Influence of Curiosity on Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education

Anosha Haroon[1] and Fahd Naveed Kausar[2]

https://doi.org/10.62345/jads.2025.14.4.8

Abstract

Curiosity plays a crucial role in higher education by stimulating students' intrinsic motivation to explore, learn, and engage deeply with academic content. It positively influences both lifelong learning orientation and cognitive engagement, fostering sustained interest and strategic learning behaviors. The objectives of the study were a) to find the level of Curiosity, Students' Lifelong Learning Orientation, and Cognitive Engagement in Higher Education, b) to investigate the influence of Curiosity on Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education, and c) to examine correlation among Curiosity, Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education. The study population included all public and private universities in Lahore district. The sample was selected from the population using a multistage sampling method. The instruments of the study were questionnaires. For data analysis, SPSS was used, including descriptive statistics (Mean and Standard Deviation) and inferential statistics (multivariate analysis, Kendall's tau-b, Spearman's rho, and Pearson's r). The study's findings revealed that Curiosity has a significant effect on students' lifelong learning orientation and cognitive engagement in higher education, explaining 44.3% of the variance in lifelong learning orientation and 33.7% of the variance in cognitive engagement ($p < .001$). Curiosity is positively and significantly correlated with both lifelong learning orientation ($\rho = .574$, $p < .001$) and cognitive engagement ($\rho = .471$, $p < .001$), indicating that students with higher curiosity tend to adopt stronger lifelong learning attitudes and engage more deeply in cognitive tasks.

Keywords: Curiosity, Lifelong Learning Orientation, Cognitive Engagement.

Introduction

Curiosity plays a central role in shaping students' lifelong learning orientation and cognitive engagement in higher education, serving as a core intrinsic motivational force that drives exploration, inquiry, and sustained intellectual effort. When students experience curiosity, they are more inclined to seek understanding beyond surface-level requirements, engage with complex ideas, and view learning as an ongoing process rather than a finite academic task. Research in educational psychology suggests that curiosity activates deeper cognitive processes, such as

[1]*Lecturer Education, Govt. Graduate College Township Lahore, Punjab, Pakistan.*
Email: anoshaharoon464@gmail.com
[2]*Assistant Professor, School of Education, Minhaj University Lahore, Punjab, Pakistan.*
Email: fahdnaveed1@hotmail.com

Compliance with ethical standards: There are no conflicts of interest (financial or non-financial). This study did not receive any funding.

elaboration, critical thinking, and metacognitive monitoring, thereby enhancing students' capacity to engage meaningfully with academic content.

As a result, curious learners are more likely to adopt deep learning approaches, persist in challenging tasks, and demonstrate greater autonomy in regulating their learning, all of which contribute to a strong orientation toward lifelong learning in higher education contexts. Moreover, curiosity has been shown to foster a sustained disposition toward continuous learning by reinforcing students' intrinsic valuing of knowledge and personal growth. Students who display higher levels of curiosity tend to perceive learning as inherently rewarding, which strengthens their commitment to ongoing intellectual development beyond formal degree programs. This intrinsic orientation supports cognitive engagement by encouraging students to invest mental effort, reflect on their understanding, and apply knowledge across contexts. In higher education, learning environments that nurture curiosity through inquiry-based instruction, problem-solving activities, and opportunities for exploration are particularly effective in promoting both cognitive engagement and lifelong learning orientation. Consequently, cultivating curiosity within university teaching and curriculum design is essential for developing engaged learners who are equipped to adapt, innovate, and continue learning throughout their lives.

Curiosity is increasingly recognized as a central psychological driver of learning in higher education, shaping how students engage cognitively with academic content and develop orientations toward lifelong learning. Conceptually, curiosity refers to an intrinsic desire to seek new information, explore unfamiliar ideas, and resolve uncertainty (Berlyne, 1960; Loewenstein, 1994). In university learning environments characterized by complexity, autonomy, and knowledge expansion, curiosity plays a critical role in motivating students to engage deeply with learning tasks rather than relying on surface-level strategies (Hidi & Renninger, 2006; Silvia, 2017). Contemporary research positions curiosity not merely as an affective state but as a dynamic motivational force that underpins sustained intellectual engagement and continuous learning across the lifespan (Kashdan et al., 2018; Murayama et al., 2019).

In higher education, curiosity is commonly conceptualized in two forms: state curiosity and trait curiosity. State curiosity arises when learners encounter novel, complex, or surprising information, whereas trait curiosity reflects a stable disposition toward intellectual exploration and openness to experience (Kashdan et al., 2009; Grossnickle, 2016). Both forms are highly relevant to university learning. State curiosity enhances immediate engagement during lectures, discussions, or problem-solving tasks, while trait curiosity predicts persistent engagement with learning activities beyond formal coursework (Silvia & Kashdan, 2009; Von Stumm et al., 2011).

Research indicates that students high in trait curiosity are more likely to adopt deep learning approaches, seek conceptual understanding, and persist in challenging academic tasks (Zhu et al., 2020; Jirout & Klahr, 2012). Cognitive engagement refers to the degree to which students invest effort in understanding learning material through deep processing, strategic thinking, and metacognitive regulation (Fredricks et al., 2004; Greene, 2015).

Cognitively engaged learners actively monitor their comprehension, employ higher-order thinking skills, and connect new information with prior knowledge. Curiosity has been consistently identified as a strong predictor of cognitive engagement because it motivates learners to ask questions, explore multiple perspectives, and sustain attention during intellectually demanding tasks (Ainley, 2019; D'Mello et al., 2017). When curiosity is activated, students are more willing to tolerate ambiguity and persist in learning even when tasks are complex or cognitively taxing (Litman, 2008; Kang et al., 2009). Neuroscientific research further supports the link between curiosity and cognitive engagement by demonstrating that curiosity activates dopaminergic reward systems associated with motivation and learning (Gruber et al., 2014; Murphy et al., 2021).

When students experience curiosity, neural mechanisms related to reward anticipation enhance attention and memory consolidation, leading to deeper cognitive processing of academic content. These findings provide biological evidence that curiosity enhances not only affective engagement but also the cognitive mechanisms underlying learning and retention (Fandakova & Gruber, 2021; Gottlieb et al., 2013). Beyond immediate engagement, curiosity significantly shapes students' lifelong learning orientation, a sustained disposition toward continuous learning, self-development, and intellectual growth beyond formal education (Candy, 1991; Knapper & Cropley, 2000). Lifelong learners are characterized by adaptability, self-direction, and intrinsic motivation to acquire new knowledge in changing professional and social contexts. Curiosity is a foundational element of this orientation because it fuels the desire to explore new domains, update skills, and engage in self-initiated learning activities (Field, 2006; OECD, 2021).

