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Primary school teachers' perceptions of integrating Islamic education into science education

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Abstract

This mixed-methods study investigates how Saudi primary school teachers view the integration of Islamic values within science curricula in alignment with Vision 2030. Quantitative data were collected from 352 teachers using a structured survey and were complemented by ten in-depth interviews conducted in Al-Madinah Al-Munawwarah. We examined two dimensions: teachers' conceptual understanding of integration and the importance they assign to embedding Islamic ethics in science, and tested for differences by gender, teaching experience, and academic specialization. Inferential analyses showed no statistically significant demographic differences in conceptual understanding. By contrast, female teachers and those with more years of experience rated the importance of curricular integration significantly higher. Interview narratives illuminated these patterns, describing integration as a means to connect scientific inquiry with students' moral development and cultural identity, deepening engagement and meaning. These findings point to practical priorities: targeted professional development that models integrative pedagogy; collaborative curriculum work between Islamic studies and science teachers; and supportive policy frameworks that institutionalize ethical reflection alongside scientific competencies. Future research should track cohorts over time and evaluate specific integrative interventions to determine their sustained effects on students' learning and character development. Overall, the study contributes context-specific evidence from Saudi schools and refines theory on religion–science integration.

Keywords: Cognitive integration, Islamic education, Primary school teachers, Religion, Science education, Teacher professional identity.

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Contents

Contribution of this paper to the literature

This study contributes to the existing literature by providing mixed-methods evidence on the integration of religion and science in primary classrooms in Saudi Arabia. The paper's primary contribution is finding that demographics influence perceived importance rather than understanding. This study documents surveys and interviews and links the results to cognitive integration, Tawhid, and teacher professional identity within Saudi Vision 2030.

1. Introduction

Traditional educational frameworks have separated religious from science education, viewing the boundary between the two as virtually impermeable. However, educators and researchers have shown increased interest in incorporating religious and ethical values into science curricula, with proponents arguing that separating the two results in fragmented student experiences that adversely affect their cognitive, ethical, and spiritual growth. In particular, the concept has drawn increased attention in Saudi Arabia, as a primary goal of that nation's ambitious Vision 2030 initiative is an educational system that produces ethically aware and scientifically competent learners.

Teachers are on the front line of implementation, and so their perceptions of and attitudes toward it are an important, even determinative, factor in its success. However, research on Saudi teachers' views on integration is lacking, possibly impeding Vision 2030's objectives. Therefore, the purpose of this study was to explore primary school teachers' conceptualizations and valuations of integration within the context of Saudi Arabia.

1.1. Statement of the Problem

In order for educators to adequately integrate Islamic religious thought into science education, they must understand integration and view it as worthwhile. Teacher preparation to do so could be worthwhile, erasing inconsistencies in approach and ensuring that teachers fully understand integration and its benefits. However, the paucity of research on Saudi teacher attitudes toward integration impedes teacher preparation to successfully implement it. Moreover, teacher characteristics such as gender, years of teaching experience, and discipline may be sources of variation in their perceptions and so affect the approaches taken in teacher development programs.

The purpose of this research was therefore to explore the attitudes and perceptions of a convenience sample of primary school teachers regarding the integration of Islamic education into science curricula. Of particular interest were their conceptual understanding of integration and their assessment of its importance. Through this study's findings, the researcher hoped to identify factors that could affect teacher preparation to implement integration and so be used in professional and curricular development programs designed to prepare teachers for implementation. Ultimately, the study's aim was to contribute to educational policy and practice initiatives aligned with the holistic educational objectives outlined in Saudi Vision 2030.

1.2. Research Questions

The following research questions guided the study:

Are the differences in teachers' conceptualizations of the integration of Islamic education into science curricula based on gender, years of teaching experience, and academic specialization statistically significant at a level $\alpha \leq 0.05$?

Are the differences in teachers' perceptions regarding the importance of integrating Islamic education into science curricula based on gender, years of teaching experience, and academic specialization statistically significant at a level $\alpha \leq 0.05$?

2. Theoretical Framework

Three complementary theoretical lenses enabled a nuanced exploration of the cognitive, cultural, and personal influences shaping teachers' approaches to integrating religion into science curricula cognitive integration theory, epistemological Tawhid, and teacher professional identity theory. These theories, which are described in detail below, provide a suitable framework with which to explore Saudi primary teachers' perceptions regarding integrating religion into science education.

