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Degree of Intermediate School Teachers' Possession of Future Thinking Skills in light of (PISA) Test Dimensions in Mathematics and Arabic Language

Maleha Mohamed Zaaf Alqahtani[a*], Sahar Abdo Mohamed Elsayed[b]

[a] *Professor of Gramer and Language- College of Education, Prince Sattam Bin Abdulaziz University Al-Kharj 11942, Saudi Arabia. Email: ml.alqahtani@psau.edu.sa*

[b] *Associate Professor of Curriculum and Mathematics Education, College of Education, Prince Sattam Bin Abdulaziz University, Al-Kharj 11942, Saudi Arabia. Email: s.elsayed@psau.edu.sa*

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Abstract
In order for future-oriented thinking skills to examine both cognitive and language skills, there is a need to examine the skill levels of professionals across various fields of education. The present study investigated the degree to which intermediate schoolteachers possess future thinking skills in the light of Program for International Student Assessment (PISA) test dimensions in mathematics and Arabic language. Using a descriptive survey method, a questionnaire was given to 98 mathematics and Arabic language teachers in Al-Kharj, Saudi Arabia. It covered five dimensions of future thinking skills including planning, predicting, imagination, problem-solving, and evaluating the future. Results showed statistically significant skill levels across all dimensions for both groups. Additionally, significant differences existed between subjects in planning, predicting, imagining, and solving future problems, attributable to disciplinary specialization. However, there was no difference in evaluating the future perspective. The study concludes that developing future thinking skills through PISA dimensions is vital for quality education meeting contemporary needs. Recommendations include building specialized university programs, holding teacher training courses, and conducting an integrated study of future thinking across mathematics, Arabic language, and science to enable comprehensive understanding. In summary, intermediate schoolteachers were found to significantly possess future thinking capacities, but differences between math and Arabic teachers highlight the need to standardize competencies.

Keywords: PISA Test - Future Thinking Skills- Mathematics Teachers- Arabic Language Teachers.

1. Introduction

Future-oriented cognition has been a part of language studies to test the ability of learners to anticipate future states and needs (Bélanger et al., 2014). This type of cognition examines two types of states: cognitive (the learners' self-concept and memory) and language (the learners' knowledge of vocabulary, word use, metaphor and like (Kamber et al., 2023). These activities mark the need of linguists and language experts in this era of the knowledge economy, which emphasizes the need to prepare skilled professionals across various fields and promote work-based education. Likewise, the

* Corresponding Author.
Email: ml.alqahtani@psau.edu.sa
DOI: http://dx.doi.org/10.32601/ejal.903008

use of future-oriented cognition in Arabic language is vital for acquiring essential life skills and linguistic knowledge for individual development. The fourth goal of the Sustainable Development Goals, emphasizing quality education (United Nations, 2021), provides a good reason to highlight the significance of the Arabic language in a global context (Khattab et al., 2023).

While future thinking involves advanced cognitive skills (Chiu, 2012), enabling educators to anticipate future scenarios (Paxton, 2008), solve problems based on cognitive predictors (Koponen et al., 2007), and engage in creative, productive thinking and forecasting in the realm of intermediate education (Education and Training Evaluation Commission, 2023), the subject of mathematics provides pivotal indicators of achievement levels in Program for International Student Assessment (PISA), as reported by the International Organization for the Evaluation of Educational Achievement (2019) and the Organization for Economic Cooperation and Development (OECD, 2018). These reports underscore the persistent challenge of low student achievement levels in PISA assessments.

The rationale behind putting together Arabic language and mathematics in the context of PISA is that the current curriculum in most Saudi universities emphasize the importance of enhancing the Arabic language skills along with mathematics education. Moreover, mathematical syntax often involves linguistic and mathematical principles together, applicable to linguistic rules, encompassing causal relationships leading to outcomes and the capacity to construct sentences mathematically from words lacking abstract contextual meaning. Through synthesis and organization of these words based on simple mathematical equations, these words yield correct and recognizable meanings. Mathematics, undoubtedly, plays a crucial role in developing future-oriented thinking skills (National Council of Teachers of Mathematics (NCTM, 2000). NCTM standards emphasize the cultivation of skills like generating hypotheses, making connections, and applying them to solve familiar and novel problems. Non-symbolic quantitative processing, arithmetic, and symbolic quantitative processing constitute fundamental variables contributing to mathematical performance (Halberda et al., 2008).

Numerous studies have highlighted the importance of future-oriented thinking among educators at all levels, as evidenced by research conducted by Torrance (2003), Botha (2016), Al-Saadi (2008), Carlson (2009), Musa (2010), Metwally (2011), and Al-Hwaiti (2017). Future thinking equips educators with essential skills like creativity and critical thinking, contributing to progress in education quality and societal advancement. Both mathematics and the Arabic language require innovative teaching methods to address cognitive and performance aspects. This study aims to assess intermediate schoolteachers' future-oriented thinking skills concerning the PISA tests in mathematics and the Arabic language. Moreover, little is known about these future-oriented thinking skills. Thus, there was a dire need to investigate the degree to which intermediate schoolteachers possess future thinking skills in light of PISA test dimensions in mathematics and Arabic language. The study covered five dimensions of future thinking skills including planning, predicting, imagination, problem-solving, and evaluating the future.

