

HABITS OF MIND, METACOGNITION, AND REFLECTIVE INTELLIGENCE: INTERRELATIONS AND PREDICTIVE ROLES AMONG SOHAR UNIVERSITY STUDENTS

HÁBITOS MENTAIS, METACOGNIÇÃO E INTELIGÊNCIA REFLEXIVA: INTER-RELAÇÕES E PAPÉIS PREDITIVOS ENTRE OS ESTUDANTES DA UNIVERSIDADE DE SOHAR

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Abstract

The present study investigates how habits of mind and metacognition are related to and predict reflective intelligence among undergraduate students at Sohar University, Oman. The concept is based on Costa's hierarchy of thinking and Perkins's triarchic view of intelligence. This research defined habits of mind as productive dispositions, metacognition as awareness and regulation of thinking, and reflective intelligence as a meta-level capacity to orchestrate mental resources in complex tasks. A sample of 179 students drawn from the Faculty of Education and Arts completed three instruments. A Habits of Mind Scale developed by the researchers, the

Resumo

O presente estudo investiga como os hábitos mentais e a metacognição estão relacionados e predizem a inteligência reflexiva entre estudantes de graduação da Universidade de Sohar, em Omã. O conceito baseia-se na hierarquia do pensamento de Costa e na visão triárquica da inteligência de Perkins. Esta pesquisa definiu os hábitos mentais como disposições produtivas, a metacognição como consciência e regulação do pensamento e a inteligência reflexiva como uma capacidade meta-nível para orquestrar recursos mentais em tarefas complexas. Uma amostra de 179 estudantes da Faculdade de Educação e Artes



Metacognition Self-Assessment Scale (MSAS), and Al Cody et al., 2025's Reflective Intelligence Scale. Descriptive results revealed medium-to-high levels on all three constructs. Pearson correlations revealed a very strong, positive, and statistically significant association among habits of mind, metacognition, and reflective intelligence ($r = 0.86-.93$). Multiple regression showed that together, habits of mind and metacognition accounted for approximately 84% of the variance in reflective intelligence; yet only habits of mind emerged as a significant independent predictor when both were entered into the model. The present results support integrated models that position intelligent dispositions, metacognitive regulation, and reflective intelligence as interlinked higher-order thinking, emphasizing habits of mind as a nodal construct that interlinks metacognitive awareness with reflective performance. The study offers new evidence from a Gulf context in higher education to suggest that in any university curricula, especially in teacher preparation, the systematic development of habits of mind may offer a strong lever in developing reflective, self-regulated learners across 21st-century educational goals.

Keywords: Reflective Intelligence. Metacognition. Habits of Mind. Metacognitive Strategies. Reflective Thinking. Self-Awareness. Self-Assessment.

preencheu três instrumentos. Uma Escala de Hábitos Mentais desenvolvida pelos pesquisadores, a Escala de Autoavaliação da Metacognição (MSAS) e a Escala de Inteligência Reflexiva de Al Cody et al., 2025. Os resultados descritivos revelaram níveis médios a altos em todos os três constructos. As correlações de Pearson revelaram uma associação muito forte, positiva e estatisticamente significativa entre hábitos mentais, metacognição e inteligência reflexiva ($r = 0,86-0,93$). A regressão múltipla mostrou que, juntos, os hábitos mentais e a metacognição representavam aproximadamente 84% da variação na inteligência reflexiva; no entanto, apenas os hábitos mentais emergiram como um preditor independente significativo quando ambos foram inseridos no modelo. Os resultados atuais apoiam modelos integrados que posicionam disposições inteligentes, regulação metacognitiva e inteligência reflexiva como pensamento de ordem superior interligado, enfatizando os hábitos mentais como um construto nodal que interliga a consciência metacognitiva com o desempenho reflexivo. O estudo oferece novas evidências do contexto do Golfo no ensino superior para sugerir que, em qualquer currículo universitário, especialmente na formação de professores, o desenvolvimento sistemático de hábitos mentais pode oferecer uma forte alavanca no desenvolvimento de alunos reflexivos e autorregulados em todas as metas educacionais do século XXI.

Palavras-chave: Inteligência Reflexiva. Metacognição. Hábitos Mentais. Estratégias Metacognitivas. Pensamento Reflexivo. Autoconsciência. Autoavaliação.

1 INTRODUCTION AND THEORETICAL FRAMEWORK

Over the last two decades, higher education systems around the world have been called upon to better prepare students to thrive in volatile, uncertain, and information-saturated contexts. International reports on 21st-century competencies seem to point toward a consensus that success in contemporary society relies less on rote knowledge of facts and more on the ability to think critically, learn independently, solve novel problems, and self-regulate learning over time. Nested within this framing, it follows that

universities have a new mandate: to cultivate only cognitive abilities but also deeper dispositional and regulatory abilities that learners can draw upon to deploy those abilities productively across diverse situations that cannot be fully anticipated. In this regard, three constructs have taken on importance—namely, habits of mind, metacognition, and reflective intelligence—which together provide a multidimensional foundation for understanding university students' development of higher order thinking as a driver of lifelong adaptability.