Cognitive Integration Theory (CIT) concerns an individual's cognitive flexibility, their mental ability to successfully reconcile seemingly contradictory concepts, adapt their behavior accordingly, and integrate new information with previously held knowledge (Legare, Evans, Rosengren, & Harris, 2012; Marin & Lindeman, 2021). Research findings suggest that individuals with relatively greater amounts of cognitive flexibility are better able to reconcile the apparent contradictions related to religious belief and scientific knowledge (Van Tongeren, Davis, Hook, Davis, & Aten, 2021). Instead of merely managing conflicts, it can enable a teacher to successfully synthesize scientific knowledge and religious belief (Haimila, Metsähinen, & Sevalnev, 2024; Purzycki, Haque, & Sosis, 2014) and so affects the success of teachers' classroom religion-science integration of religion with science (Mansour, 2011; Mavuru, 2024).

Complementing CIT is *epistemological Tawhid*. The Islamic notion of *Tawhid*, belief in the oneness and divinity of God, is inextricably linked to epistemology. It proposes that God is the source of all forms of knowledge, including science and religion, and that the acquisition of knowledge thus constitutes an act of worship. Within an educational context, it therefore provides the basis for incorporating Islamic teaching, including that related to ethics, into science curricula (Adelia & Anbia, 2023). Including moral instruction in science education aligns with Saudi Vision 2030's goal of cultivating ethically aware and scientifically competent learners, thus justifying the integration of science and religion in the classroom. Tawhid implies that teachers' epistemological views significantly shape the practices through which they implement Islam-science integration, suggesting that targeted professional development programs are necessary to prepare teachers to successfully incorporate Islamic ethical principles into science education.

Teacher professional identity theory concerns the role that teachers' professional identities play in their teaching. Constituting these identities are teachers' views of themselves and their roles, which are based on their own values,

personal and religious beliefs, and socio-cultural factors such as the norms and expectations of their general culture and, more specifically, the cultures of the individual institutions in which they teach. Teacher professional identity theory posits that teachers' professional identities largely determine their teaching practices particularly within an Islamic context (Mansour, 2011; Rodriguez & Navarro-Camacho, 2023), where educators must ensure that their teaching strategies do not conflict with religious precepts (Carlone, Haun-Frank, & Kimmel, 2010). Teacher professional identity theory thus concerns the effect that the factors comprising a teacher's professional identity can have on integrating religion, in this case Islam, into science education.

3. Literature Review

The literature relevant to this study included multidisciplinary educational integration, teachers' beliefs and professional identities, and student outcomes related to multidisciplinary educational integration. Also pertinent were debates concerning whether integration of religious values should be incorporated into science curricula.

3.1. Teacher Attitudes Toward Integration

Exploring the approaches a purposive sample of Muslim preservice teachers utilized to reconcile their individual religious beliefs with scientific principles, Turgut (2019) found that the study participants perceived no conflict between the possibility of divine intervention within the physical universe and scientific premises and saw "miracles and jinn" as being investigable using scientific methods, provided empirical data were available (p. 164).

3.2. Benefits of Multidisciplinary Integration

In a qualitative study, Lowe (2022) found that faith and religious identity formation among students increased significantly when religious perspectives, in this case creationism, were integrated into science education. While not situated in an Islamic context, study findings pointed to substantial educational and spiritual benefits from the incorporation of religious precepts in science education.

The findings of Linn, Gerard, Matuk, and McElhaney (2016) suggest that multidisciplinary integration in science education increases student engagement and thereby enhances learning. The researchers emphasized the importance of teachers' perceptions regarding the integration of religion into science education and of their cultural contexts to the success of the integration.

3.3. Integration-Related Methodology

Owens, Pear, Alexander, Reiss, and Tal (2018) proposed a method to enable instruction involving such seemingly contradictory topics as religion and science. Adopting evolution as an example, which directly conflicts with some religious beliefs, Owens et al. (2018) proposed the 'pedagogy of difference,' which encourages students to view, but not necessarily accept, a controversial topic from a perspective that tolerates and even perceives as valuable a conflicting viewpoint.

Perceiving a lack of empirical research on the outcomes of Islamic religion-science integration, Zabidi, Mohamad, and Jamaludin (2019) conducted a literature review of published studies analyzing the outcomes of integration implemented at Sunan Ampel State Islamic University Surabaya. After conducting a thematic analysis to identify patterns, the researchers found that integration enhances the relevance of Islamic education. Mirza (2024) proposed a framework titled Islamic Scientific Critical Consciousness (ISCC), based on decoloniality, that incorporates the integration of Islamic teachings with science to capture the positive aspects of both.

In a study conducted by Chan and Erduran (2023), science and religious education teachers collaborated to teach argumentation, which the science teachers reported to have increased their students' ability for scientific reasoning, thus pointing to it as a valuable teaching tool, particularly with respect to religious education and in interdisciplinary teaching.