Specifically, the study objectives included: (i) to assess the extent of future thinking skills among intermediate school mathematics teachers in relation to the dimensions of the (PISA) test in Mathematics; (ii) to evaluate the extent of future thinking skills among intermediate school Arabic language teachers in relation to the dimensions of the (PISA) test in Arabic language; and (iii) to determine the statistical significance of differences, at a significance level of $\alpha = 0.05$, in the future thinking skills of intermediate schoolteachers, considering the specialization variable (Mathematics vs. Arabic language). The absence of prior research on intermediate schoolteachers' future thinking skills in relation to the (PISA) test dimensions in Mathematics and Arabic language motivated this study.

Hence, the study revolved around the primary question: To what extent do intermediate schoolteachers possess future thinking skills, considering the dimensions of the (PISA) test in Mathematics and Arabic Language? This question led to the following inquiries: (i) What is the level of future thinking skills among intermediate school mathematics teachers in the context of PISA test dimensions in mathematics? (ii) What is the level of future thinking skills among intermediate school Arabic language teachers in the context of PISA test dimensions in Arabic language? (iii) Are there statistically significant differences, at a significant level of $\alpha = 0.05$, in the future thinking skills of intermediate schoolteachers based on their specialization, Mathematics or Arabic language?

The study is significant in many respects. First, it highlights the importance of developing future thinking skills among intermediate schoolteachers in mathematics and Arabic language. Possessing these skills can help teachers better anticipate future changes and prepare students for the 21st century job market. Secondly, it emphasizes the role of mathematics and Arabic language in nurturing creative and critical thinking abilities. Excellence in these core subjects is crucial for a nation's development. Thirdly, this research fills a gap by examining the degree of future thinking skills among intermediate schoolteachers considering PISA test dimensions. No other studies have evaluated this topic specifically. Fourthly, this study provided practical recommendations for building training programs to improve the future thinking capacities of teachers. It also suggested conducting more

research on this theme across subjects like math, languages, and science. Finally, this study would foster future thinking skills in intermediate schoolteachers to enhance the educational environment for mathematics and Arabic, with a focus on real-world applications and research facilitation.

2. Theoretical Framework

Linguistically and grammatically accurate sentences can be composed through logical and learned linguistic connections, such as associating adjectives with accusatives and verbs with subjects. On a mathematical level, this can be expressed using the following simple equation: S = NP + V + PP, where S represents the sentence, and NP, V, and PP denote the sentence's components, with V standing for the verb, P for preposition, and NP for noun phrase, among others. Linguistic and mathematical equations can branch and intersect, creating new sentences through internal combinations based on mathematical equations. Multiple studies have shown the pivotal role of fundamental numerical processing, including non-symbolic quantitative processing, arithmetic, and symbolic quantitative processing, in mathematical performance (Halberda et al., 2008). Lee et al. (2004) discovered a significant relationship between the reading, spelling, comprehension, vocabulary skills of 10-year-old students, and their mathematical performance. Koponen et al. (2007) research also identified a significant correlation between reading proficiency, arithmetic fluency, and word meaning comprehension in intermediate stages. Teama's (2018) study explored a simple model involving mathematical sentence construction in linguistics. Mathematical principles can often be applied to linguistic structures, allowing the formation of sentences from words that may lack abstract contextual meanings. By synthesizing and arranging these words using straightforward mathematical equations, they can convey correct and familiar meanings.

Theoretically, this study overviews two key concepts: PISA and Future thinking. PISA, overseen by the Organization for Economic Cooperation and Development (OECD), assesses tenth-grade students' proficiency in mathematics, reading, and science, as well as their ability to apply these skills to real-life problems (Education and Training Evaluation Commission, 2023; OECD, 2018). This research focuses on PISA's dimensions, specifically mathematics and Arabic language knowledge, at the second intermediate grade level. These dimensions aim to evaluate students' readiness for lifelong learning through tasks mirroring real-life situations. The second concept, future thinking, as defined by Torrance (2003), involves various mental processes that individuals use to explore their future experiences. It includes comprehension, planning for upcoming challenges, and evolving through prediction based on past experiences to arrive at results, solutions, or decisions. In this research, future thinking is operationally defined as a cognitive process encompassing advanced mental skills used by intermediate schoolteachers for future planning and anticipation. This process involves problem-solving rooted in current experiences, imagination, creative thinking, and predictive abilities.

The dimensions of the PISA test have gained global attention in the 21st century for their unique focus on students' reading, mathematics, and science literacy in education. Unlike traditional approaches, PISA emphasizes the development of reflective teaching skills among educators, promoting a holistic understanding of the natural world through the application of scientific knowledge. Saudi Arabia actively participates in international PISA tests as part of its ambitious objectives, which include evaluating students' performance in general education's foundational stages, assessing fundamental knowledge and skills, and studying the education system's disparities compared to other participating countries. This participation aligns with the goals outlined in Vision 2030 (Education and Training Evaluation Commission, 2023).

