or modified curricula might produce more comprehensive effects.

Second, this study intentionally focused on core wisdom precursors that are not only most likely to relate to the BWDS scores, but also in close alignment with the current intervention specifically targeting critical thinking disposition and orientation-to-learning. Therefore, we did not explore other wisdom precursors identified by Glück and Bluck (2013) and Brown (2004). Future research should investigate the effects of these additional precursors in a wider range of wisdom educational contexts.

Third, due to practical constraints, this study did not include a control group, which prevents definitive conclusions about the program’s causal efficacy. While our SEM models

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

suggest plausible developmental pathways, these relationships remain correlational. Future research should employ randomized controlled designs to establish causal effects.

In conclusion, this study underscores the potential of formal education to foster wisdom development in a gender-neutral manner, provided that the curriculum is thoughtfully designed to provide an engaging environment for learners' critical thinking dispositions to function effectively. The findings highlight the importance of orientation-to-learning as a critical factor in promoting cognitive wisdom, offering valuable insights for educational practice and policy.

Funding

This work was supported by Guangdong Provincial Undergraduate University Teaching Quality and Teaching Reform Project (2024): "Construction and Practice of the Blended Teaching Model for Annotated Reading of College English in the Digital-Intelligent Era" and The Belt-and-Road-Initiative-Oriented International English Teachers' Professional Development Framework Project (2025): "A Framework-based GenAI literacy model for English Teachers"(Grant No. TCA2025KT015).

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Vol.1 No.2 2025
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Vol.1 No.2 2025
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Vol.1 No.2 2025
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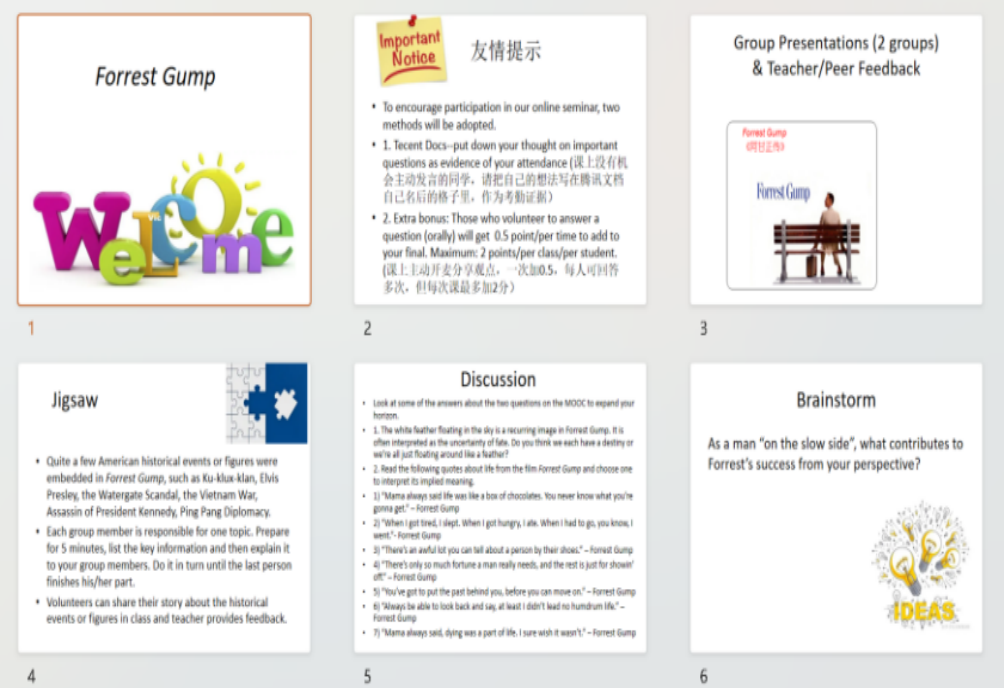
1. Appendix A. Wisdom-fostering Episodes based on the film Forrest Gump

(The rest films are *Coco, The Shawshank Redemption, Mona Lisa Smile, Jane Eyre, Wonder, Pride and Prejudice, and The Sound of Music*)

2. A Course Overview

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605



3. Mini Video Course I

4. Mini Video Course II

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

5. Mini Video Course III

6. Watch Clips 1 and Discuss：

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

任务点

Discussion 1 --Clip 1 置顶 回复

徐 老师 2023-03-15 15:43 英语经典影片赏析河源班、开放班级 阅读 148 删除

The white feather floating in the sky is a recurring image in Forrest Gump. It is often interpreted as the uncertainty of fate. Do you think we each have a destiny or we're all just floating around like a feather?

- Examples of female students' answers:

英语经典影片赏析河源班

第61楼 2023-05-05 19:52

I think each of us is like a leaf wandering in the breeze. Life is changeable. We can't predict the future. All we can do is to always maintain an optimistic attitude towards life and live a good life. If we encounter a hammer from life, we will brush off the dust from our shoulders and continue to move forward.