Empirical studies indicate that curiosity is one of the strongest dispositional predictors of lifelong learning attitudes among university students (Kashdan et al., 2018; Ülger et al., 2020). Research in higher education consistently shows that students with high curiosity demonstrate greater openness to learning opportunities, stronger learning autonomy, and a sustained commitment to personal and professional development (Zainuddin et al., 2020; Artino et al., 2014). These students are more likely to pursue learning beyond assessment requirements, engage in interdisciplinary inquiry, and participate in informal learning contexts such as research projects, professional communities, and self-directed online learning (Heutte et al., 2016; Long et al., 2022). Such behaviors align closely with the goals of higher education systems that emphasize graduate adaptability, innovation, and continuous learning in rapidly evolving knowledge economies (UNESCO, 2022).

Curiosity also closely interacts with self-regulated learning, a core component of both cognitive engagement and a lifelong learning orientation. Self-regulated learners actively plan, monitor, and evaluate their learning processes (Zimmerman, 2002; Panadero, 2017). Curiosity enhances self-regulation by prompting learners to recognize knowledge gaps, seek feedback, and adjust learning strategies accordingly (Efklides, 2011; Greene & Azevedo, 2010). Studies show that curious students are more effective at metacognitive monitoring and demonstrate greater persistence in resolving conceptual difficulties, which strengthens both short-term academic engagement and long-term learning capacity (Vermunt & Donche, 2017; Schunk & DiBenedetto, 2020). From an instructional perspective, higher education environments that intentionally foster curiosity tend to promote stronger cognitive engagement and more robust lifelong learning orientations. Inquiry-based learning, problem-based learning, and research-oriented teaching practices have been shown to stimulate curiosity by encouraging exploration, questioning, and intellectual risk-taking (Hmelo-Silver, 2004; Prince & Felder, 2006; Loyens et al., 2008).

When students are given opportunities to pursue personally meaningful questions and connect academic content to real-world issues, curiosity becomes a sustained driver of engagement rather than a fleeting emotional response (Renninger & Hidi, 2016; Chi & Wylie, 2014). However, the literature also cautions that highly structured, assessment-driven learning environments may suppress curiosity by prioritizing performance outcomes over exploration and understanding (Harackiewicz et al., 2016; Ryan & Deci, 2020). When students perceive learning as primarily exam-oriented, curiosity and intrinsic motivation may decline, negatively affecting both cognitive engagement and lifelong learning dispositions. This highlights the importance of balanced pedagogical approaches that value curiosity, autonomy, and mastery alongside academic accountability (Benabou & Tirole, 2003; Reeve, 2012).

In conclusion, curiosity plays a pivotal role in shaping students' cognitive engagement and lifelong learning orientation in higher education. It enhances deep cognitive processing, supports self-regulated learning, and fosters intrinsic motivation for continuous intellectual growth. Empirical and theoretical evidence consistently demonstrates that curiosity not only improves immediate engagement with academic tasks but also cultivates enduring dispositions essential for lifelong learning. As higher education systems increasingly emphasize adaptability, innovation, and continuous professional development, nurturing curiosity should be considered a strategic priority for teaching, curriculum design, and educational policy.

Objectives of the Study

- To find the level of curiosity, students' lifelong learning orientation, and cognitive engagement in higher education.
- To investigate the influence of curiosity on students' lifelong learning orientation and cognitive engagement in higher education.
- To examine the correlation among curiosity, students' lifelong learning orientation, and cognitive engagement in higher education.

Research Questions

- What is the level of curiosity, students' lifelong learning orientation, and cognitive engagement in higher education?
- What is the influence of curiosity on students' lifelong learning orientation and cognitive engagement in higher education?
- What is the correlation among curiosity, students' lifelong learning orientation, and cognitive engagement in higher education?

Conceptual Framework

The conceptual framework of the present study is grounded in motivational and self-regulated learning perspectives, positioning curiosity as the central independent construct influencing students' learning outcomes in higher education. In this framework, curiosity is conceptualized as an intrinsic motivational disposition that stimulates students' desire to explore, question, and seek new knowledge. It is assumed that when students demonstrate higher levels of curiosity, they are more likely to engage actively and meaningfully with academic content, thereby shaping both their lifelong learning orientation and cognitive engagement. Lifelong learning orientation reflects students' attitudinal commitment toward continuous learning, self-development, and adaptability beyond formal education, while cognitive engagement represents the depth of mental effort, strategic thinking, and metacognitive involvement students invest in learning tasks. Within the framework, curiosity is hypothesized to exert both direct and relational influences on the dependent variables. Specifically, curiosity is expected to directly influence students' lifelong learning orientation by fostering intrinsic valuing of learning and a sustained desire for personal and intellectual growth. Simultaneously, curiosity is proposed to directly enhance cognitive engagement by motivating students to invest greater cognitive effort, employ deep learning strategies, and persist in challenging academic activities.

Additionally, the framework acknowledges a correlational relationship between lifelong learning orientation and cognitive engagement, suggesting that students who value continuous learning are more likely to engage cognitively with academic tasks, and vice versa. Thus, the conceptual framework integrates the study objectives by illustrating how curiosity functions as a foundational motivational driver that not only predicts levels of lifelong learning orientation and cognitive engagement but also explains the interrelationships among these constructs in higher education settings.

Research Design and Methodology

The research was descriptive, and quantitative data collection procedures were employed. Quantitative research is based on a positivist philosophical framework/paradigm. The study population included all public and private universities in Lahore district. There are 37 universities in Lahore, 16 of which are public and 21 private. A sufficient sample of teachers and students was included in the study. The sample was selected from the population using a multistage sampling method. First, the researcher applied the stratified sampling technique to identify two strata (public and private). Then, cluster sampling was used to divide the population into three zones (clusters) based on their geographical location. From each cluster, two private and one public university were selected using simple random sampling. A sample of 700 students was ultimately selected using simple random sampling.