Future thinking is a crucial aspect of preparing future generations, equipping them with the ability to adapt to change, engage in strategic planning, employ critical thinking, and foster innovation. Educators must possess the skills to anticipate and creatively address future challenges, contributing to national development and sustainability. This form of thinking involves identifying problems, formulating hypotheses, establishing connections based on past experiences and current information, and seeking solutions while presenting results. It requires inquiry, research, investigation, and imagination to transform concepts into tangible ideas or mental images (Al-Hwaiti, 2018). In contemporary teacher preparation programs, there is a growing emphasis on future thinking, particularly in the context of mathematics and Arabic language education. This focus aims to continually improve teaching practices, leading to enhanced educational outcomes for students. Future thinking encompasses various skills, including anticipation, forecasting, imagining future scenarios, mental visualization, creative problem-solving, and fostering a productive mindset (Ahmed, 2017). It involves forward-looking thinking to understand future challenges, predict scenarios, and use imagination to develop future perceptions, offering alternatives and solutions (Al-Mutairi, 2018).

The importance of future thinking is evident, as noted by Al-Mutairi (2018) and Al-Nawab et al. (2022). It is highlighted by several key factors namely, (1) enabling the visualization of potential future events, facilitating adaptation to these events rather than overlooking them; (2) playing a vital role in the realms of planning, organization, and decision-making; (3) fostering change at all levels and

promoting comprehensive development by fostering an environment conducive to informed and thoughtful decision-making; (4) creating an ideal setting for transitioning towards a balanced future, thus achieving short and long-term objectives; and (5) engaging higher-order cognitive skills such as innovation, creativity, critical thinking, and effective decision-making.

The significance of future thinking with respect to mathematics and Arabic language educators is reflected in previous research. For instance, Al-Shafey (2014) conducted a study at Helwan University's Faculty of Education, focusing on enhancing future thinking skills and environmental awareness among student teachers. The study employed a proposed environmental sciences course using problem-based education. Results indicated the course's effectiveness in developing future thinking skills and environmental awareness, with gender differences favoring female students in expectation skills. Likewise, Al-Hwaiti (2017) assessed future thinking skills among students at the College of Education and Arts, University of Tabuk, using a descriptive survey method. Significant statistical differences were found based on gender, academic level, and teaching experience. In another study, Botha (2016) aimed at cultivating future thinking skills among executives through a training course emphasizing neurological and psychological aspects. The course incorporated future studies and theories and tools.

Ammar (2015) investigated the effectiveness of a service-learning program in teaching contemporary issues and enhancing future thinking skills among student-teachers at Fayoum University. Webber's (2013) study affirmed that enhancing teaching practices among educators contributes to recognizing individual student needs and learning styles, enabling more effective instruction. The importance of possessing future thinking skills and improving teaching practices among mathematics and Arabic language educators, particularly in the context of PISA test dimensions, is evident (Al-Anzi, 2022; Al-Barjas, 2023; Almirabi, 2021; Chiu, 2012; Paxton, 2008). This preparation not only equips students for international competitions but also aligns them with the demands of the job market and fosters creativity and innovation.

This study aligns with previous research objectives but distinguishes itself by encompassing multiple variables, research methods, and analytical approaches not addressed in prior studies. Notably, none of the previous studies comprehensively addressed the objectives of the current study, particularly regarding the assessment of Intermediate School Teachers' future thinking skills in the context of PISA Test Dimensions in Mathematics and Arabic Language. These findings serve as foundational points upon which the current study builds.

3. Statement of the Problem

Future thinking skills are pivotal cognitive abilities in the twenty-first century, encompassing advanced cognitive skills that involve synthesizing past and present experiences. These skills include planning for the future, predicting future scenarios, exercising future-oriented imagination, engaging in future problem-solving, and evaluating prospective future perspectives (Al-Hwaiti, 2018; Al-Saadi, 2008; Botha, 2016; Carlson, 2009; Chiu, 2012; Metwally, 2011; Musa, 2010; Paxton, 2008; Torrance, 2003). It is therefore necessary to prepare educators capable of navigating future shifts through future thinking skills.

The current problematic state is that students fail to anticipate forthcoming changes, comprehend contemporary educational challenges, process them, and analyze them within the context of PISA test dimensions. There is a need to empower students, particularly female students, to participate in international competitions, enhance their readiness for the job market, and foster creativity and innovation. There is also a need to develop future thinking skills among intermediate schoolteachers to enhance the quality of mathematics and Arabic language education is crucial due to the low achievement demonstrated by students in international assessments such as the PISA test (Abrami et al., 2008). This deficiency indicates a lack of capacity for applying knowledge and skills to real-life situations. Fostering the abilities to anticipate, evaluate, and solve future problems can better prepare learners to extrapolate current learning and perform in simulated contexts (Abrami et al., 2008).

However, there is limited research on the degree to which intermediate teachers possess higher-order competencies within the subject domains of mathematics and Arabic language. Quantifying and contrasting future thinking dispositions between the two specializations can identify targets for standardized development to elevate pedagogical practices (Abrami et al., 2008). The limited research only seeks to quantify and compare such capacities using the frame of PISA test content areas and contrasting subject specializations (Abrami et al., 2008). The literature review reveals that there is insufficient research and understanding regarding intermediate schoolteachers' proficiencies in higher-order future thinking skills in mathematics and Arabic language, which are essential for enhancing student achievement and readiness for an evolving world. The available empirical evidence on the impact of instruction on the development and enhancement of critical thinking skills and dispositions emphasizes the importance of such skills in educational settings (Abrami et al., 2008).