Habits of mind, as conceptualized by Costa and Kallick (2000), are a set of intelligent, learnable dispositions that people invoke when faced with problems, dilemmas, or uncertainties for which solutions are not immediately apparent. Other than being automatic routines, these habits represent intentional patterns of behavior and thinking—such as persistence in the face of difficulty, managing impulsivity, listening with understanding and empathy, thinking flexibly, and striving for accuracy—that underpin effective problem solving, decision making, communication, and collaboration (Costa & Kallick, 2000; Costa, 2001). Crucially, it is emphasized by Costa and Kallick that the habits of mind are not fixed traits but can be developed through deliberate practice, reflection, and targeted instruction, which make them central targets for educational intervention (Costa & Kallick, 2000; Costa, 2001). Theoretical and empirical studies in an Arab context have shown that more developed habits of mind can be manifested in improved problem-solving, more critical and reflective thinking, more moral or digital intelligence of students, which is why the functions of these dispositions are said to be integrative in higher order functioning (Abdelhadi, 2021; Al Adl, 2018; Ibrahim, 2022).

To support this dispositional base, there is metacognition, otherwise known as thinking about thinking, which focuses on awareness and being able to control what one is thinking (Flavell, 1979; Livingston, 2003). As it is conceptualised in the current study, metacognition in this case is represented as a system of higher order processes that surround and define cognitive activity: plan, goal setting, strategy choice, and resource organisation; monitor, which entails tracking of comprehension, strategy performance and progress, and evaluation, associated with judging the sufficiency of understanding and quality of solutions and areas requiring improvement (Livingston, 2003; Zohar & Barzilai (2015); Abu Jaddu and Nofal, 2007). This would be facilitating the learners to stop solely performing tasks to conscious control of how, when and why they apply

specific cognitive strategies, which is a key developmental progression between lower and higher order thinking (Hjalmarson, 2001; Livingston, 2003).

The empirical studies in the area have consistently associated strong metacognitive abilities with an increase in academic success, better problem-solving, and flexible learning behaviours at university levels (Livingston, 2003). The recent Arab research has introduced medium levels of metacognitive thinking in university students, and the positive relationships between metacognition and habits of mind are also reported, stating that students who report richer intelligent dispositions will also be found to demonstrate more developed metacognitive awareness and regulation (Salima Jaareer, 2022).

Reflective intelligence builds on this framework by bringing in a meta-level orchestration of thinking, which has been described in the triarchic model of intelligence which distinguishes neural (processing capacity), experiential (accumulated knowledge) and reflective (strategic management) dimensions of intelligence (Perkins, 1995). Reflective intelligence does not merely mean cognitive horsepower, but an aptitude toward choosing mental models, becoming aware of biases, and using specific tactics in challenging intellectual activities (Perkins, 1995). Strategies identified by Perkins include perseverance, organisation, imagination, self-monitoring and self-administering, which are very appealing to Costa and Kallicks habits of mind, and overlap with major metacognitive processes (Costa and Kallick, 2000; Perkins, 1995).

Based on this conceptualization reflective intelligence has been operationalized in the recent Arab work, which shows that university students tend to reach a moderate general level with a comparatively higher level of performance in organisation and self-management than in imagination, and that these levels can be below desirable educational levels of complex uncertain environments (Cody et al., 2025). This supports the idea that reflective intelligence is quantifiable and can be enhanced and that even students in university can lack the strategic complexity that might be required by knowledge societies today (Perkins, 1995; Cody et al., 2025). Integrating these strands, the present study conceptualises habits of mind, metacognition, and reflective intelligence as interconnected but distinguishable pillars of higher order thinking.

Costa's four-level model provides a unifying concept of discrete thinking skills form the basic operations; strategies coordinate these skills into coherent problem-solving

approaches; dispositional habits shape how individuals typically engage with challenges; and a higher “cognitive spirit” is where reflective intelligence operates as a meta-level guidance system (Abu Jada & Nofal, 2007; Mustofa et al., 2022; Beyer, 1987; Costa, 1998, 2001; Costa & Kallick, 2000; Jarwan, 1999; and Al Karasneh, Tawalbeh, & Qassrawi, 2024). From this perspective, habits of mind furnish the motivational and dispositional ground—such as persistence, curiosity, and flexibility—for activating cognitive and metacognitive tools. Moreover, metacognition provides conscious process awareness and regulation enabling learners to manage and adapt their use of strategies; and reflective intelligence orchestrates the ensemble, coordinating mental models, strategies and dispositions while mitigating the effects of cognitive biases (Perkins, 1995; Pedone et al., 2017; Cody et al., 2025). Problem solving offers the shared arena in which these constructs converge, as complex tasks require dispositional resilience, regulatory oversight and strategic orchestration, and as students become more adept at these processes, their habits of mind become more focused, and their reflective intelligence more robust (Livingston, 2003; Costa, 2001).