3.4. Teacher Preparation

The need for teacher development programs aimed at enabling them to knowledgeably teach integrated material appeared throughout the literature. Wahyuni (2020) proposes "shared," "webbed," and "integrated" curriculum models that explicitly connect Islamic values with science education. Aksan, Zein, and Saumur (2023) examine the implementation of the I-STEM model incorporating Islamic principles and STEM subjects in Malaysia. Although it shows "great potential," the authors cite challenges to its implementation such as cultural resistance and the gap between conceptualization and practical application and emphasize the need for teacher development programs to address these issues.

Siron (2024) conducted a study to capture the perceptions of in-service and pre-service early childhood educators regarding the integration of Islamic values into STEM education. Key themes identified included the necessity of integration, particularly concerning *Tawhid*, and the importance of incorporating moral teachings into STEM curricula, especially given the development of technologies such as cloning and artificial intelligence. Proposals for implementing integration included contextualized teaching, problem-based learning, and the incorporation of Islamic narratives into science lessons. The authors emphasized the need for educator training to effectively implement integration.

In a study conducted to determine Egyptian teachers' views of the debate between Islam and science, including their relationship, Mansour (2011) found that, since teachers' views were determined by their upbringing and culture, which varied widely, teacher education should encompass both domains, enabling them to discuss either subject knowledgeably and to determine whether the methods of science, religion, or both should be employed to answer a particular question.

Zamista, Sari, Deswita, and Asrar (2022) investigated Madrasah teachers' perceptions of integrating teachings based on the Qur'an with science and concluded that science teachers needed proper training to do so effectively, a finding shared by Tambak, Ahmad, Sukenti, and Siregar (2022), who investigated how teachers' religious identities influenced pedagogical practices within Madrasah science education.

4. Research Methodology

4.1. Research Design

The researcher utilized a mixed-method research explanatory sequential design for the study, enabling an in-depth investigation of the perceptions of primary school teachers located in Al-Madinah Al-Munawwarah, Saudi Arabia, regarding the integration of Islamic doctrine into science education (Creswell & Creswell, 2018). Purposive sampling was employed for the qualitative portion of the study.

4.2. Participants

The study target population consisted of 3,277 primary school teachers from approximately 300 schools located in Al-Madinah Al-Munawwarah, Saudi Arabia. Those specializing in Islamic education numbered 2,629, and 648 specialized in science education. For the quantitative stage of the study, a randomly selected sample of 352 teachers (171 males and 181 females) was selected to ensure balanced representation with respect to gender and level of teaching experience, which ranged from less than five to more than twenty years (see Table 1).

For the qualitative phase, a purposive sample of 10 participants was selected from among the 352 participants in the quantitative phase of the study. These 10 participants were chosen to maximize diversity with respect to teacher level of awareness regarding Islam-science integration, the perceived importance of integration, gender, and level of professional experience as measured by years of teaching. Appendix A lists the participating schools across Al-Madinah Al-Munawwarah, documenting the study setting and enhancing transparency for replication.

Table 1. Demographic characteristics of the participants (N = 352).

Demographic variables	Category	Frequency (n)	Percentage (%)
Gender	Male	171	48.6%
	Female	181	51.4%
Teaching experience	Less than 5 years	109	31.0%
	5–10 years	123	35.0%
	More than 10 years	120	34.0%
Academic specialization	Islamic education	181	51.4%
	Science education	171	48.6%

5. Instruments

5.1. Survey

For the study's quantitative stage, the researcher constructed a survey instrument based on a thorough review of the existing literature on Islam-science education integration. It consisted of three sections designed to gather the following information: respondent demographic characteristics, conceptual awareness of integration (five items), and perceived importance of integration (five items). Responses were measured on a five-point Likert scale, ranging from 1 (Rarely) to 5 (Always).

5.2. Interview

The semi-structured interviews included six open-ended questions aimed at obtaining in-depth information on teachers' perceptions of, experiences with, and instructional approaches to integrating Islamic doctrine and values into science education. The questions were specifically designed to assess respondents' conceptual understanding and perceived valuation of integration.

5.3. Validity and Reliability

To ensure the validity of study findings, the survey underwent rigorous content validation by five expert reviewers specializing in Islamic education and curriculum design. The study earned excellent validity ratings (I-CVI range: 0.80–1.00; S-CVI/Ave: 0.92). Reliability was measured using Cronbach's alpha, yielding $\alpha = 0.91$, indicating strong internal consistency among the questions. The measure of split-half reliability equaled 0.88. Additionally, the calculation of Cohen's kappa coefficient measuring inter-rater agreement yielded $\kappa = 0.83$.

5.4. Data Collection

Collection of survey responses was conducted through dedicated WhatsApp groups for primary school teachers, and the response rate was 75%. Participants completed the survey electronically over a two-week period. The semi-structured interviews, comprising the qualitative stage of the study, each lasted approximately 27 minutes and were conducted either face-to-face or virtually, according to the participant's preference. All interviews were audio-recorded, transcribed verbatim, and carefully reviewed for accuracy within 48 hours of recording.