Furthermore, the study on critical thinking in teaching Arabic as a foreign language highlights the elements of personal competency that Arabic language teachers need to encourage critical thinking in the classroom (Nor & Sihes, 2022). Additionally, the analysis of mathematics teacher candidates' critical thinking dispositions and their logical thinking skills underscores the key role of teachers in developing critical thinking skills (Incikabi et al., 2013). In conclusion, the synthesis of the selected references supports the need for further research to understand and develop future thinking skills among intermediate schoolteachers in mathematics and Arabic language education. This is essential for improving student achievement and readiness for an evolving world.

4. Literature Review

Al-Anzi (2022) examine the effectiveness of a program aimed at enhancing creativity and future thinking skills in student teachers specializing in mathematics at the College of Education. Using a quasi-experimental single-group design, the research employed a future thinking test to measure the program's impact. The result showed statistically significant improvements in the pre- and post-test scores of student teachers at the 0.05 significance level. In a similar study, Almirabi (2021) explored the use of Arabic metaphorical expressions linked to the conceptual metaphors *Time Is Space* and *The Future Is Behind*. The research involved online searches for relevant expressions and validation of their natural usage in Hijazi-Saudi Arabic by native speakers. Findings revealed that the future is conventionally conceptualized as being in front of the *Ego*, contrasting with its less productive placement behind. The study introduced a bi-dimensional conceptual framework for the *Journey of Time*, incorporating an 'elsewhere' location, encompassing non-frontal positions, and expanding the notion of 'behind'. This research encourages further examination of how the future is conceptually situated across languages and cultures.

Mahmoud (2014) assessed fourth-year student-teachers specializing in Arabic language at Fayoum University's Faculty of Education, focusing on critical thinking skills. Significant improvements in student-teachers' performance were noted, while secondary students showed no significant changes in linguistic thinking skills. The study suggests integrating critical thinking into Arabic language instruction and emphasizing skill development within the curriculum. Likewise, Olaimat et al. (2022) assessed Arabic teachers' proficiency in utilizing interactive whiteboards in Al Balqa Governorate. The study employed a descriptive approach with 90 randomly selected teachers and found a moderate level of proficiency. While no significant gender, directorate, or experience differences were noted, variations existed based on educational qualifications. The study recommended implementing specialized training programs to improve teachers' interactive whiteboard skills and integration into their teaching.

Smith et al. (2020) conducted an empirical study on autism spectrum disorder in children aged 5-10 years to assess the impact of behavioral techniques on children within this age group. The study employed a quasi-experimental design with a sample of 45 children divided into experimental and control groups. Findings indicated that a behavioral package intervention, encompassing modeling, reinforcement, and task analysis training, had the most significant positive effect on skill acquisition and the reduction of problematic behaviors. The study recommended the implementation of a comprehensive behavioral intervention model to foster positive development in young children with autism. Ainin et al. (2022) conducted a literature review on the inclusion of higher-order thinking skills (HOTS) in an eleventh-grade Arabic language textbook in Indonesian high schools. Their study found that 75% of textbook exercises incorporated HOTS, focusing on skills like analysis, evaluation, and creativity. While the textbook aligned with 21st-century curriculum objectives, it also emphasized lower-order skills in some introductory sections, like memorization.

Raswan et al. (2022) conducted a mixed-methods study on the integration of higher-order thinking skills (HOTS) in standardized national Arabic language exams in Indonesian high and Islamic schools. Their findings showed that only 60% of the exam questions demonstrated critical thinking skills, with most focusing on lower-level comprehension. The study identified 27 HOTS-based exam items, emphasizing the importance of teacher training for designing HOTS-based questions and the need for broader testing approaches to improve student analytical abilities. Samsul and Djafar (2018) assessed the mathematical literacy and thinking skills of Indonesian college students compared to PISA math ability levels. The study included tests and interviews with six participants. All met PISA level 1 criteria, signifying basic skills, but two students achieved up to level 6, indicating complex modeling and reflection abilities. A level 1 student displayed lower-order thinking skills, while levels 5 and 6 demonstrated higher-order skills. The study highlights the gap in college math instruction and the need for courses enhancing advanced analytical abilities in students' mathematical literacy.

Stacey (2011) discussed the PISA program in the context of Indonesian students, whose score is lower in math than OECD averages and top-performing regions. Despite improvements in reading scores and socioeconomic equity, less than 1% of Indonesian students demonstrate advanced mathematical abilities, compared to 12% in OECD countries. The study emphasized the importance of enhancing mathematical literacy and problem-solving skills in Indonesian students. Schleicher (2007) discussed PISA, led by OECD, assessing competencies in 15-year-

olds for real-world success. Competence combines knowledge, skills, attitudes, and behaviors applied in complex contexts. PISA shifts from memorization to practical application, informing global education policies. Although PISA cannot cover all abilities, it predicts success and highlights institutional disparities. The study suggests that unassessed competencies may reveal deficiencies in unmeasured skills.