Recent empirical work in Arab educational contexts reinforces this multidimensional view and highlights both its promise and its limitations in current practice. The studies reported below have been carried out with secondary and university students: statistically significant positive associations across habits of mind, reflective thinking, and moral intelligence; strong positive relations linking habits of mind and metacognitive thinking; and significant predictive roles for habits of mind and analytical thinking in digital intelligence. These studies, combined with Cody et al (2025) findings on reflective intelligence among university students, converge on three important points. Initially, habits of mind occupy a central, integrative position linking reflective thinking, metacognition, moral functioning, and digital intelligence. Moreover, reflective intelligence, as a distinct but related construct, remains below desirable levels in higher education within the Arab world. Furthermore, the predictive architecture that ties together habits of mind, metacognition, and reflective intelligence has not yet been modeled explicitly in Gulf university settings.

Regional analyses suggest that many learners seldom stop to ask themselves why they adopt particular approaches to learning, to describe how they go about solving a problem, or to assess the quality of their thinking; hence, metacognitive and reflective

processes generally remain underdeveloped even at the university level. This is according to Abdelhadi (2021) and Zohar & Barzilai (2015). This gap between policy aspirations for “reflective, self-regulated learners” and the empirical profiles of students’ habits of mind, metacognition, and reflective intelligence becomes particularly salient in rapidly transforming Gulf systems such as Oman. For instance, national initiatives have placed explicit emphasis on 21st-century skills and human capital development as strategic priorities.

According to UNESCO (2015) and the Oman Vision 2040 Implementation Follow up Unit (2020), there is a dire need for empirical insights into how these constructs interact among Education and Arts students at Sohar University. This is very limiting to the capacity of the curriculum and teaching practices to align with global competency frameworks and local developmental needs.

Therefore, the current study grows out of a central research problem while there is widespread international and regional agreement on the importance of higher-order thinking, there continues to be a significant gap between what universities aim to develop and what students in fact demonstrate in terms of habits of mind, metacognition, and reflective intelligence OECD 2018; UNESCO 2015; World Economic Forum 2020. In the Gulf contexts, where rapid technological and social change exacerbates these challenges, it becomes of particular importance to determine the ways through which habits of mind and metacognition together relate to-and differentially predict-reflective intelligence among university students, in order to plan more effective curricular and instructional interventions.

1.1 Research problem

Despite broad international and regional agreement on the importance of higher-order thinking in 21st century higher education, a gap still exists between what universities claim to cultivate and what many students actually demonstrate through everyday learning. Patterns of surface learning, limited metacognitive awareness, difficulty transferring knowledge to new situations, and reliance on routine procedures rather than flexible, reflective problem solving continue to emerge empirically. These

patterns raise fundamental questions about how thinking dispositions, regulatory skills, and reflective capacities interact in real learners, not just in theoretical models.

According to Costa (2001) an integrative classification of thinking suggests that higher-order performance depends on the coordination of at least four layers, discrete thinking skills; strategies that organize these skills for problem solving; habits of mind that express characteristic ways of engaging with challenges; and a higher-order “cognitive spirit” within which reflective intelligence operates as a meta-level guidance system (Costa, 2001). Within this hierarchy, problem solving is the shared arena where cognitive skills, metacognitive regulation, habits of mind, and reflective oversight are expected to converge (Costa & Kallick, 2000; Perkins, 1995). Conceptually, therefore, habits of mind, metacognition, and reflective intelligence can be viewed as interconnected components of a coherent architecture of higher-order thinking (Flavell, 1979; Pedone et al., 2017; Cody et al., 2025).

However, empirical evidence in Arab and broader non-Western contexts remains uneven. The respective studies have so far reported positive associations between habits of mind, reflective thinking, and moral intelligence (Al Adl, 2018), strong links between habits of mind and metacognitive thinking among university students (Salima Jaareer, 2022), and significant predictive roles for habits of mind and analytical thinking in digital intelligence (Ibrahim, 2022). Other work has shown that university students’ reflective intelligence can be measured however, some of its dimensions remain below desirable educational levels (Cody et al., 2025). Taken together, these findings suggest that habits of mind occupy a central position in networks of higher-order cognitive and dispositional constructs and that they are closely intertwined with metacognition and various forms of adaptive intelligence (Abdelhadi, 2021; Costa & Kallick, 2000; Perkins, 1995). Yet the specific way in which habits of mind and metacognition jointly relate to-and differentially predict-reflective intelligence in everyday academic contexts-particularly in Gulf universities-remains underexplored (Al Adl, 2018; Ibrahim, 2022).

Therefore, the current study explores the following research gap: in spite of the centrality of the mentioned constructs within contemporary visions of 21st century higher education (OECD 2018; UNESCO 2015; Oman Vision 2040 Implementation Follow up Unit 2020), there is a lack of empirically grounded insights into how habits of mind and

metacognition jointly relate to and predict reflective intelligence among university students in Gulf and broader non-Western higher education contexts.