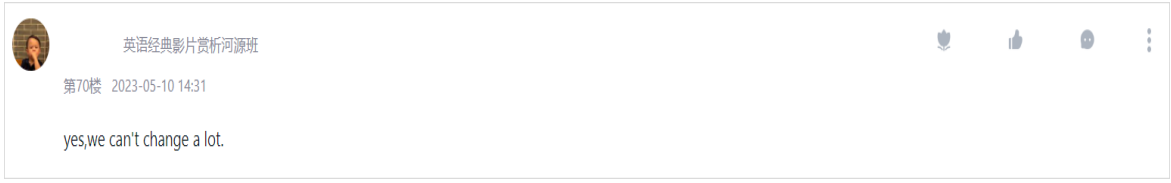
英语经典影片赏析河源班

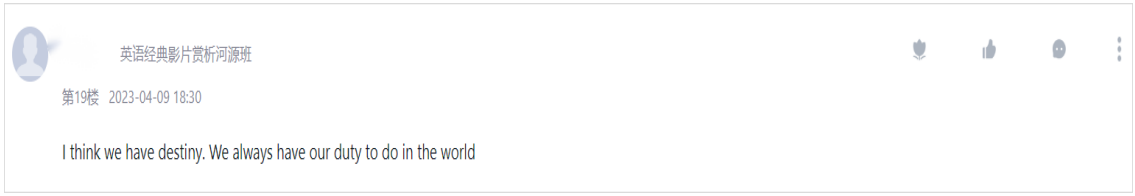
第20楼 2023-04-09 23:09

I think fate is a matter of both destiny and individual effort and choice. Everyone is born with a part of their destiny, but their experiences, choices and efforts can also influence their fate. Therefore, each of us has a certain degree of autonomy and choice, can change and influence their own destiny through their own efforts. At the same time, we also need to accept that some things cannot be changed, need to learn to adapt and adjust.

- Examples Male student's answers:

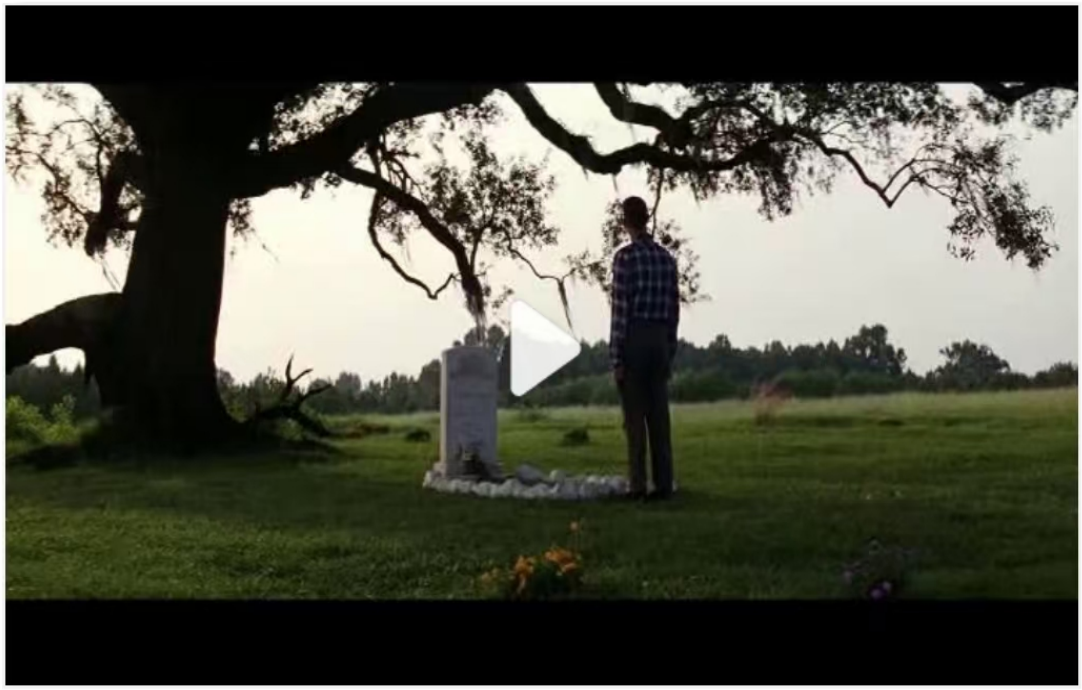
Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605