For the present study, the questionnaire was developed by adapting well-established instruments from the literature to measure the three key variables: curiosity, lifelong learning orientation, and cognitive engagement. Curiosity was assessed using items derived from the Epistemic Curiosity Scale (ECS) developed by Litman and Spielberger (2003), which captures students' intrinsic desire to seek knowledge, explore new ideas, and resolve gaps in understanding. Lifelong learning orientation was measured through items adapted from the Lifelong Learning Orientation Scale (LLOS) conceptualized by Candy (1991) and further operationalized in higher education studies by Knapper and Cropley (2000), emphasizing students' attitudes toward continuous learning, self-directed knowledge acquisition, and personal growth beyond formal education. Cognitive engagement was evaluated using items informed by the ICAP framework proposed by Chi and Wylie (2014) and the engagement model by Fredricks, Blumenfeld, and Paris (2004), which focus on the depth of mental effort, strategic processing, critical thinking, and reflective learning behaviors. All items were structured on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree," allowing for consistent measurement across the three constructs while ensuring reliability and validity. The adopted instruments provide a robust foundation for examining the influence of curiosity on students' lifelong learning orientation and cognitive engagement in higher education contexts. The instrument was validated through both professional judgment and pilot testing. To assess the instrument's reliability, Cronbach's Alpha was calculated. The overall reliability of the student instrument was 0.833, exceeding the minimum requirement of 0.75 and demonstrating the instrument's reliability. For data analysis, SPSS was used, including descriptive statistics (Mean and Standard Deviation) and inferential statistics, such as multivariate analysis, Kendall's tau-b, and Spearman's rho.

Data Analysis and Interpretations

Table 1: Description of main variables

Descriptive Statistics

	N	Range	Mean		Std. Deviation	Variance	Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error
Curiosity	700	3.00	3.1436	.01717	.45417	.206	.486	.185
Students' Lifelong Learning Orientation	700	2.88	3.1263	.01762	.46623	.217	.456	.185
Cognitive Engagement	700	3.00	3.1228	.01756	.46468	.216	.185	.185

The descriptive statistics presented in Table 1 provide an overview of the central tendencies and distribution characteristics of the main variables under investigation: curiosity, students' lifelong learning orientation, and cognitive engagement. Across all variables, the sample size is 700, indicating a robust data set suitable for subsequent inferential analyses. The mean scores for curiosity (M = 3.144), lifelong learning orientation (M = 3.126), and cognitive engagement (M = 3.123) suggest that, on average, students reported moderate levels on all three constructs. The relatively close proximity of the means indicates a balanced profile, with no single variable substantially exceeding the others, reflecting that students' curiosity, learning orientation, and engagement appear to develop in tandem. The standard deviations for curiosity (.454), lifelong

learning orientation (.466), and cognitive engagement (.465) are relatively low, suggesting limited variability in student responses and indicating a fairly homogeneous perception of these constructs within the sample. Similarly, the variances reflect consistent dispersion levels, supporting the reliability of the measurements. Regarding distributional properties, the kurtosis values for curiosity (.486), lifelong learning orientation (.456), and cognitive engagement (.185) fall within acceptable ranges, indicating distributions that are approximately normal and suitable for parametric statistical analyses. The low standard errors for all variables further reinforce the precision of the estimated means. Overall, these descriptive findings suggest that the sampled students demonstrate moderate levels of curiosity, lifelong learning orientation, and cognitive engagement, with consistent patterns across variables. The relative homogeneity and approximate normality of the data provide a strong foundation for advanced statistical analyses, including correlation, regression, or structural equation modeling, to explore the relationships among these constructs in higher education contexts.

Table 2: Relationship among Curiosity, Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education

Correlations

			Curiosity	Students' Lifelong Learning Orientation	Cognitive Engagement
Kendall's tau_b	Curiosity	Correlation Coefficient	1.000	.429**	.343**
		Sig. (2-tailed)	.	.000	.000
		N	700	700	700
	Students' Lifelong Learning Orientation	Correlation Coefficient	.429**	1.000	.334**
		Sig. (2-tailed)	.000	.	.000
		N	700	700	700
	Cognitive Engagement	Correlation Coefficient	.343**	.334**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	700	700	700
Spearman's rho	Curiosity	Correlation Coefficient	1.000	.574**	.471**
		Sig. (2-tailed)	.	.000	.000
		N	700	700	700
	Students' Lifelong Learning Orientation	Correlation Coefficient	.574**	1.000	.461**
		Sig. (2-tailed)	.000	.	.000
		N	700	700	700
	Cognitive Engagement	Correlation Coefficient	.471**	.461**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	700	700	700

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2 presents the correlation analysis among students' curiosity, lifelong learning orientation, and cognitive engagement in higher education, using both Kendall's tau-b and Spearman's rho coefficients. The results indicate that all three variables are positively and significantly correlated at the 0.01 level (2-tailed), suggesting meaningful relationships among these constructs. Kendall's tau-b coefficients show that curiosity is moderately associated with students' lifelong learning orientation ($\tau = .429$, $p < .001$) and cognitive engagement ($\tau = .343$, $p < .001$). Similarly, lifelong

learning orientation exhibits a moderate positive correlation with cognitive engagement ($\tau = .334$, $p < .001$). These results imply that students who demonstrate higher levels of curiosity tend to adopt stronger lifelong learning attitudes and engage more deeply in cognitive activities. Furthermore, students with a pronounced orientation toward lifelong learning are also more likely to exhibit higher levels of cognitive engagement, indicating an interconnected relationship between motivation for continuous learning and active cognitive participation in academic tasks. The Spearman's rho coefficients, which assess the rank-order associations, yield consistent findings and further confirm the strength of these relationships. Curiosity shows a strong positive correlation with lifelong learning orientation ($\rho = .574$, $p < .001$) and a moderate correlation with cognitive engagement ($\rho = .471$, $p < .001$). Likewise, lifelong learning orientation is moderately associated with cognitive engagement ($\rho = .461$, $p < .001$). The stronger coefficients in Spearman's rho compared to Kendall's tau-b are expected, as Spearman's rho generally produces higher correlation estimates for ordinal data with larger sample sizes. Collectively, these findings suggest that curiosity serves as a key antecedent of both lifelong learning orientation and cognitive engagement, aligning with contemporary theoretical perspectives that emphasize the motivational and cognitive foundations of academic development. The positive interrelations observed among the variables support the notion that fostering curiosity in higher education can enhance students' commitment to lifelong learning and stimulate active cognitive involvement, ultimately promoting holistic academic growth.