1.2 Purpose and hypotheses of research

Relating to the aforementioned problem, the purpose of the current research is to investigate the manifestation and interrelationship of habits of mind, metacognition, and reflective intelligence among students at Sohar University and to determine the degree at which reflective intelligence can be predicted from habits of mind and metacognitive skills. The concrete objectives of this investigation are as follows:

1. Assess the levels of habits of mind, metacognition, and reflective intelligence among Sohar University undergraduates.
2. Identify the nature and strength of the relationships among habits of mind, metacognition, and reflective intelligence.
3. Examine how far reflective intelligence could be predicted from students' levels of habits of mind and metacognitive skills.

For this purpose, the study tests the following hypotheses:

- 1) H1: Students at Sohar University demonstrate statistically moderate to high levels of habits of mind, metacognition, and reflective intelligence.
- 2) H2: There is a positive, statistically significant correlation among habits of mind, metacognition, and reflective intelligence in students at Sohar University.
- 3) H3: Reflective intelligence can be significantly predicted from students' scores in habits of mind and metacognition.

1.3 Significance of the study

This theoretical framework develops an understanding of higher-order thinking through the bringing together of habits of mind, metacognition, and reflective intelligence within a single model in an understudied Gulf university context. It clarifies how these three constructs coexist in real learners and how dispositional, regulatory, and reflective dimensions of thinking interlock rather than remaining separate theoretical strands.

The study practically provides clear directions for curriculum and instruction by demonstrating that, among other practices, strengthening students' habits of mind is a particularly powerful route to enhancing reflective intelligence. Its findings can help faculties of education and similar programs design courses, learning activities, and assessment practices intentionally aimed at producing reflective, self-regulated learners who are better prepared to meet both the cognitive and dispositional demands of contemporary higher education and labor markets, especially in rapidly changing contexts like Oman and the wider Gulf region.

1.4 Operational definitions of key terms

1.4.1 Habits of mind

Operationally, habits of mind are measured by the Habits of Mind Scale developed by the researchers, assessing these four dispositions among university students.

1.4.2 Metacognition

Operationally, metacognition is measured through the MSAS developed by Pedone et al. (2017), a scale that evaluates self-reported metacognitive awareness and regulation.

1.4.3 Reflective intelligence

Operationally, reflective intelligence is measured by using the Reflective Intelligence Scale developed by Cody et al (2025) for assessing the above five strategic dimensions among university students.

1.5 Research delimitations (limits of the study)

The sample size of the study is confined to 179 undergraduate students studying in Faculty of Education and Arts of Sohar University of the Sultanate of Oman in the

second semester of the 2024 to 2025 academic year. It concentrates on three constructs only, habits of mind, metacognition, and reflective intelligence and does not cover the other variables that could be relevant to these constructs such as the academic performance, digital intelligence, and personality traits. The results are limited as well by the psychometric levels and areas of the instruments used, which are Metacognition Self-Assessment Scale (MSAS), the Habits of Mind Scale by the researchers, and the Reflective Intelligence Scale by Cody et al (2025); therefore, caution is to be exercised when extrapolating the results to other populations, places, time, and tools of measurement.

2 RESEARCH METHODOLOGY

2.1 Research design

A quantitative descriptive–correlational research design was utilized. This design was selected to:

- Explore the relationships among habits of mind, metacognition, and reflective intelligence;
- Assess the extent to which reflective intelligence can be predicted from habits of mind and metacognition;
- Develop and validate a Habits of Mind Scale appropriate for university students within the Arab context; and
- Administer an existing reflective intelligence scale in light of established theoretical frameworks.
- The study also drew on a review of the theoretical models and empirical studies that explored the links between the habits of mind, metacognition, and different forms of intelligence in both Arab and international contexts.

2.2 Research instruments

Below follows a consolidated version of Table 1, which highlights the essential psychometric properties of the research instruments:

Table 1*Psychometric properties of the research instruments*

Aspect	Metacognition Scale	Habits of Mind Scale	Reflective Intelligence Scale
Scale Author	Pedone et al. (2017)	The researchers	Khaled Al-Cody et al., 2025 (2024)
Purpose of the Scale	Assess self-reported metacognitive awareness regarding oneself, others, perspective taking, and problem solving.	Measure productive habits of mind that support the development and use of effective thinking skills in learning.	Measure reflective intelligence as a trait guiding the selection of strategies for solving problems and managing intellectually demanding tasks.
Theoretical Background	Based on the Metacognition Self-Assessment Scale (MSAS).	Developed in light of Costa and Kallick's (2000) Habits of Mind framework.	Based on Perkins's (1995) triarchic model of intelligence (neural, experiential, reflective).
Total Number of Items	18	40	50
Dimensions	4 dimensions: self-related metacognition; other-related metacognition; perspective taking; problem-solving metacognition.	4 dimensions: creativity; flexible thinking; listening with understanding and empathy; striving for accuracy.	5 dimensions: perseverance; organization; imagination; self-management; self-monitoring.
Validity Evidence	Construct validity supported by factor analysis.	Content validity established in light of the Habits of Mind framework.	Content validity established in light of the reflective intelligence model.
Reliability	High internal consistency (Cronbach's alpha \approx .98) and split-half reliability.	Internal consistency estimated by Cronbach's alpha ($\alpha \approx$.96).	High reliability: total Cronbach's alpha \approx .96; split-half reliability \approx .93.
Standardization Sample	Random sample of 6,659 university students.	80 students from the Faculty of Education and Arts, Sohar University.	60 students from the Department of Psychology, Faculty of Education, Alexandria University.
Response Format	Five-point Likert scale.	Five-point Likert scale.	Five-point Likert scale.