5.5. Data Analysis

Descriptive and inferential statistical techniques were employed to analyze the quantitative data collected, using Microsoft Excel's Data Analysis ToolPak. Qualitative data were examined using thematic analysis with descriptive in vivo coding methods, inductively generating themes directly from participants' expressions and experiences, thus ensuring alignment with their perspectives and insights.

5.6. Ethical Considerations

Ethical standards were rigorously enforced throughout the conduct of the study. All participants were informed of the study's aims, and all were informed that participation was voluntary and that they could withdraw from the study at any time. Participants were assured that strict anonymity would be observed and that pseudonyms would be employed in data reporting. Finally, the researcher obtained written consent from each participant prior to their participation.

6. Study Results

Following the study's sequential explanatory mixed-method design, initial analysis of the quantitative data collected was performed to identify patterns that were then used to guide the qualitative investigation.

Analysis of the quantitative data was conducted using the Data Analysis ToolPak of Microsoft Excel to obtain descriptive and inferential statistical results. Before performing the inferential analyses, data analysis related to data distribution and variance homogeneity was performed to ensure that the data met the necessary assumptions.

6.1. Findings Related to Research Question 1

The first research question addressed whether there were statistically significant differences (at $\alpha = 0.05$) in teachers' perceptions regarding the conceptualization of integrating Islamic education with science education, attributable to variables such as gender, years of teaching experience, and academic specialization.

To thoroughly investigate this question, both quantitative and qualitative analyses were integrated. Quantitative results provided initial insights into patterns and differences among participant responses, while qualitative findings expanded upon and clarified the reasons behind these quantitative trends through detailed narrative explanations from participants. See Table 2.

Table 2. Teachers' perceptions of integration by demographic factors (means and standard deviations).

Variables	Category	Conceptual understanding (M ± SD)	Perceived importance (M ± SD)
Gender	Male (n=171)	3.52 ± 0.58	3.75 ± 0.50
	Female (n=181)	3.67 ± 0.62	3.97 ± 0.41
Teaching experience	< 5 years (n=109)	3.56 ± 0.55	3.70 ± 0.44
	5–10 years (n=123)	3.58 ± 0.60	3.82 ± 0.47
	> 10 years (n=120)	3.63 ± 0.64	3.90 ± 0.48
Academic specialization	Islamic Ed. (n=181)	3.57 ± 0.90	3.75 ± 0.90
	Science Ed. (n=171)	3.63 ± 0.54	3.97 ± 0.54

6.2. Gender

To investigate gender differences in teachers' conceptualizations of Islamic-science integration, a two-sample t-test was conducted (171 males; 181 females) and revealed no statistically significant difference ($t = -1.88$, $df = 287$, $p = 0.061$). Female teachers exhibited slightly higher mean scores ($M = 3.67$) compared to males ($M = 3.52$). Moreover, Cohen's d, approximately 0.19, indicated a small effect size, suggesting minimal practical implications.

Qualitative findings, however, provided additional context, showing that female teachers expressed greater sensitivity and attentiveness toward integrating religious and ethical dimensions into science education. Specifically, 8 of 10 female participants explicitly emphasized the value of connecting scientific concepts with Islamic ethical principles. One female teacher explained:

"You cannot teach science without pointing to God's power in creation; students need that connection to find inspiration in science."

Supporting this viewpoint, another stated:

Incorporating Islamic ethics into science lessons makes learning more relevant for students, helping them realize that scientific knowledge isn't separate from their faith and everyday life.

Male teachers also recognized the value of integration, with one stating:

"While I agree that integrating religion into science lessons is important, I often struggle to find effective methods to clearly accomplish this."

Such qualitative insights reinforce the subtle quantitative trend suggesting slightly greater awareness and inclination among female teachers to integrate Islamic moral values into science education.

6.3. Teaching Experience

Regarding differences in teaching experience, a one-way ANOVA performed across three distinct experience groups—teachers with less than 5 years ($n = 40$), 5–10 years ($n = 35$), and more than 10 years ($n = 30$)—found no statistically significant differences among them ($F(2, 102) = 0.17$, $p = 0.84$). Levene's test confirmed homogeneity of variances ($p = 0.56$). The calculated effect size ($\eta^2 = 0.003$) indicated that teaching experience had an almost negligible effect on teachers' conceptual awareness scores. See Figure 1 and Table 3.