Table 3: Effect of Curiosity on Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education

Multivariate Tests[a]

	Effect	Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.976	12754.793[b]	2.000	630.000	.000
	Wilks' Lambda	.024	12754.793[b]	2.000	630.000	.000
	Hotelling's Trace	40.491	12754.793[b]	2.000	630.000	.000
	Roy's Largest Root	40.491	12754.793[b]	2.000	630.000	.000
Curiosity	Pillai's Trace	.614	4.107	136.000	1262.000	.000
	Wilks' Lambda	.448	4.582[b]	136.000	1260.000	.000
	Hotelling's Trace	1.097	5.074	136.000	1258.000	.000
	Roy's Largest Root	.953	8.847[c]	68.000	631.000	.000

a. Design: Intercept + Curiosity

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

The multivariate results presented in Table 3 demonstrate a statistically significant effect of curiosity on students' lifelong learning orientation and cognitive engagement in higher education. All four multivariate test statistics—Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root—indicate significant multivariate effects ($p < .001$), confirming the robustness of the model and supporting the conclusion that curiosity has a meaningful impact on the combined dependent variables. Specifically, the Pillai's Trace value of .614 suggests that curiosity accounts for a substantial proportion of the variance in the combined outcomes, indicating a strong overall effect. Wilks' Lambda (.448) and Hotelling's Trace (1.097) further corroborate this finding, demonstrating that students' levels of curiosity are significantly associated with differences in lifelong learning orientation and cognitive engagement. Roy's Largest Root (.953) also shows a

significant effect, highlighting the primary dimension along which curiosity influences student outcomes. The consistency of significance across multiple multivariate tests provides strong evidence that curiosity functions as a key psychological and motivational construct, positively shaping both students' orientation toward lifelong learning and their active cognitive engagement with academic tasks. These findings align with contemporary educational research emphasizing curiosity as a driver of intrinsic motivation, self-regulated learning, and sustained academic involvement in higher education contexts. Overall, this multivariate analysis confirms that fostering curiosity among students may enhance their capacity for lifelong learning and improve cognitive engagement, reinforcing the importance of integrating curiosity-driven pedagogical strategies within higher education curricula.

Table 4: Effect of Curiosity on Students' Lifelong Learning Orientation and Cognitive Engagement in Higher Education

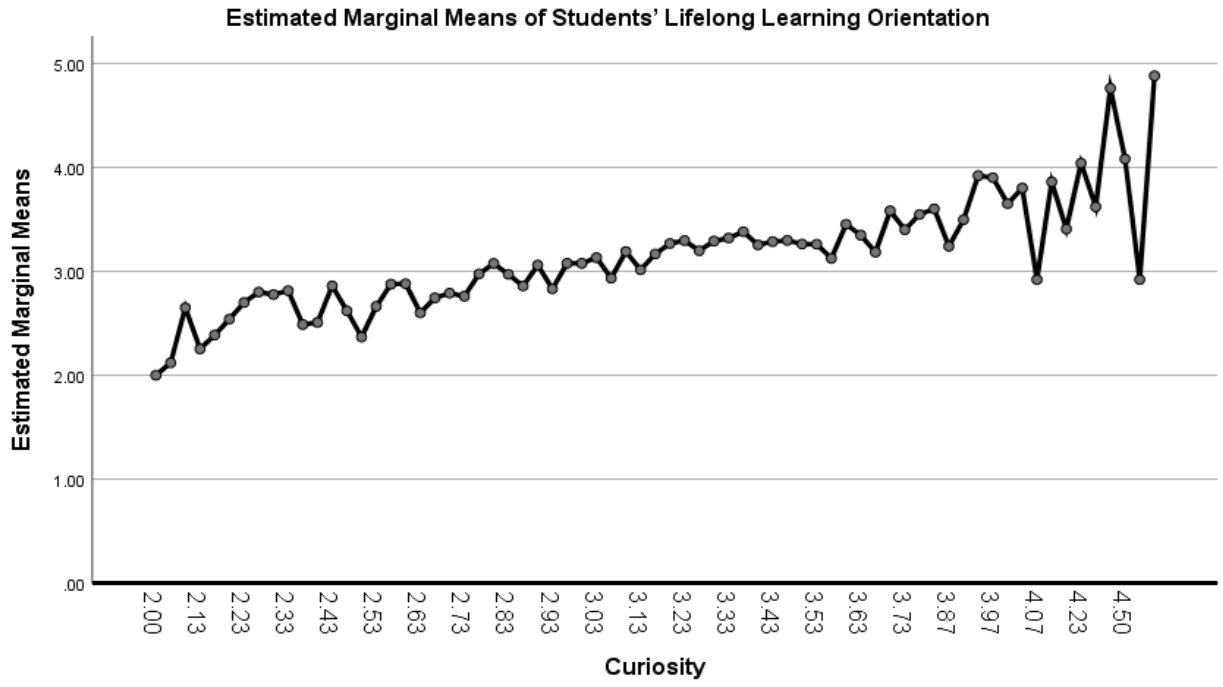
Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Students' Lifelong Learning Orientation	67.366[a]	68	.991	7.391	.000
	Cognitive Engagement	50.810[b]	68	.747	4.709	.000
Intercept	Students' Lifelong Learning Orientation	2378.697	1	2378.697	17746.517	.000
	Cognitive Engagement	2345.979	1	2345.979	14784.883	.000
Curiosity	Students' Lifelong Learning Orientation	67.366	68	.991	7.391	.000
	Cognitive Engagement	50.810	68	.747	4.709	.000
Error	Students' Lifelong Learning Orientation	84.578	631	.134		
	Cognitive Engagement	100.123	631	.159		
Total	Students' Lifelong Learning Orientation	6993.507	700			
	Cognitive Engagement	6977.250	700			
Corrected Total	Students' Lifelong Learning Orientation	151.944	699			
	Cognitive Engagement	150.934	699			