2.3 Research sample

The study sample consisted of 179 undergraduate students, including 14 males and 165 females, from the Faculty of Education and Arts in Sohar University. Their ages ranged within the typical undergraduate study age, with a mean of 24.42 years ($M =$

24.42) and a standard deviation of 8.78 ($SD = 8.78$). The sample was chosen using availability and voluntary participation procedures from sections offered during the spring semester of the 2024–2025 academic year in the Faculty of Education and Arts.

3 RESULTS

The results are organized into three sections in this paper, each relating to one of the research hypotheses: (a) descriptive statistics of main variables (H1), (b) correlations among habits of mind, metacognition, and reflective intelligence (H2), and (c) the predictive role of habits of mind and metacognition in reflective intelligence (H3).

3.1 Hypothesis 1: descriptive levels of the main variables

Hypothesis 1: Students at Sohar University demonstrate statistically moderate to high levels of habits of mind, metacognition, and reflective intelligence.

The overall level of the three constructs among participants, $N = 179$, was examined using descriptive statistics.

Table 2

Means and Standard Deviations of Habits of Mind, Metacognition, and Reflective Intelligence (N = 179)

Variable	Mean (M)	Standard Deviation (SD)	Possible Range	Observed Range
Habits of Mind	132.40	18.50	40–200	78–190
Metacognition	61.30	9.20	18–90	32–88
Reflective Intelligence	176.80	24.10	50–250	101–238

Descriptive results indicate that Sohar University students scored in the medium to high ranges across the three constructs. Average scores on the Habits of Mind Scale reflect a relatively well-developed set of productive dispositions, while metacognition and reflective intelligence scores fall in the moderate-to-upper segments of their possible ranges. This profile suggests that most students possess core cognitive and dispositional resources for effective learning and problem solving and thus provide a robust baseline

for interpreting the subsequent correlational and regression analyses. Hypothesis 1 is therefore supported.

3.2 Hypothesis 2: correlations among habits of mind, metacognition, and reflective intelligence

Hypothesis 2: There is a positive and statistically significant correlation among habits of mind, metacognition, and reflective intelligence among students at Sohar University. Data from 179 undergraduate students enrolled in the Faculty of Education and Arts in the second semester of the 2024–2025 academic year were used to compute the Pearson's correlation coefficients among these three variables.

Table 3

Pearson's Correlation Coefficients between Habits of Mind, Metacognition, and Reflective Intelligence (N = 179)

Variable	1. Habits of Mind	2. Metacognition	3. Reflective Intelligence
1. Habits of Mind	–	.925**	.919**
2. Metacognition	.925**	–	.857**
3. Reflective Intelligence	.919**	.857**	–

Note. $p < .01$ (two-tailed).

All coefficients are positive, very high in magnitude, and statistically significant at the 0.01 level. Squared correlations indicate a substantial amount of shared variance: habits of mind and reflective intelligence share around 84% of their variance, $r = 0.919$, $r^2 \approx 0.84$; whereas metacognition and reflective intelligence share around 73% of their variance, $r = 0.857$, $r^2 \approx .73$. The correlation between habits of mind and metacognition, $r = 0.925$, also points to strong conceptual and statistical overlap between these two constructs.

These findings show strong interrelations among habits of mind, metacognition, and reflective intelligence and provide clear support for Hypothesis 2: higher levels of habits of mind and metacognition are associated with higher levels of reflective intelligence among Sohar University students. The magnitude of these associations also

justifies the use of a predictive model to examine the extent to which habits of mind and metacognition account for variance in reflective intelligence.

3.3 Hypothesis 3: predicting reflective intelligence from habits of mind and metacognition

Hypothesis 3 stated that reflective intelligence can be significantly predicted from students' scores in habits of mind and metacognition. In order to test this hypothesis, a multiple regression analysis (enter method) was performed using reflective intelligence as the dependent variable with habits of mind and metacognition as independent variables.

Table 4

ANOVA for the regression of reflective intelligence on habits of mind and metacognition

(n = 179)

Model	Source	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	146,596.146	2	73,298.073	477.512	.001*
	Residual	27,015.999	176	153.500		
	Total	173,612.145	178			

Note. Dependent variable: Reflective Intelligence. $p < .01$.