7. Watch Clips 2 and Discuss：

任务点



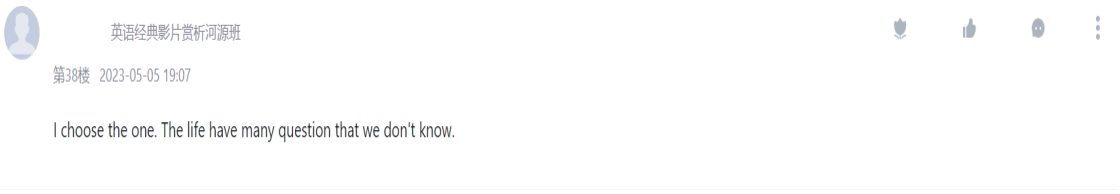
Discussion 2-Clip 2 置顶

徐 老师 2023-03-15 12:09 英语经典影片赏析河源班、开放班级 阅读 74 删除

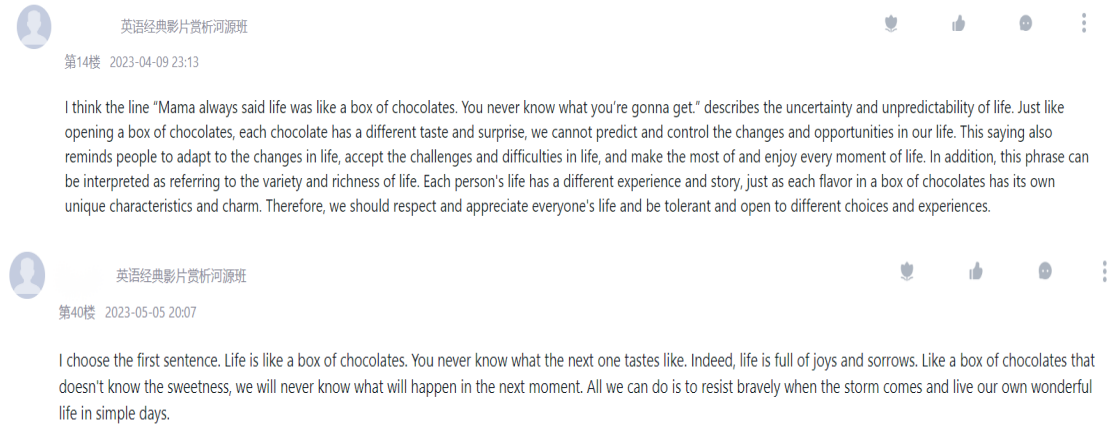
Read the following quotes about life from the film Forrest Gump and choose one to discuss about the implied meaning of it.
1) "Mama always said life was like a box of chocolates. You never know what you're gonna get." – Forrest Gump
2) "When I got tired, I slept. When I got hungry, I ate. When I had to go, you know, I went."- Forrest Gump
3) "There's an awful lot you can tell about a person by their shoes." – Forrest Gump
4) "There's only so much fortune a man really needs, and the rest is just for showin' off." – Forrest Gump
5) "You've got to put the past behind you, before you can move on." – Forrest Gump
6) "Always be able to look back and say, at least I didn't lead no humdrum life." – Forrest Gump
7) "Mama always said, dying was a part of life. I sure wish it wasn't." – Forrest Gump

- Examples of male students' answers:

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605



- Examples of female students' answers:



Appendix B. Brief Wisdom Development Scale

1. I am well aware of all of my weaknesses.
2. I am well aware of all of my values.
3. I am well aware of all of my interests.
4. I learn from others.
5. I have general confidence in what I know.
6. I present well-supported arguments.
7. I am aware of different ways of life, philosophies, and cultures.
8. I integrate and apply what I have learned from one part of my life to another.
9. I understand how my background has shaped my perspective on things.
10. I see the interconnectedness between people and the natural world.
11. I see the interconnectedness between knowledge and ideas.
12. I recognize that there are cycles in life.
13. I have a sense of purpose in my life.
14. I make sound decisions.
15. I attend to the important matters in my life.
16. I learn from my experiences.
17. I enjoy learning for the sake of learning.
18. I am open to change.

Appendix C. Critical Thinking Disposition Scale (CTDS)

1. 1.I usually try to think about the bigger picture during a discussion.

Vol.1 No.2 2025
DOI: 10.64699/25TTBD8605

2. 2.I often use new ideas to shape (modify) the way I do things.
3. 3.I use more than one source to find out information for myself.
4. 4.I am often on the lookout for new idea.
5. 5.I sometimes find a good argument that challenges some of my firmly held beliefs.
6. It's important to understand other people's viewpoint on an issue.
7. It is important to justify the choices I make.
8. 8.I often re-evaluate my experiences so that I can learn from them.
9. 9.I usually check the credibility of the source of information before making judgement.
10. 10.I usually think about the wider implications of a decision before taking action.
11. 11.I often think about my actions to see whether I could improve them.

Appendix D. Openness to Diversity and Challenge Scale (ODCS)

1. I enjoy taking courses that challenge my beliefs and values.
2. Learning about people from different cultures is a very important part of my college education.
3. I enjoy talking with people who have values different from mine, because it helps me better understand myself and my values.
4. The courses I enjoy most are those that make me think about things from a different perspective.
5. Learning about people from different cultures is a very important part of my college education.
6. I enjoy having discussions with people whose ideas and values are different from my own.
7. The real value of a college education lies in being introduced to different values.