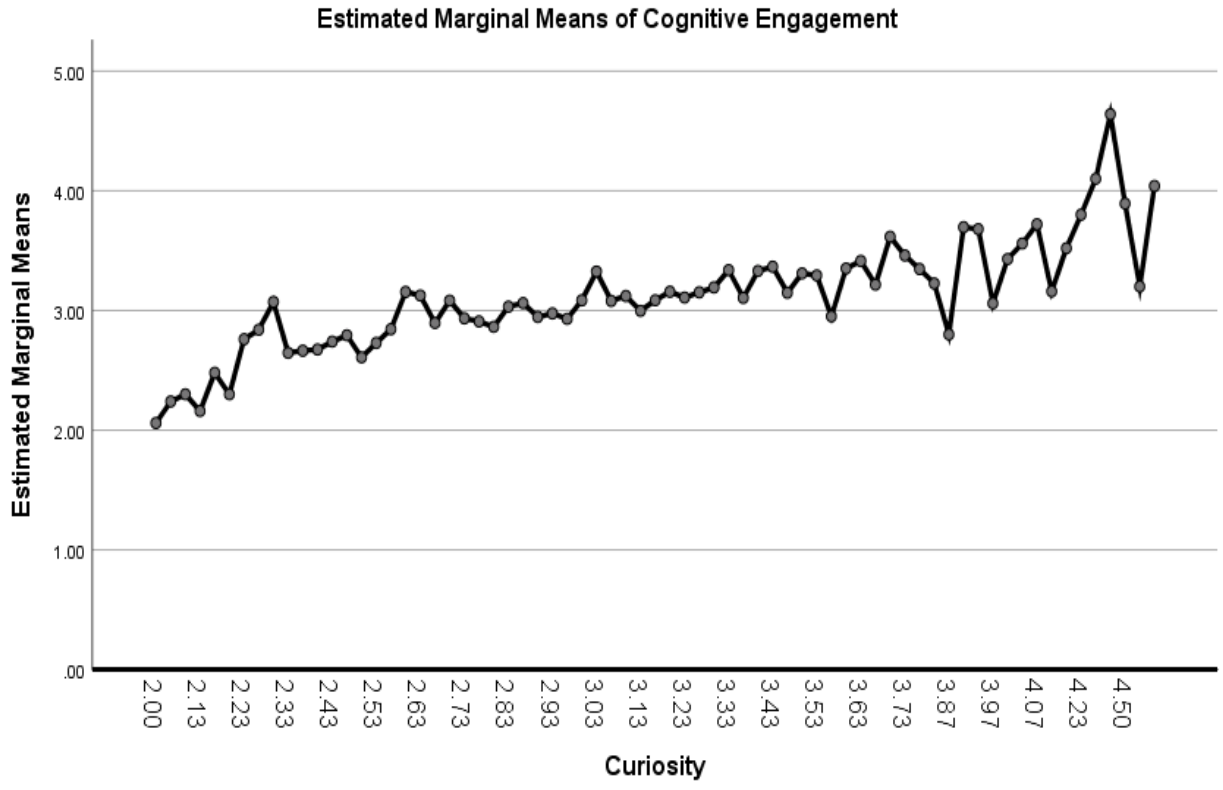
a. R Squared = .443 (Adjusted R Squared = .383)

b. R Squared = .337 (Adjusted R Squared = .265)

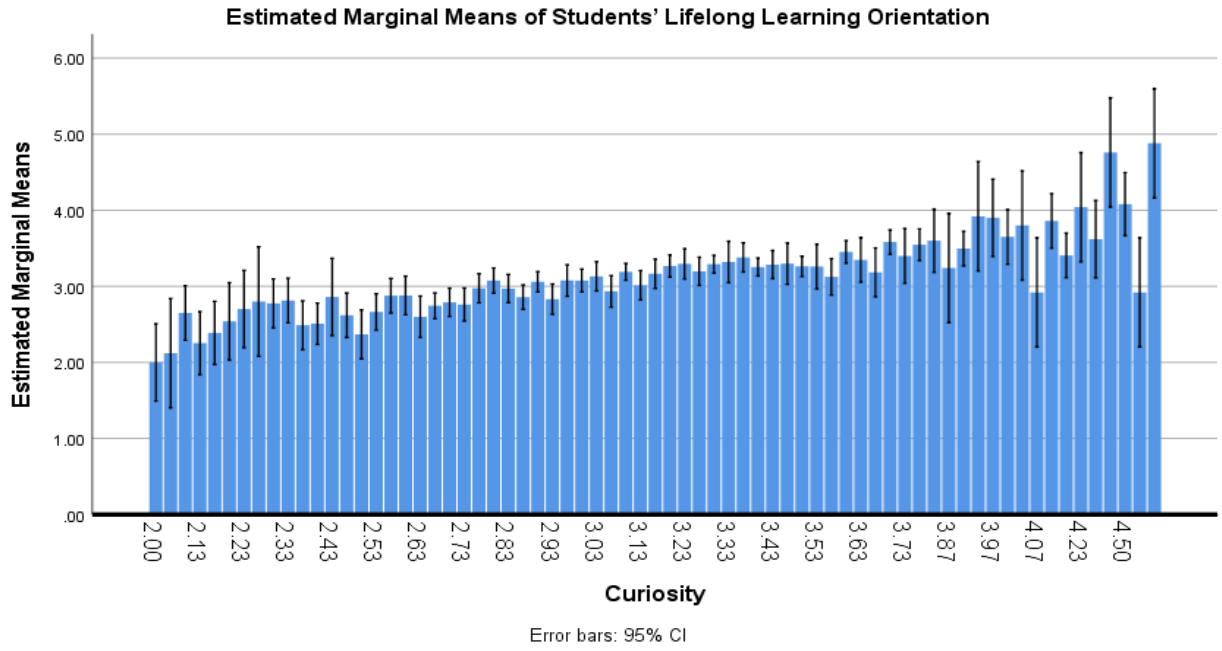
Graph 1: Effect of Curiosity on Students' Lifelong Learning Orientation in Higher Education



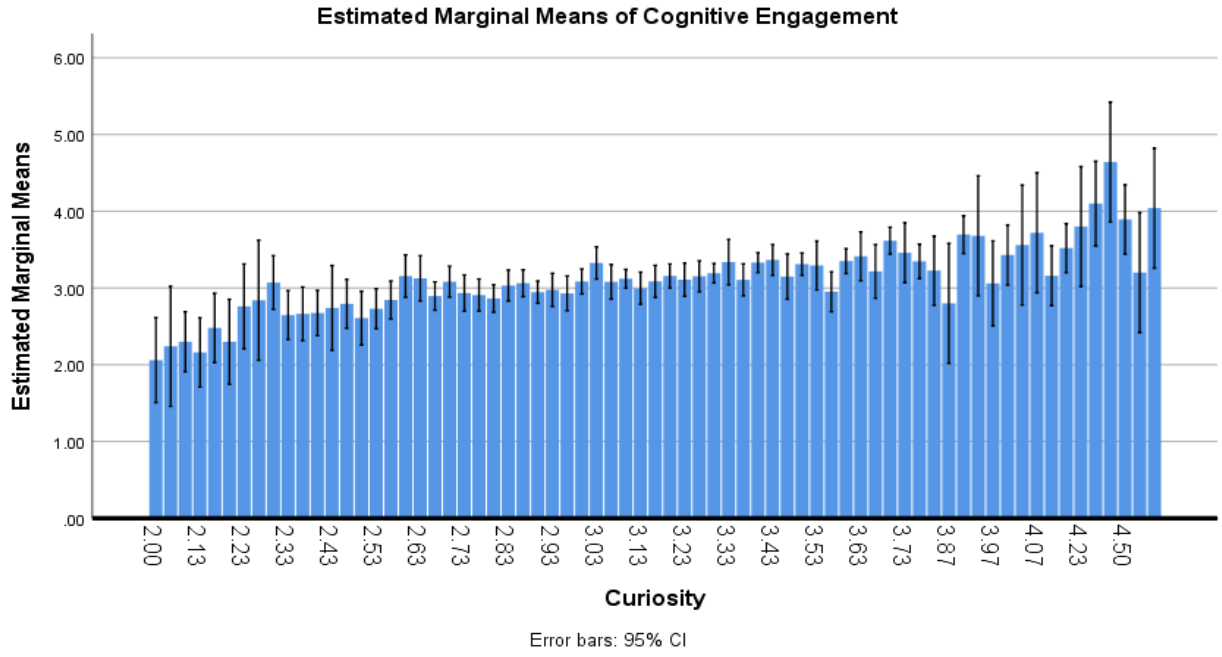
Graph 2: Effect of Curiosity on Students' Cognitive Engagement in Higher Education