Khlaisang et al. (2023) studied factors influencing Thai primary school teachers' adoption of mobile technologies for enhancing students' thinking skills. Surveying 825 teachers with an extended technology acceptance model (TAM), they found that 67.5% of behavioral intentions were explained by attitude, perceived value, cognitive teaching beliefs, and personal innovativeness. Perceived usefulness correlated with peer influences, cognitive feedback, and teaching beliefs. The study recommends teacher training and policies that leverage factors such as ubiquitous connectivity and alignment with cognitive instruction techniques to promote meaningful technology integration. Erdoğan (2020) studied 201 prospective middle school mathematics teachers in Turkey to understand the link between critical thinking (CT) and reflective thinking (RT). A moderate positive correlation was found between these skills, with CT significantly predicting RT (explaining 24% of the variance). Gender and achievement level differences were noted in CT skills, while RT skills improved with higher grade levels. The study suggests integrating instructional approaches and coursework to nurture these essential abilities for teaching and lifelong learning.

In conclusion there are several studies that emphasize the importance of enhancing critical thinking skills in both teachers and students (Ainin et al., 2022; Mahmoud, 2014; Raswan et al., 2022). They recommend additional teacher training, including technology integration (Khlaisang et al., 2023; Olaimat et al., 2022), and student-centered interventions (Samsul & Djafar, 2018; Smith et al., 2020). However, research gaps exist in cross-cultural interventions and long-term impacts on sustained critical thinking skills in futuristic terms. Differences in research design, context, and recommendations across studies also exist. Future research could consolidate these findings through cross-cultural meta-analyses, explore teacher adoption of best practices, and investigate the long-term effects of cognitive instruction on career success. Collaboration between policy, research, and classroom practice is crucial for equipping students with higher-order abilities.

5. Methodology

- *Research Design*

The research employed a quantitative research design employing descriptive survey and analytical approaches in order to keep data aligned with the research objectives. The study aimed to identify the degree to which intermediate schoolteachers possessed future thinking skills in light of PISA test dimensions in mathematics and Arabic language. The descriptive survey method used a questionnaire that covered five dimensions of future thinking skills including planning, predicting, imagination, problem-solving, and evaluating the future.

- *Data Collection*

The study based on the Questionnaire as a main tool to collect the primary data. The study employed two 20-item questionnaires to assess future thinking skills in Mathematics and Arabic Language among intermediate teachers, using a 5-point Likert scale. These questionnaires underwent expert validation and reliability testing with a sample of 40 additional teachers.

- *Sampling and Population*

The target population comprised 290 intermediate schoolteachers (120 mathematics and 170 Arabic language) in Al-Kharj, Saudi Arabia. The sample comprised 98 teachers - 48 mathematics (49%) and 50 Arabic language (51%) - from second intermediate grade in Al-Kharj.

- *Data Analysis*

SPSS 29 was used to analyze the data derived from the questionnaires. The objective was to find the statistically significant skill levels across all dimensions and find out to what extent future thinking skills through PISA dimensions are vital for quality education meeting contemporary needs.**Results and Discussion**

Right at the outset, the questionnaire items were validated for all its various dimensions. Table 1 summarizes the validity of the questionnaire for Mathematics teachers in the context of (PISA) Test in Mathematics. The correlation coefficient between the sub-skill scores and the overall score of the primary skill, as well as the holistic opinion survey, was found to be statistically significant at the 0.05 significance level. This result indicates that the questionnaire demonstrated an acceptable level of validity, rendering it suitable for utilization within the research study.

Table 1: *Validity Assessment of the Questionnaire for Mathematics Teachers Within the Context of The (PISA).*

Future Thinking Skills for Mathematics Teachers	Correlation Coefficient Between the Sub-Skill Score and The Total Main Skill	Correlation Coefficient Between the Sub-Skill Score and Total Survey
Planning for the future		
1. Cover as much mathematical content as possible.	0.724*	0.523*
2. Focus on the probability branch of mathematics.	0.608*	0.430*
3. Explaining the relationship between mathematical reasoning and computational thinking.	0.774*	0.522*
4. Identify computational thinking tools.	0.814*	0.596*
Predicting the future		
5. Developing mathematics education by employing available tools and potential methods.	0.760*	0.504*
6. Interact with mathematical concepts through new media and presentation tools.	0.777*	0.473*
7. Express mathematical ideas in new ways.	0.527*	0.314*
8. Plan to provide students with contextualized computational thinking tools.	0.832*	0.582*
Future imagination		
9. Recreate abstract structures by exploring and interacting with mathematics concepts dynamically.	0.811*	0.608*
10. Use a combination of practical and computational thinking tools.	0.650*	0.375*
11. Deepening learning of mathematical content.	0.724*	0.572*
12. Representing the integrated and mutual relationship between mathematical reasoning and computational thinking.	0.674*	0.536*
Future problem solving		
13. Employing brainstorming and constructivist strategies to learn mathematics.	0.876*	0.632*
14. Supporting students' abilities to explore new mathematical ideas and build on them.	0.660*	0.357*
15. Thoughtful use of computational thinking tools and necessary skill sets.	0.614*	0.614*
16. Interact with mathematical concepts through dynamic media and visualization tools.	0.773*	0.632*
Evaluating the future perspective		
17. Adding appropriate mathematical behavior and thinking in the case of probability and randomness.	0.736*	0.500*
18. Choosing appropriate cognitive and non-cognitive strategies.	0.678*	0.490*
19. Choosing appropriate computational thinking skills in patterns, analysis, quantity, and probability.	0.647*	0.441*
20. Appreciating the importance of the relationship between sports knowledge and twenty-first-century skills.	0.789*	0.553*