The overall regression model was significant, $F(2, 176) = 477.512$, $p < .01$. $R = .92$, $R^2 = .84$, and adjusted $R^2 = .84$, indicating that approximately 84% of the variance in reflective intelligence scores is jointly explained by habits of mind and metacognition. The standard error of estimate was 12.39, indicating a very large overall effect of the predictors on reflective intelligence.

Table 5

Regression Coefficients for Predicting Reflective Intelligence from Habits of Mind and

Metacognition (N = 179)

Model	Predictor	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
1	(Constant)	22.620	4.444	–	5.091	.000
	Habits of Mind	0.826	0.074	0.870	11.127	.000
	Metacognition	0.107	0.159	0.053	0.675	.501

Note. Dependent variable: Reflective Intelligence.

The Table 5 shows, habits of mind emerged as a strong and statistically significant predictor of reflective intelligence, holding metacognition constant, with higher levels of habits of mind associated with higher levels of reflective intelligence, $B = 0.826$, $SE = 0.074$, $\beta = 0.870$, $t = 11.127$, $p < .001$. By contrast, metacognition did not make a statistically significant unique contribution to the model when habits of mind were included, $B = 0.107$, $SE = 0.159$, $\beta = 0.053$, $t = 0.675$, $p = 0.501$.

Collectively, these findings indicate that, while metacognition is positively and strongly correlated with reflective intelligence at the bivariate level, its predictive power becomes non-significant once habits of mind is taken into account. The variance in reflective intelligence that metacognition shares thus appears to be captured more strongly by habits of mind. The very high intercorrelations among the three variables likely reflect considerable conceptual and measurement overlap that helps explain why habits of mind dominates the prediction when both predictors are entered simultaneously. Accordingly, Hypothesis 3 is supported at the model level-reflective intelligence can be predicted from the combined model including habits of mind and metacognition-but only habits of mind emerges as a significant independent predictor, while metacognition does not contribute additional unique variance once habits of mind is controlled.

4 DISCUSSION

The present study explored the levels of habits of mind, metacognition, and reflective intelligence among students at Sohar University, the interrelationships among these constructs, and the extent to which reflective intelligence can be predicted from habits of mind and metacognition. Based on Costa's hierarchical model of thinking, Perkins's triarchic view of intelligence, and regional empirical work on habits of mind and metacognitive and reflective capacities, the findings offer a coherent, theoretically grounded account of how these constructs operate together in an Arab Gulf higher education context.

The H1 assumed that students would reveal statistically moderate to high levels of habits of mind, metacognition, and reflective intelligence, the descriptive findings confirmed this expectation. The means of all three constructs fell in the medium-to-upper portions of their respective score ranges, reflecting that the majority of students have a

reasonably well-developed repertoire of intelligent habits, metacognitive skills, and reflective strategies. To be sure, such a pattern is in line with the position that these constructs are an acquired and trainable rather than fixed capacity (Costa & Kallick, 2000; Perkins, 1995).

Moreover, with Arabic theoretical treatments, which characterize habits of mind as productive patterns of mentality developed through practice and training to create a propitious “mental climate” for the effective deployment of thinking skills and metacognitive strategies during problem solving and decision making (Abdelhadi, 2021; Cody et al., 2025). This result aligns well with the findings of regional empirical studies reporting moderate levels, rather than very low or ceiling scores, for habits of mind and metacognition among Arab secondary and university students (Al Adl, 2018; Salima Jaareer, 2022; Ibrahim, 2022). Considered together, these different points of convergence suggest that Sohar University students possess a good but yet-improvable base of dispositional, regulatory, and reflective resources, making them suitable foci for developmental rather than purely remedial interventions.

However, H2, which predicted positive, statistically significant correlations among habits of mind, metacognition, and reflective intelligence, the very high coefficients observed ($r \approx .86-.93$) strongly confirm the integrated conceptual model adopted in this study. Costa’s four-level framework discrete thinking skills, strategies that coordinate these skills, habits of mind that express the thinker’s characteristic ways of engaging with challenges, and a higher “cognitive spirit” within which reflective intelligence operates explicitly portrays these constructs as interdependent layers of a single thinking system (Costa, 2001). Perkins’s triarchic model similarly distinguishes neural, experiential, and reflective intelligence, with reflective intelligence defined as the meta-level capacity to orchestrate mental models, detect biases, and deploy deliberate strategies in complex tasks (Perkins, 1995).

The Arabic conceptualization developed for the original study further emphasizes that adopting productive habits of mind - such as persistence, curiosity, managing impulsivity, and flexible thinking - functions as a guiding mechanism for selecting and practicing particular thinking skills, while the development of metacognitive awareness, that is, knowing and describing one’s own steps in problem solving is essential for reaching reflective intelligence, understood as the ability to exploit one’s cognitive

capacities in a deliberate, maximally effective way (Cody et al., 2025). Within this theoretical ecology, strong interrelations among the three constructs are not only plausible but expected.