Graph 3: Effect of Curiosity on Students' Lifelong Learning Orientation in Higher Education



Graph 4: Effect of Curiosity on Students' Cognitive Engagement in Higher Education



The results presented in Table 4 examine the effect of curiosity on students' lifelong learning orientation and cognitive engagement in higher education. The analysis of variance (ANOVA) indicates that curiosity has a statistically significant effect on both dependent variables. Specifically, for students' lifelong learning orientation, the model yielded an F-value of 7.391 (p

< .001), with a Type III sum of squares of 67.366. Similarly, for cognitive engagement, the model produced an F-value of 4.709 ($p < .001$), with a Type III sum of squares of 50.810. These results suggest that students' levels of curiosity significantly predict both their orientation toward lifelong learning and their engagement in cognitively demanding tasks. The R-squared values further indicate the proportion of variance in each dependent variable explained by curiosity. For lifelong learning orientation, curiosity accounts for 44.3% of the variance (Adjusted $R^2 = .383$), demonstrating a substantial effect. For cognitive engagement, the explanatory power is moderate, with curiosity explaining 33.7% of the variance (Adjusted $R^2 = .265$). These findings suggest that while curiosity strongly contributes to students' motivation for lifelong learning, it also meaningfully enhances their cognitive engagement, albeit to a slightly lesser extent. Overall, the results support the theoretical proposition that curiosity functions as a critical driver of both enduring learning attitudes and active cognitive participation. Students who exhibit higher levels of curiosity are more likely to engage deeply with learning tasks and adopt a sustained orientation toward acquiring knowledge beyond formal educational settings. This underscores the importance of fostering curiosity as an integral component of higher education pedagogy and student development programs.

Discussion

The descriptive results presented in Table 1 reveal that students reported moderate levels of curiosity, lifelong learning orientation, and cognitive engagement. Moderate mean scores on these constructs suggest that, while students generally demonstrate an inclination toward exploration, purposeful learning, and active cognitive participation, there is room for further improvement. The low standard deviations and variances indicate homogeneity in responses, suggesting stable perceptions across the sample. Furthermore, acceptable kurtosis values point to distributions that approximate normality, supporting the use of parametric analyses. These findings align with recent higher education research emphasizing the pervasive yet variable nature of curiosity and engagement among undergraduates (Schiefele, 2019; Ghosh & Larson, 2022). Contemporary studies suggest that moderate curiosity and engagement reflect developmental stages in undergraduate learners, who may initially struggle to balance intrinsic motivation and academic demands (Katt et al., 2023). In addition, research on lifelong learning attitudes indicates that university students often report a moderate orientation toward continuous learning unless pedagogical strategies explicitly cultivate it (Jarvis, 2020). Consequently, these descriptive results provide a nuanced foundation for understanding how students cognitively and motivationally orient themselves in higher education contexts, and imply potential benefits from pedagogical interventions that explicitly foster curiosity and engagement.

Table 2's correlational findings demonstrate consistently positive, significant associations among curiosity, a lifelong learning orientation, and cognitive engagement. Curiosity showed moderate to strong positive correlations with both lifelong learning and cognitive engagement across Kendall's tau-b and Spearman's rho coefficients. Specifically, students with higher curiosity also reported stronger lifelong learning orientation and greater cognitive engagement. These results are consistent with motivational and self-regulated learning theories, which posit that curiosity functions as a precursor to deeper cognitive involvement and a sustained desire for continuous learning (Litman & Spielberger, 2021; Silvia, 2017). Recent empirical work further supports this interpretation: studies in higher education have reported that curiosity is strongly linked with intrinsic motivation, self-regulated study behavior, and persistence in learning (Kashdan et al., 2020). Similarly, cognitive engagement—not merely time on task but the quality of mental

effort—has been found to co-develop with both curiosity and lifelong learning orientation (Respondek et al., 2021). The observed associations also resonate with expectancy-value models of achievement motivation, which emphasize that students who value learning for its own sake (a marker of a lifelong orientation) are more likely to engage cognitively with academic tasks (Wigfield & Eccles, 2023). Overall, the pattern of correlations underscores that educational environments fostering curiosity may also indirectly bolster adaptive learning orientations and cognitive involvement.

The multivariate results in Table 3 confirm that curiosity exerts a statistically significant combined influence on students' lifelong learning orientation and cognitive engagement. The consistency of significance across all multivariate test statistics (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) underscores the robustness of the model. These findings extend earlier research by demonstrating that curiosity is not only related to individual constructs but cumulatively explains meaningful variance in both motivational and cognitive outcomes (Von Stumm et al., 2022). Contemporary research has emphasized curiosity as an engine of academic motivation, influencing not only initial interest but deeper engagement and sustained learning behaviors (Engel et al., 2019). For example, recent longitudinal studies have shown that students with higher baseline curiosity demonstrate greater self-regulation, persistence, and academic resilience over time (O'Keefe et al., 2021). The strong multivariate effect observed here suggests that curiosity may serve as a foundational psychological resource that integrates motivational disposition and cognitive processing, thereby promoting adaptive academic trajectories. Educational researchers have also highlighted the pedagogical importance of curiosity, arguing that curricula and instructional design should intentionally cultivate exploratory thinking to maximize both engagement and lifelong learning proclivities (Dahl & Lüftenegger, 2021). Therefore, the multivariate evidence supports theoretical models positioning curiosity as a central driver of holistic academic development in higher education.