Table 2 displays the assessment of stability through internal consistency concerning the (PISA) Test in Mathematics using Cronbach's Alpha. It provides an evaluation of the questionnaire's stability when it comes to assessing the (PISA) Test in Mathematics. This assessment is conducted using a statistical measure called Cronbach's Alpha (α) stability coefficient. In this case, the questionnaire contains 20 skills related to Mathematics, and its Cronbach's Alpha value is calculated at 0.87. The Cronbach's Alpha coefficient is a measure of internal consistency, and in this context, a value of 0.87 indicates a high level of reliability, suggesting that the questionnaire is a consistent and dependable tool for assessing the specified skills in Mathematics.

Table 2: *Cronbach's Alpha (α) Stability Coefficient.*

Tool	No. of Total Skills in Mathematics	Cronbach's Alpha (α) stability coefficient
Questionnaire	20	0.87

Table 3 summarizes the validity assessment of the questionnaire for Arabic Language teachers within the context of the (PISA) Test in Arabic Language. It illustrates the correlation coefficients between various sub-skills

and two key metrics: the total main skill and the total survey score. These coefficients serve as indicators of the strength and direction of the relationships between these variables. The presence of an asterisk * alongside a coefficient signifies a statistically significant correlation, signifying that the observed relationship is unlikely to have occurred by chance. To exemplify, within the "Planning for the future" category, sub-skill 14, involving the clarification of text types in terms of formatting, exhibits a robust positive correlation of 0.801 with the total main skill, as well as a positive correlation of 0.683 with the total survey score. These noteworthy correlations underscore the close association of this sub-skill with both the main skill and the overall survey score, particularly within the context of the PISA Test in Mathematics for Mathematics teachers.

Table 3: *Validity Assessment of the Questionnaire for Arabic Language Teachers Within the Context of the (PISA*

Future Thinking Skills for Mathematics Teachers		Correlation Coefficient Between the Sub-Skill Score and the Total Main Skill	Correlation Coefficient Between the Sub-Skill Score and Total Survey
	Planning for the future		
1.	Clarifying the types of texts in terms of structure.	0.674*	0.395*
2.	Clarifying the types of texts in terms of formatting.	0.801*	0.683*
3.	Clarifying the types of texts in terms of topic.	0.673*	0.389*
4.	Clarifying the types of texts in terms of purpose.	0.860*	0.666*
	Predicting the future		
5.	Providing learners with the necessary knowledge and skills to interact with society.	0.777*	0.525*
6.	Interact with texts through new media and presentation tools.	0.643*	0.373*
7.	Interacting with texts through media and dynamic representation tools.	0.824*	0.632*
8.	Plan to provide text types with context for students.	0.832*	0.582*
	Future imagination		
9.	Integrating and interpreting links within the text itself and between a group of related texts.	0.847*	0.697*
10.	Dealing with unfamiliar ideas in different texts in terms of content and form.	0.750*	0.475*
11.	The ability to install key text features in unusually.	0.694*	0.477*
12.	Conducting many detailed conclusions and comparisons between multiple texts.	0.654*	0.396*
	Future problem solving		
13.	Participate effectively through the presented texts in solving community problems.	0.870*	0.572*
14.	Ability to analyze key text features.	0.683*	0.452*
15.	Comparing different types of texts and the use of written texts.	0.666*	0.414*
16.	Determine mechanisms for accessing and retrieving information.	0.743*	0.528*
	Evaluating the future perspective		
17.	Contemplate and evaluate the ideas presented in the read text and determine their quality.	0.747*	0.583*
18.	Deducing the challenges present in the read text, which opens the way for the reader to discover the meanings behind it included in the context.	0.638*	0.490*
19.	Making judgments about the relationships between ideas in one text, or in several texts.	0.605*	0.381*
20.	Accessing challenging information in a textual context.	0.755*	0.482*

Table 4 displays the internal consistency reliability of the questionnaire used for Arabic Language assessment. It includes 20 skills in Arabic Language and reports a Cronbach's Alpha (α) stability coefficient of 0.85, indicating high reliability.

Table 4: *Stability by Internal Consistency in Arabic Language (Cronbach's Alpha).*

Tool	No. of Total Skills IN Arabic Language	Cronbach's Alpha (A) Stability Coefficient for Reliability.
Questionnaire	20	0.85

The next step was to examine the research questions framed for the current study. Specifically, in response to the first research question concerning the level of future thinking skills among intermediate

school Mathematics teachers within the context of (PISA) test dimensions in mathematics, Mean and standard deviations were conducted. A One-sample T-test was also used and the statistical significance of future thinking along with its sub-skills was assessed.