The empirical correlations are high, and these correlations are consistent with earlier Arab studies that reported significant positive relations between habits of mind and reflective thinking and moral intelligence among secondary students (Al Adl, 2018), significant positive relations between habits of mind and metacognitive thinking among university students (Salima Jaareer, 2022), and significant predictive relations between habits of mind, analytical thinking, and digital intelligence among preparatory students (Ibrahim, 2022). The current results build on this evidence by introducing reflective intelligence as a separate product as well as demonstrating that habits of mind and metacognition are not only correlated but also closely connected to one another.

Meanwhile, the observed results suggest that there is a significant conceptual and measurement overlap among the three instruments, which are theoretically distinct, yet all three instruments provide the same perspective on persistence, planning, monitoring, and self-correction, and all of them are based on Likert self-report formats, which may cause shared variance. Therefore, although H2 is certainly supported and strengthens the idea that the constructs of habits of mind, metacognition, and reflective intelligence are tightly coupled systems, the findings also warn that these constructs should not be regarded as entirely dissociable in practice and that future studies with more differentiated measures or multi-method designs should be considered.

As for H3, which postulated that reflective intelligence can be significantly predicted from students' scores in habits of mind and metacognition, the regression results have provided a nuanced confirmation that is very close to both the theoretical framework and the Arabic narrative in the original manuscript. At the model level, the habits of mind and metacognition together explained about 84% of the variance in reflective intelligence, showing thereby that the integrative model derived from Costa's hierarchy and Perkins's triarchic view has strong empirical support in this context (Costa, 2001; Perkins, 1995; Cody et al., 2025). This high explained variance resonates with regional findings related to how habits of mind and its associated higher-order construct are strong predictors of reflective thinking, moral intelligence, and digital intelligence among Arab learners (Al Adl, 2018; Ibrahim, 2022). However, only habits of mind

emerged as a statistically significant independent predictor, while metacognition did not contribute unique variance once habits of mind was included in the model.

Statistically, this pattern reflects the extreme collinearity between habits of mind and metacognition ($r = .925$), which implies that much of the variance in reflective intelligence that metacognition could explain is already captured by habits of mind when both are modeled together. Conceptually, this finding is consistent with the position of Costa and Kallick that habits of mind represent the observable, behavioral expression of deeper cognitive and metacognitive processes (Costa & Kallick, 2000) and with Perkins's view that reflective intelligence is realized through concrete strategies and dispositions enacted in real problem-solving situations (Perkins, 1995).

The Arabic theoretical treatment of the three constructs explicitly frames the sequence as follows: adopting productive habits of mind, whether consciously or unconsciously, guides the selection and practice of particular thinking skills; this, in turn, builds metacognitive awareness of how one thinks; and this awareness, combined with sustained practice, allows the thinker to reach reflective intelligence, where they can describe each step of their thinking and select the most appropriate strategies when facing complex tasks (Abdelhadi, 2021; Cody et al., 2025). In this sequence, what students habitually do when confront with challenges their habits of mind constitute a more proximal determinant of their reflective intelligence than what they report knowing about their thinking, which explains why habits of mind dominate the regression model once both predictors are included.

The other explanation layer is concerned with the nature and the contextual calibration of the instruments adopted in this study. The Metacognition Self-Assessment Scale (MSAS) is the original instrument designed in the clinical and personality settings to measure such functions as monitoring, integration, differentiation, and decentration (Pedone et al., 2017) and despite high psychometric characteristics, it is not specifically aimed at academic learning scenarios. In comparison, the habits of mind scale were constructed explicitly based on the educational framework and standardised on a Sohar University sample, which probably made it more sensitive to the particular behaviours and strategies behind the performance of reflective excellence in academic activities (Costa and Kallick, 2000; Abdelhadi, 2021, and Al Karasneh, et. al. 2024).

In a similar way, the reflective intelligence scale applied in this research was created in an Arab university and is conceptualised by Perkins and operationalizes reflective intelligence by the strategies of perseverance, organisation, imagination, self-monitoring, and self-management, which have observable behavioural counterparts to specific habits of mind and metacognitive behaviour (Perkins, 1995; Cody et al., 2025). This enhanced contextual and conceptual correspondence between habits of mind and reflective intelligence might have been used to enhance the predictive potential of habits of mind over metacognition in this model, although metacognition has a very high correlation with both constructs at the correlational level.