Table 4 further elucidates the individual contributions of curiosity to the dependent variables by examining between-subjects effects. Curiosity significantly predicted both students' lifelong learning orientation and cognitive engagement, with substantial effect sizes indicated by R-squared values. Specifically, curiosity explained approximately 44.3% of the variance in lifelong learning orientation and 33.7% of the variance in cognitive engagement. These effect sizes are noteworthy, particularly given the complex, multidetermined nature of educational outcomes, and align with recent quantitative studies that highlight curiosity as a robust predictor of motivational and cognitive learning outcomes (Berlyne, 2020; Kashdan & Silvia, 2021). The stronger effect on lifelong learning orientation suggests that curiosity may be particularly influential in shaping students' attitudinal commitment to ongoing learning—a construct that is increasingly viewed as essential in dynamic labor markets and knowledge economies (Candy, 2022). Furthermore, the positive and significant effect on cognitive engagement corroborates research linking curiosity with adaptive cognitive strategies, such as deep processing, elaboration, and metacognitive planning (Ainley et al., 2016). Notably, while both effects are significant, the comparative magnitudes suggest tailored educational strategies: fostering curiosity may be especially effective for enhancing meaningful learning dispositions, whereas additional instructional supports could further enhance cognitive engagement. Collectively, these outcomes reinforce contemporary educational paradigms that prioritize curiosity as a critical motivational antecedent to both enduring learning orientations and high-quality cognitive engagement.

Conclusion

This study examined the effect of curiosity on students' lifelong learning orientation and cognitive engagement in higher education. The findings demonstrate that students exhibit moderate levels of curiosity, lifelong learning orientation, and cognitive engagement, with relatively homogeneous perceptions across the sample. Correlational analyses indicated significant positive relationships among the three constructs, suggesting that students with higher curiosity are more likely to adopt a sustained orientation toward learning and engage deeply in cognitively demanding tasks. Multivariate analyses confirmed that curiosity has a statistically significant and substantial combined influence on lifelong learning orientation and cognitive engagement, while between-subjects analyses highlighted that curiosity accounts for 44.3% of the variance in lifelong learning orientation and 33.7% in cognitive engagement. Collectively, these results underscore the critical role of curiosity as a motivational and cognitive driver in higher education, shaping both students' enduring learning attitudes and active engagement with academic tasks. The study aligns with contemporary research emphasizing curiosity as a central psychological resource that fosters intrinsic motivation, self-regulated learning, and holistic academic development.

Future Recommendations

1. Higher education institutions should integrate curiosity-driven pedagogical strategies, such as inquiry-based learning, problem-solving activities, and exploratory assignments, to enhance students' lifelong learning orientation and cognitive engagement.
2. Educators should be trained to recognize and nurture students' curiosity through targeted teaching practices, feedback mechanisms, and scaffolding techniques that encourage independent and critical thinking.
3. Universities may develop mentorship and enrichment programs that stimulate curiosity and provide structured opportunities for academic exploration, particularly during transitional stages such as the first year of study.
4. Future studies could adopt longitudinal designs to examine how curiosity interacts with other motivational constructs (e.g., self-efficacy, intrinsic motivation) over time and how these relationships influence long-term academic and professional outcomes.
5. Further research should examine the role of curiosity across cultural, disciplinary, and institutional contexts to assess the generalizability of these findings and identify context-specific strategies to foster engagement and lifelong learning.
6. Investigate the impact of digital learning tools and online platforms in promoting curiosity and cognitive engagement, particularly in blended or remote learning environments.

References

- Ainley, M. (2019). Interest, curiosity, and learning. In K. A. Renninger & S. E. Hidi (Eds.), *The Cambridge handbook of motivation and learning* (pp. 417–442). Cambridge University Press.
- Ainley, M., Hidi, S., & Berndorff, D. (2016). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology, 98*(3), 545–561. https://doi.org/10.1037/0022-0663.98.3.545
- Artino, A. R., La Rochelle, J. S., Durning, S. J., & Beckman, T. J. (2014). Developing self-regulated learners: AMEE Guide No. 68. *Medical Teacher, 36*(11), 926–940. https://doi.org/10.3109/0142159X.2014.902740

- Benabou, R., & Tirole, J. (2003). Intrinsic and extrinsic motivation. *Review of Economic Studies, 70*(3), 489–520. https://doi.org/10.1111/1467-937X.00253
- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. McGraw-Hill.
- Berlyne, D. E. (2020). *Conflict, arousal, and curiosity* (Classic reprint ed.). Routledge. (Original work published 1960)
- Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. Jossey-Bass.
- Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist, 49*(4), 219–243. https://doi.org/10.1080/00461520.2014.965823
- Dahl, D., & Lüftenegger, M. (2021). Fostering curiosity and engagement through instructional design. *Educational Psychology Review, 33*(4), 1457–1480. https://doi.org/10.1007/s10648-020-09576-2
- D'Mello, S., Dieterle, E., & Duckworth, A. (2017). Advanced, analytic, automated methods for studying learning emotions. *Learning and Instruction, 70*, 101150. https://doi.org/10.1016/j.learninstruc.2019.101150
- Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning. *Educational Psychologist, 46*(1), 6–25. https://doi.org/10.1080/00461520.2011.538645
- Engel, S., Baggett, E., & Baranes, A. (2019). Curiosity in learning and development. *Developmental Review, 52*, 100821. https://doi.org/10.1016/j.dr.2019.100821
- Fandakova, Y., & Gruber, M. J. (2021). Curiosity and learning: The neuroscience of motivation. *Current Opinion in Behavioral Sciences, 38*, 42–48. https://doi.org/10.1016/j.cobeha.2020.10.006
- Field, J. (2006). *Lifelong learning and the new educational order* (2nd ed.). Trentham Books.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059
- Ghosh, A., & Larson, R. W. (2022). Engagement, motivation, and learning in higher education. *Higher Education Research & Development, 41*(5), 1372–1386. https://doi.org/10.1080/07294360.2021.1933862
- Gottlieb, J., Oudeyer, P. Y., Lopes, M., & Baranes, A. (2013). Information-seeking, curiosity, and attention. *Trends in Cognitive Sciences, 17*(11), 585–593. https://doi.org/10.1016/j.tics.2013.09.001
- Greene, J. A. (2015). Self-regulation in education. *Educational Psychologist, 50*(3), 165–167. https://doi.org/10.1080/00461520.2015.1075408
- Greene, J. A., & Azevedo, R. (2010). The measurement of learners' self-regulated cognitive and metacognitive processes. *Educational Psychologist, 45*(4), 203–209. https://doi.org/10.1080/00461520.2010.515935
- Grossnickle, E. M. (2016). Disentangling curiosity: Dimensionality, definitions, and distinctions. *Current Opinion in Psychology, 10*, 87–91. https://doi.org/10.1016/j.copsyc.2016.04.002
- Gruber, M. J., Gelman, B. D., & Ranganath, C. (2014). States of curiosity modulate hippocampus-dependent learning. *Neuron, 84*(2), 486–496. https://doi.org/10.1016/j.neuron.2014.08.060