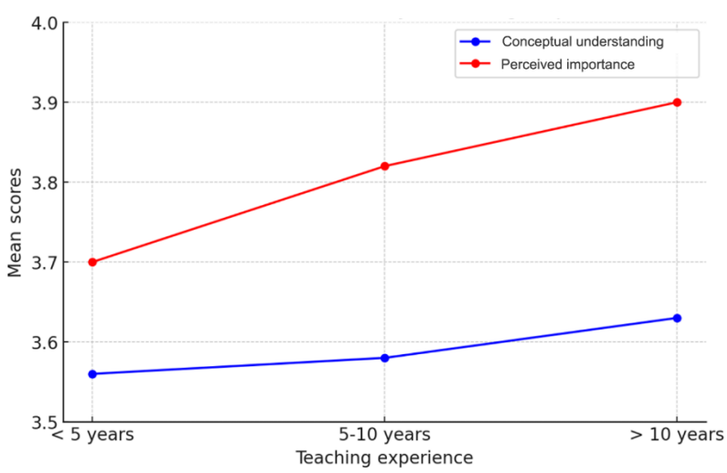

Figure 1. Teachers' mean scores by teaching experience.

Table 3. Inferential statistics for group comparisons by demographic factors.

Variable	Comparison	Test	Statistic	p-value	Effect size
Gender	Conceptual understanding	t-test	t = -1.88	0.061	d = 0.19
	Perceived importance	t-test	t = -4.60	<0.001*	d = 0.48
Teaching experience	Conceptual understanding	ANOVA	F = 0.17	0.84	η^2 = 0.003
	Perceived importance	ANOVA	F = 4.47	0.012*	η^2 = 0.025
Specialization	Conceptual understanding	t-test	t = -0.76	0.45	d = 0.08
	Perceived importance	t-test	t = -0.76	0.45	d = 0.08

Note: * indicates statistical significance at α = 0.05. Tests: independent-samples t-test (t) and one-way ANOVA (F). Effect sizes: Cohen's *d* for t-tests and eta squared (η^2) for ANOVA. Significant results in this table are marked with an asterisk (e.g., $p < 0.001$*, $p = 0.012$*).

However, qualitative findings offered valuable insights into how teachers' experiences influenced their appreciation for integrating Islamic values into science education. One male teacher shared:

Over time, I realized that integrating values gives the lesson a deeper soul and impact.

Another experienced teacher added:

"Initially, I saw science and religion as separate. However, through years of teaching, I have discovered numerous ways to link Islamic principles with scientific content, making my lessons more meaningful and captivating."

Less experienced teachers expressed more hesitation.

"I understand the importance of integration, but as someone relatively new to teaching, I often find it challenging to clearly connect Islamic values with scientific topics."

These insights underscore the role teaching experience plays in shaping educators' perceptions and instructional methods related to integration.

This qualitative theme enriches and adds context to the quantitative findings, aligning with previous research by Tambak, Ahmad, Sukenti, and Siregar (2022) and Mirza (2024), which found that prolonged professional engagement enhances teachers' understanding of effectively merging religious principles with scientific content, as shown in Figure 2.

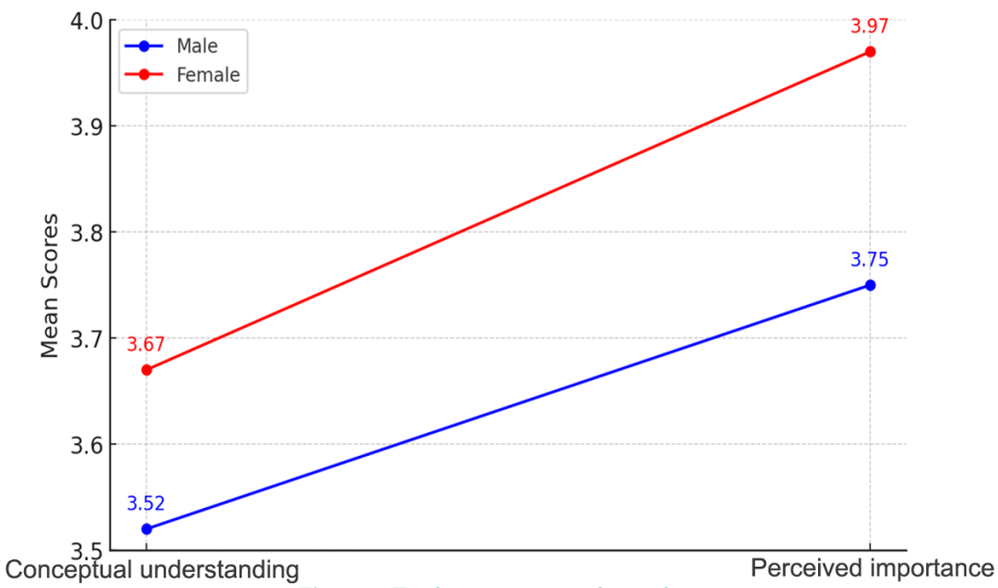

Figure 2. Teachers' mean scores by gender.