Table 5: *Significance of T-values for Future Thinking Skills of Intermediate School Mathematics Teachers in (PISA) Test Dimensions in Mathematics.*

Skills Dimensions	Mean	SD	T-value	α=0.05
Planning for the future	4.07	0.15	50.95	Sig.
Predicting the future	4.31	0.08	119.09	Sig.
Future imagination	4.16	0.15	55.24	Sig.
Future problem solving	4.43	0.07	143	Sig.
Evaluating the future perspective	4.21	0.07	121	Sig.
Total Future Thinking	4.24	0.04	206.67	Sig.

Table 5 shows that the arithmetic mean ranged from 4.07 to 4.43, the standard deviation ranged from 0.04 to 0.15, and T-values ranged from 50.95 to 206.67, all of which are statistically significant at α=0.05. These findings align with prior research by Al-Sarouji (2019), Al-Hwaiti (2017), Botha (2016), Ammar (2015), Webber (2013), and Al-Shafey (2014), which also emphasized the importance of a diverse range of tools aimed at enhancing future thinking skills in Mathematics.

The second research question: What is the level of future thinking skills of intermediate schoolteachers of Arabic language in the light of (PISA) test dimensions in Arabic language? To answer this question, arithmetic averages, standard deviations, t-test for one-sample, and statistical significance of future thinking as a whole and its sub-skills were extracted.

Table 6*: T-Values for Future Thinking Skills of Intermediate School Arabic Language Teachers in (PISA) Test Dimensions in Arabic Language, Indicating Statistical Significance.*

Skills Dimensions	Mean	SD	T-value	α=0.05
Planning for the future	4.28	0.08	116.36	Sig.
Predicting the future	4.33	0.06	166.25	Sig.
Future imagination	4.04	0.08	94.55	Sig.
Future problem solving	4.35	0.14	67.50	Sig.
Evaluating the future perspective	4.23	.012	72.35	Sig.
Total Future Thinking	4.25	0.03	312.50	Sig.

Table 6 reveals that the arithmetic mean ranged from 4.04 to 4.35, the standard deviation ranged from 0.03 to 0.14, and T-values ranged from 67.50 to 312.50, all of which are statistically significant at α=0.05. These findings are in line with previous research by Al-Hwaiti (2017), Botha (2016), Ammar (2015), Al-Shafey (2014), Webber (2013), and Almirabi (2021), all of which underscored the importance of a diverse array of tools aimed at enhancing future thinking skills in Arabic.

The third research question: Are there statistically significant differences at the level of significance (α= 0.05) in future thinking skills of intermediate schoolteachers due to the variable of specialization (Mathematics-Arabic language)? To answer this question, arithmetic averages, standard deviations, T-test for two independent samples, and statistical significance of future thinking as a whole and its sub-skills were extracted.

Table 7: *Significant Differences in Future Thinking Skills of Intermediate School Teachers By Specialization (Mathematics Vs. Arabic Language) At A=0.05.*

Skills Dimensions	Mathematics		Arabic language		T-value	α=0.05
	Mean	SD	Mean	SD		
Planning for the future	4.07	0.15	4.28	0.08	3	Sig.
Predicting the future	4.31	0.08	4.33	0.06	1.99	Sig.
Future imagination	4.16	0.15	4.04	0.08	2.4	Sig.
Future problem solving	4.43	0.07	4.35	0.14	2	Sig.
Evaluating the future perspective	4.21	0.07	4.23	.012	1.5	Non-Sig.
Total Future Thinking	4.24	0.04	4.25	0.03	2.17	Sig.

Table 7 reveals statistically significant differences in future thinking skills (planning for the future, predicting the future, imagining the future, solving future problems) and overall future thinking related to specialization in mathematics and Arabic language, with respective T-values of 3, 1.09, 2.4, 2, and 2.17, all exceeding the critical value at α=0.05. These findings align with previous studies (Al-Hwaiti, 2017; Al-Saadi, 2008; Botha, 2016; Carlson, 2009; Metwally, 2011; Musa, 2010; Torrance, 2003) indicating that future thinking skills enhance productive thinking, such as creativity and critical thinking, promoting advanced educational outcomes and societal progress. However, no statistically significant differences in evaluating future perspectives were observed based on specialization in mathematics and Arabic language, as the T-value was 1.5, falling below the critical value at α=0.05. This contrasts with Teama's (2018) suggestion that mathematical laws often apply to linguistic laws, as they both involve constructing sentences from abstract words using simple mathematical equations.

These results align with previous research emphasizing the importance of critical thinking skills development. For example, several studies underscored the need to cultivate critical thinking in both teachers and students (Ainin et al., 2022; Mahmoud, 2014; Raswan et al., 2022). These findings highlight critical thinking as an essential competence for educators and pupils alike. Additionally, the recommendations for supplemental teacher training around relevant instructional skills agrees with past work (Khlaisang et al., 2023; Olaimat et al., 2022). Specializing professional development toward technology integration and other pertinent abilities can better equip teachers to promote higher-order thinking. Likewise, specific student-centered interventions have successfully improved critical capacities (Samsul & Djafar, 2018; Smith et al., 2020), further demonstrating the viability of targeted efforts.