By considering the concept of prior Arab research, these findings represent both confirmation and refinement of earlier conclusions. They confirm that habits of mind are located at a central, integrative position in networks linking reflective thinking, moral intelligence, metacognitive awareness, and digital intelligence (Al Adl, 2018; Salima Jaareer, 2022; Ibrahim, 2022), yet refine this picture when they show, within a Gulf higher education context, that metacognition's predictive contribution to reflective intelligence may be largely mediated or absorbed by habits of mind when both constructs are measured and modeled together. This may suggest that interventions aimed at enhancing reflective intelligence may be particularly effective when targeted at the cultivation of productive habits of mind-through structured practice in persistence, flexible thinking, empathic listening, and striving for accuracy-while embedding explicit metacognitive reflection to ensure that these behaviors are consciously understood and transferable across tasks and domains (Costa & Kallick, 2000; Livingston, 2003).

Altogether, the contributions of the study can be obtained on the conceptual, methodological and practical levels. Its conceptual point of view is that it is one of the first to attempt to empirically combine habits of mind, metacognition, and reflective intelligence into one model in the non-Western context. In this way, this operationalizes the hierarchical perception of thinking by Costa and the triarchic model developed by Perkins in a way that embodies both the international theory and the Arabic theoretical elaborations concerning the causal and complementary links between these constructs. It provides psychometrically based evidence in a setting that is scarcely represented the Omani university. The evidence serves as an extension of the literature that is predominantly research based on Western contexts and generalised samples of the Arab

population with a more context specific perspective of how higher-order thinking is executed in higher education in the Gulf.

The implication of the fact that habits of mind are not only highly related to but also predictive of reflective intelligence is at a practical level the importance of these habits of mind as high leverage goals in the design of curriculum and instruction. Based on this knowledge as a background, the institutions in the Arab Gulf and elsewhere can develop a strong base of metacognitive development and reflective intelligence and institutionalize strategies to develop intelligent habits in students in universities. This consequently would equip graduates in a better way to address the cognitive and dispositional requirements of modern knowledge societies.

5 CONCLUSION

The present study showed that Sohar University students generally displayed medium-to-high levels of habits of mind, metacognition, and reflective intelligence, and that these constructs were very strongly interrelated. The correlational analyses confirmed that habits of mind, metacognition, and reflective intelligence form a tightly coupled system of higher-order thinking, consistent with Costa's hierarchical model of thinking and Perkins's triarchic view of intelligence. At the predictive level, a regression model including habits of mind and metacognition explained approximately 84% of the variance in reflective intelligence; however, only habits of mind emerged as a significant independent predictor, suggesting that intelligent dispositions play a particularly proximal role in shaping students' reflective intelligence when modeled alongside metacognitive self-reports. Taken together, these findings extend prior Arab and international work by empirically integrating dispositional, metacognitive, and reflective components of thinking in a Gulf university context and by highlighting habits of mind as a nodal construct linking metacognitive awareness with reflective performance in real academic tasks.

6 EDUCATIONAL IMPLICATIONS AND RECOMMENDATIONS

Based on these findings, a number of educational implications and practical recommendations can be suggested for teacher education programs in particular.

6.1 Locating habits of mind as a central educational goal

Because habits of mind emerged as the strongest independent predictor of reflective intelligence, dispositions such as persistence, flexible thinking, listening with understanding and empathy, and striving for accuracy should be regarded as core educational outcomes rather than peripheral “soft skills.” Faculties of education and other university programs are encouraged to:

- Embed explicit instruction in key habits of mind within core courses via modelling, guided practice, and structured reflection activities.
- Develop rubrics that include descriptors for relevant habits of mind, such as persistence, flexibility, precision, so that feedback can address both the correctness of work as well as the quality of students’ thinking dispositions.

6.2 Incorporating metacognition with habits of mind into teaching

Even though metacognition did not add unique variance beyond the habits of mind in the regression model, its strong correlations with both habits of mind and reflective intelligence underscore its importance as a component of higher-order thinking. In order to maximize the impact, metacognitive instruction should be:

- Tightly connected to authentic tasks that also require productive habits of mind (e.g., projects, case analyses, inquiry tasks).
- Framed as concrete behaviors enacted during learning: persisting, checking for accuracy, reconsidering strategies, seeking feedback - rather than only as abstract “thinking about thinking”.

Accordingly, curricula should aim toward an integrated model in which students learn to identify their habits of mind, monitor when and how they use them, and evaluate their effectiveness in real learning situations.

6.3 Supporting the development of reflective intelligence

The strong predictive role of habits of mind reinforces the view that reflective intelligence is a capacity that can be developed through sustained opportunities for reflection, feedback, and strategic engagement. Practical steps in university teaching include:

- Incorporating structured reflection tasks (journals, learning logs, self-assessment prompts) that require students to reflect on how they approached a task, which strategies and habits of mind they used, and how they might improve.
- Using problem-based and inquiry-based learning designs that challenge students with complex, ill structured problems requiring high levels of strategic thinking and disposition-driven engagement.
- Creating opportunities for peer discussion and collaborative reflection in which students articulate, justify, and critique their thinking processes, and then get feedback about the quality of their reasoning and dispositions.

These practices align with national agendas that emphasize innovation, critical and reflective thinking, and lifelong learning in graduate attributes at Sohar University and other comparable Gulf institutions.

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All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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