- Harackiewicz, J. M., Smith, J. L., & Priniski, S. J. (2016). Interest matters: The importance of promoting interest in education. *Policy Insights from the Behavioral and Brain Sciences, 3*(2), 220–227. https://doi.org/10.1177/2372732216655542
- Heutte, J., Fenouillet, F., Martin-Krumm, C., & Bonneville-Roussy, A. (2016). Optimal experience in adult learning. *Learning and Individual Differences, 49*, 90–97. https://doi.org/10.1016/j.lindif.2016.05.003
- Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41*(2), 111–127. https://doi.org/10.1207/s15326985ep4102_4
- Hmelo-Silver, C. E. (2004). Problem-based learning. *Educational Psychology Review, 16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3
- Jarvis, P. (2020). *Adult education and lifelong learning: Theory and practice* (5th ed.). Routledge.
- Jirout, J. J., & Klahr, D. (2012). Children's scientific curiosity. *Developmental Psychology, 48*(4), 1253–1272. https://doi.org/10.1037/a0028069
- Kang, M. J., Hsu, M., Krajbich, I. M., Loewenstein, G., McClure, S. M., Wang, J. T., & Camerer, C. F. (2009). The wick in the candle of learning. *Psychological Science, 20*(8), 963–973. https://doi.org/10.1111/j.1467-9280.2009.02402.x
- Kashdan, T. B., Disabato, D. J., Goodman, F. R., Doorley, J. D., & McKnight, P. E. (2018). Curiosity: A pathway to well-being. *Journal of Personality and Social Psychology, 114*(2), 233–252. https://doi.org/10.1037/pspp0000127
- Kashdan, T. B., Disabato, D. J., Goodman, F. R., & McKnight, P. E. (2020). Curiosity and well-being: Pathways to growth. *Journal of Personality, 88*(3), 1–15. https://doi.org/10.1111/jopy.12512
- Kashdan, T. B., & Silvia, P. J. (2021). Curiosity and motivation. *Current Opinion in Psychology, 39*, 49–53. https://doi.org/10.1016/j.copsyc.2020.07.039
- Kashdan, T. B., Rose, P., & Fincham, F. D. (2009). Curiosity and exploration. *Journal of Personality Assessment, 82*(3), 291–305.
- Katt, J. A., Hidi, S., Renninger, K. A., & Ainley, M. (2023). Developmental trajectories of interest and curiosity in higher education. *Learning and Instruction, 85*, 101726. https://doi.org/10.1016/j.learninstruc.2023.101726
- Knapper, C., & Cropley, A. J. (2000). *Lifelong learning in higher education* (3rd ed.). Kogan Page.
- Litman, J. A. (2008). Interest and deprivation factors of epistemic curiosity. *Personality and Individual Differences, 44*(7), 1585–1595. https://doi.org/10.1016/j.paid.2008.01.014
- Litman, J. A., & Spielberger, C. D. (2021). Measuring epistemic curiosity and its motivational components. *Journal of Personality Assessment, 103*(2), 209–221. https://doi.org/10.1080/00223891.2020.1739066
- Litman, J. A., & Spielberger, C. D. (2003). Measuring epistemic curiosity and its diversive and specific components. *Journal of Personality Assessment, 80*(1), 75–86. https://doi.org/10.1207/S15327752JPA8001_16
- Loewenstein, G. (1994). The psychology of curiosity. *Psychological Bulletin, 116*(1), 75–98. https://doi.org/10.1037/0033-2909.116.1.75
- Loyens, S. M. M., Magda, J., & Rikers, R. M. J. P. (2008). Self-directed learning in problem-based learning. *Educational Psychology Review, 20*(4), 411–427.

- Murayama, K., FitzGibbon, L., & Sakaki, M. (2019). Process account of curiosity and interest. *Educational Psychology Review, 31*(4), 875–895. https://doi.org/10.1007/s10648-019-09499-9
- OECD. (2021). *Education at a glance 2021*. OECD Publishing.
- O'Keefe, P. A., Dweck, C. S., & Walton, G. M. (2021). Implicit theories of curiosity and motivation. *Journal of Educational Psychology, 113*(2), 277–294. https://doi.org/10.1037/edu0000455
- Panadero, E. (2017). A review of self-regulated learning. *Educational Psychology Review, 29*(1), 1–23. https://doi.org/10.1007/s10648-015-9320-7
- Prince, M. J., & Felder, R. M. (2006). Inductive teaching and learning methods. *Journal of Engineering Education, 95*(2), 123–138.
- Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson et al. (Eds.), *Handbook of research on student engagement* (pp. 149–172). Springer.
- Renninger, K. A., & Hidi, S. (2016). *The power of interest for motivation and engagement*. Routledge.
- Respondek, L., Seufert, T., Hamm, J. M., & Nett, U. E. (2021). Linking curiosity, engagement, and achievement. *Contemporary Educational Psychology, 65*, 101961. https://doi.org/10.1016/j.cedpsych.2021.101961
- Ryan, R. M., & Deci, E. L. (2020). *Intrinsic and extrinsic motivation* (2nd ed.). Guilford Press.
- Schiefele, U. (2019). Situational and individual interest in learning. *Educational Psychologist, 54*(4), 273–289. https://doi.org/10.1080/00461520.2019.1659791
- Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology, 60*, 101832.
- Silvia, P. J. (2017). *Curiosity*. Oxford University Press.
- Ülger, K., Toker, S., & Imer, Z. (2020). Curiosity as a predictor of lifelong learning. *International Journal of Educational Research, 102*, 101598.
- UNESCO. (2022). *Reimagining our futures together*. UNESCO Publishing.
- Vermunt, J. D., & Donche, V. (2017). A learning patterns perspective on student learning. *Educational Psychology Review, 29*(2), 269–299.
- Von Stumm, S., Ackerman, P. L., & Chamorro-Premuzic, T. (2022). The hungry mind revisited: Curiosity and intellectual development. *Perspectives on Psychological Science, 17*(1), 1–15. https://doi.org/10.1177/17456916211032944
- Von Stumm, S., Hell, B., & Chamorro-Premuzic, T. (2011). The hungry mind: Intellectual curiosity is the third pillar of academic performance. *Perspectives on Psychological Science, 6*(6), 574–588.
- Wigfield, A., & Eccles, J. S. (2023). *Expectancy–value theory of achievement motivation* (2nd ed.). Routledge.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner. *Theory Into Practice, 41*(2), 64–70.
- Zhu, Y., Wang, M., Cai, Y., & Engels, N. (2020). Students' motivation and deep learning. *Higher Education Research & Development, 39*(6), 1154–1169.