However, differences emerged concerning research design, context, participants, and precise recommendations across studies. While some were qualitative pursuits (Samsul & Djafar, 2018) or literature reviews (Ainin et al., 2022; Stacey, 2011), others used experimental (Mahmoud, 2014), quasi-experimental (Smith et al., 2020) or descriptive quantitative methods (Olaimat et al., 2022). Participant groups also varied, spanning pupils, preservice teachers, and current educators across multiple countries and content areas like Arabic, mathematics, and special education.

Ultimately, the success of interventions underscores the potential for critical thinking improvement through well-designed initiatives tailored to local contexts. Still, a research gap persists regarding cross-cultural efforts and long-term skill sustainability over time. Exploring teacher uptake and response to recommended best practices constitutes another area warranting further attention. Finally, longitudinal tracking of evidence-based cognitive instruction could better substantiate reform efforts aimed at eventual career competencies and success. Equipping students with adaptable higher-order abilities likely requires coordinated endeavors unifying policy, research, and practice across classroom settings.

7. Conclusion

In conclusion, the research findings emphasize the significance of possessing future thinking skills and enhancing teaching practices among mathematics and Arabic language teachers, particularly in the context of the PISA test dimensions. These skills are pivotal in preparing students for international competitions, fostering their adaptability in the evolving labor market, and nurturing their creativity and innovation during the digital age and contemporary industrial transformations. Moreover, the excellence achieved in both mathematics, which serves as a universal symbolic language and a testament to human civilization's progress, and the Arabic language, as the language of the Holy Qur'an, the nation's constitution, and the foundation of its legislation, underscores their enduring importance.

The study faced a few limitations such as: (i) its objectives had a very limited scope as the study was confined only to to assess intermediate schoolteachers' future thinking skills in Mathematics and Arabic Language during the first semester of the academic year 2023-2024, with a focus on (PISA) test dimensions. (ii) secondly, the study also had a limited spatial scope as it encompassed the population of only intermediate mathematics teachers (120), representing 42% of the total, and Arabic language teachers (170), making up 58% of the total, within the Al-Kharj Education Department in Riyadh region. Likewise, the sample size was also restricted to 98 second intermediate grade teachers from the total population of Al-Kharj Education Department in Riyadh. Finally, the study was conducted during the first semester of the academic year 2023-2024, thus limiting its implication within a limited time.

Specifically, the study limitations could have the following consequences: (1) *Generalizability*: The diverse research designs, contexts, and participant demographics in the studies make it challenging to generalize findings to broader educational settings or different cultural contexts; (2) *Research Diversity:* The study covered two subject areas, potentially limiting the direct applicability of their findings to other academic disciplines; (3) *Research Design:* The varied research methods, from literature reviews to experimental designs, could impact the comparability of results and their broader relevance (4) *Participant Variation:* Participants included students, preservice teachers, and current educators from diverse countries, introducing variation that may affect result transferability; and (5) *Context-Specific Recommendations:* Studies provide context-specific recommendations, which may not be universally applicable, emphasizing the need for tailored approaches in different educational settings.

Despite these limitations, the study has both brought out several recommendations: first, there is a need to establish the importance of educational programs and curriculum enhancements aiming the nurturing of future thinking skills among university students; secondly, comprehensive training workshops should be organized for mathematics and Arabic language teachers, both pre-service and in-service, to enhance their proficiency in future thinking; thirdly, comprehensive research studies should be undertaken that encompass the dimensions of the PISA test in mathematics, Arabic language, and science to gain deeper insights into student performance and areas of improvement. Finally, it is also necessary to identify and emphasize various factors and variables that influence future thinking skills, whether positively or negatively, and address them within the educational framework.

The study also laid out future directions. Future researchers can endeavor to conduct an integrated study examining future thinking skills considering the PISA test across multiple subjects-mathematics, Arabic language, and science. The current study focused only on mathematics and Arabic language teachers, so expanding to include science would provide a more comprehensive understanding. Secondly, the variables and factors that positively or negatively impact the development of future thinking skills among teachers should also be examined. The study could identify influences such as years of experience, professional development opportunities, school environment, etc. and how they relate to capacities for future thinking. Thirdly, such training programs should be developed that aim at improving future thinking abilities among pre-service and in-service mathematics and Arabic language teachers. The study highlights the importance of these skills, so the next step is to actively build them. Fourthly, future studies can also compare future thinking skills of teachers internationally by administering translated versions of the study questionnaire in other countries. This would provide interesting insights into how capacities vary across cultural and educational contexts. Last, but not the least, intervention studies can be conducted that evaluate the impact of improving teachers' future thinking skills on student outcomes like achievement, engagement, and interest in mathematics and Arabic language. This would demonstrate the practical significance of the classroom.

The study would have several useful implications. First, it emphasizes the need to prioritize critical thinking skill development in both teachers and students. Second, this study paves the way for supplementary teacher training, particularly in technology integration, for effective skill enhancement. Third, this study showed how to take a student-centered approach implementing such teaching methods that encourage active learning and problem-solving among students. Fourth, given the findings, this study opens new avenues for cross-cultural research when future studies should explore the cross-cultural effectiveness of critical thinking initiatives. Fifth, this study would make long-term impact which would help in the assessment of the long-term effects of cognitive instruction on career success. Finally, this study would open new opportunities for collaboration between policymakers, researchers, and educators for effective implementation of teaching methods.

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