6.4. Academic Specialization

Finally, regarding academic specialization (Islamic education teachers, n = 181; science teachers, n = 171), the two-sample *t*-test revealed no statistically significant differences in teachers' conceptual awareness scores ($t(350) = -0.76$, $p = 0.45$). The effect size, indicated by Cohen's $d \approx 0.08$, further underscores the minimal practical significance of differences between specialization groups. Both Islamic education and science teachers demonstrated comparable levels of conceptual understanding regarding the integration of Islamic values with scientific education.

An Islamic education teacher emphasized:

"Integrating religion and science doesn't rely solely on one's specialization; it fundamentally depends on teachers' openness and ability to bridge these disciplines effectively."

Similarly, a science educator remarked:

"Although my background is strictly scientific, I recognize the significance of integrating Islamic perspectives. This approach grounds science education within our students' cultural and spiritual realities."

Additionally, another Islamic education teacher highlighted the value of collaboration in integration:

"Successful integration requires cooperation between teachers of both Islamic studies and science. Each specialization complements the other, enriching the overall educational experience."

The information gained through the study's qualitative analysis reflected a consensus across disciplines, thereby emphasizing the importance of collaboration in integration.

Results of the quantitative analyses revealed no statistically significant demographic differences with respect to gender, level of teaching experience, and academic specialization regarding perception of integration. Significant qualitative findings were that female teachers stressed integrating the moral and ethical dimensions of Islam into science education to a greater extent than males, and that years of teaching experience were associated with increasing levels of perceived value of integration.

6.5. Findings Related to Research Question 2

The aim of Research Question 2 was to determine whether there were statistically significant differences in the perceived importance of integrating Islamic doctrine into science education based on gender, years of teaching experience, and academic specialization. Both the quantitative and qualitative stages of the study were dedicated to addressing this question.

6.6. Gender

The two-sample *t*-test used to analyze the study's quantitative data related to Research Question 2 yielded a statistically significant difference ($t(350) = -4.60$, $p < 0.001$) between female (M = 3.97, SD = 0.41, n = 181) and male teachers (M = 3.75, SD = 0.50, n = 171). The Cohen's *d* value of 0.48 indicated a medium effect size for gender differences.

Relative to the males, the female interviewees demonstrated high levels of sensitivity towards the moral and spiritual dimensions of integrating Islamic values into science education. As one female teacher explained:

"When I teach science, I make sure my students see it through the lens of God's wisdom and purpose it makes the lesson more meaningful to them and to me."

"Integration isn't just about combining academic disciplines; it's about cultivating students' ethical identities by teaching science through a lens of spiritual values."

6.7. Teaching Experience

Teaching experience differences were analyzed using a one-way ANOVA, comparing three groups: less than 5 years (n = 109), 5–10 years (n = 123), and more than 10 years (n = 120). The results indicated statistically significant differences in perceptions regarding the importance of integration ($F(2, 349) = 4.47$, $p = 0.012$). Teachers with greater experience notably attributed higher importance to curricular integration.

The content of the interviews underscored the increased understanding and valuation of integration demonstrated by the interviewees having relatively greater levels of teaching experience. As one veteran teacher remarked:

"Early in my career, I focused only on content. But with time, I have come to see that integrating Islamic values gives every science lesson a deeper impact and moral direction."

Similarly, another, relatively more experienced teacher stated:

"When students recognize scientific achievements as signs of God's greatness, their curiosity and academic motivation soar dramatically."

Less experienced teachers cited the need for further guidance in implementing integration. For instance:

"I strongly believe integration is beneficial, but I need more practical guidance and professional training to confidently implement it in my classroom."

6.8. Academic Specialization

Regarding academic specialization, a two-sample t-test showed no statistically significant differences between Islamic education teachers (M = 3.57, SD = 0.90, n = 181) and science teachers (M = 3.63, SD = 0.54, n = 171), ($t(350) = -0.76$, $p = 0.45$). The small Cohen's *d* value (~0.08) indicated minimal effect of specialization, a finding reinforced by the contents of the interviews.

Integration between religion and science doesn't require a specific specialization it requires an understanding of our educational mission. (An Islamic teacher)

"My training was focused entirely on science, yet I clearly see the benefit of integrating Islamic perspectives. It ensures that science education resonates with students' cultural and spiritual identities." (A science teacher).

"For integration to truly succeed, teachers from both science and Islamic education backgrounds must work together, complementing each other's strengths and insights." (A science teacher).

7. Discussion

The study's combined quantitative and qualitative findings provide nuanced insights into the Saudi primary school teachers' perceptions regarding the integration of Islamic values into science education. Although analysis of the survey responses yielded no statistically significant results, the female and the relatively more experienced teachers rated their understanding and valuation of integration higher than did the male and less experienced teachers, respectively, a finding borne out by the contents of the interviews.

Regarding the conceptualization of integration, female interviewees compared it to viewing science "through the lens of God's wisdom and purpose" and "through a lens of spiritual values," a perspective aligned with Zabidi et al. (2019) and consistent with epistemological Tawhid. Additionally, the female participants emphasized the moral, ethical, and spiritual dimensions of education, aligning with the findings of Mansour (2011) and Zamista et al. (2022).

Female teachers consistently valued an integrative approach higher than did the males, as also found in Aksan et al. (2023) and Wahyuni (2020). In particular, female study participants cited integration as contributing to pupils' holistic development. One stated that teaching science from a religious perspective cultivated students' ethical identities rather than simply imparting information. Findings align with those of Aksan et al. (2023) and Wahyuni (2020),, who identified gender-based differences in attitudes toward holistic educational methods.

Study findings align with teacher professional identity theory, which concerns educators' perceptions of their professional identities, i.e., their role and its fulfillment. The study's female instructors viewed themselves as not being just passive conduits of information but as helping shape their students' ethical and moral character, a culturally influenced perception of a teacher's role.

Those study participants who had greater amounts of teaching experience, i.e., 10 years or more, consistently understood and valued Islamic religious-science integration more highly, confirming findings of previous studies (Tambak et al., 2022; Turgut, 2019). Unlike less-experienced colleagues, experienced teachers had sustained exposure to national educational policies aimed at cultivating ethically and scientifically proficient learners, which Saudi Arabia's Vision 2030 explicitly sets as a goal. In contrast to the female instructors, the experienced males'

positive view of integration seemed based on pragmatism, with one stating that integration gave a science lesson "greater impact and moral direction," while another reported that it motivated students to learn. Importantly, however, one less-experienced teacher opined that, while he saw the value of integration, he felt he needed preparation as to how to effectively implement it.

With respect to the teaching discipline, statistically significant differences were also lacking, and teachers of neither discipline consistently dominated with respect to integration's conceptualization or importance. One Islamic educator mentioned that discipline was irrelevant and that it instead required an understanding of instructors' "educational mission," a belief aligning with teacher professional identity theory.

Collectively, the findings underscore the need for targeted structural and policy interventions to implement integration. Teachers recognized the value of integrating Islamic values into science instruction, emphasizing the foundational role of cultural and religious identity in education, consistently citing the inclusion of Islamic ethical values as essential in developing students' moral reasoning and practicing ethically informed scientific inquiry, a finding in agreement with those of Lowe (2022) who emphasized the need for culturally responsive pedagogies explicitly incorporating local religious and cultural dimensions. Such tailored educational strategies will incorporate Saudi Arabia's distinct religious, cultural, and educational contexts and fulfill the objective of holistic student development outlined by Saudi Vision 2030.

Additionally, the study results provide empirical support for Mirza (2024) Islamic Scientific Critical Consciousness (ISCC) and Wahyuni (2020) structured-curriculum integration models, demonstrating their relevance and applicability within the Saudi context. The findings also underscore the paucity of practical implementation and empirical validation of these models within the Saudi context. To effectively bridge this gap, future research should adapt, apply, and rigorously evaluate these models within respective educational settings.

Moreover, the results revealed the significant role that teachers' personal beliefs and professional identities play in shaping their perceptions of and practices related to integration. Suggesting the necessity for professional development programs in the implementation of integration. In addition, these could encourage educators to critically reflect on their personal biases and beliefs and thereby enhance their ability to effectively integrate Islamic values with science instruction (Mansour, 2011; Turgut, 2019).

The study's findings also highlight the strategic importance of aligning integration initiatives with broader national educational policies, notably Saudi Vision 2030. Doing so would ensure the systematic implementation of integrative educational policies that explicitly embed Islamic ethical values within STEAM curricula and promote holistic student development.

The study's findings support three theoretical frameworks: cognitive integration theory (CIT), emphasizing cognitive flexibility, explains the teachers' consensus regarding integration's feasibility. Notably, educators with greater experience were better able to reconcile potentially conflicting epistemologies, e.g., biological processes and Quranic teachings.

The teachers' agreement on the integration's moral and spiritual necessity supports epistemological Tawhid, as the teachers routinely referencing the unity and divine coherence of knowledge explicitly linked such scientific phenomena as water cycles and planetary motions with Islamic teachings about divine creation.

Lastly, teacher professional identity theory explains the gender- and experience-based variations in attitudes regarding integration, also offering actionable insights into curriculum development and professional training programs aimed at integrative teaching practices.

In conclusion, the study's findings constitute a significant contribution to current Saudi educational reform efforts, providing critical insights related to targeted educational interventions that would facilitate the development of integrative educational approaches that balance students' cognitive and moral growth as envisioned by Saudi Vision 2030.

8. Conclusion

This study offered significant insights into Saudi primary school teachers' perceptions concerning the integration of Islamic doctrine and values into science education. Notably, distinct gender-based differences were evident, with female teachers consistently assigning greater importance to ethical and spiritual integration. Additionally, educators with greater teaching experience more strongly supported integration. Despite variations in background, teachers across academic specializations uniformly recognized the importance of such integration.

These results underscore the critical need for targeted professional development, explicit curricular reforms that embed Islamic teaching and ethical principles in science education, and educational policies to ensure effective integration practices. Theoretically, the findings validate the relevance of cognitive integration theory, epistemological Tawhid, and teacher professional identity theory to integration. In particular, gender- and experience-based differences highlight the role of cognitive flexibility and professional identity in shaping pedagogical practices, and the interdisciplinary consensus supports the central tenet of epistemological Tawhid—that knowledge is unified and interconnected.

Future research could examine the long-term impact of integration using longitudinal studies, directly evaluate student outcomes, and explore integrative approaches across diverse educational contexts.

9. Recommendations

To effectively translate the study findings into actionable policies within Saudi educational institutions, the researcher proposes the following recommendations:

9.1. Targeted Professional Development

Policymakers and educational leaders should implement regular, targeted professional development programs explicitly designed to increase teachers' understanding and application of integrative education, with special emphasis placed on raising male teachers' awareness and appreciation of integration's ethical and educational benefits.

9.2. Curriculum Reform Through Collaboration

Expert committees, including educators, scholars, and curriculum developers, should collaborate in revising STEAM curricula to explicitly incorporate Islamic teachings and ethical values. Collaboration would ensure culturally relevant and academically robust integration aligned with Vision 2030 objectives.

9.3. Resource Allocation and Reflective Practice

Educational institutions should allocate adequate funding and technological resources to support integrative teaching practices. Additionally, instituting structured reflective training and mentorship programs would empower educators to effectively integrate their personal beliefs with professional pedagogical practices.

9.4. University-School Partnerships for Empirical Validation

Establishing formal partnerships between universities and primary schools would enable empirical evaluation of integrative educational frameworks and would facilitate evidence-based curriculum improvement and inform ongoing professional development initiatives.

9.5. Development and Monitoring of National Guidelines

Policymakers should develop clear national guidelines to support sustainable integrative educational practices aligned with Saudi Vision 2030. These guidelines should clearly detail expectations, implementation methods, and mechanisms for monitoring and evaluation to ensure continuous improvement.

Together, instituting these recommendations would offer a roadmap for ensuring the effective, sustainable integration of Islamic teaching into science education, ultimately fostering holistic student development consistent with Saudi Vision 2030.

10. Implications

Study findings have important implications for educational stakeholders, i.e., policymakers, educators, curriculum developers, and researchers. Teachers' positive perceptions regarding curricular integration strongly align with national educational goals, particularly Saudi Vision 2030, encouraging policymakers to develop policy frameworks formally supporting and institutionalizing the integration of Islamic teaching into science curricula. Strategic alignment of policy and practice facilitating a coherent educational approach would reinforce both cognitive development and ethical educational objectives.

For educators and curriculum developers, the research findings underscore the importance of tailoring instructional methods and educational resources to provide effective support for integration. Targeted professional development programs should delineate clear pedagogical strategies for integrating Islamic teaching and ethics into science education. Curriculum developers should create teaching materials that incorporate integration.

Furthermore, the gender disparities in teachers' valuation of integration imply that targeted professional development interventions aimed particularly at male educators are necessary to enable them to successfully incorporate integration into their teaching. Addressing these disparities would increase inclusivity and the effectiveness of pedagogical practices, benefiting students across all educational contexts.

Identification of practical challenges, such as resource constraints and limited professional training opportunities, is necessary to enable institutions to prioritize resource allocation and support for integration. Institutional backing is crucial to ensure that educators have access to the necessary tools and resources needed to successfully implement integration.

Lastly, for educational researchers, this study's findings underscore the importance of continued empirical investigation into integration's benefits and implementation. Possibilities include longitudinal studies focused on student outcomes and teacher professional growth, which would enhance understanding of integration's benefits and, more broadly, best practices in culturally responsive and ethically grounded science education.

11. Limitations and Future Research Directions

The study had several limitations. First, the research was situated within primary schools located in the Al-Madinah Al-Munawwarah region of Saudi Arabia, limiting the generalizability of findings with respect to other educational stages and locations, even within Saudi Arabia itself. Future research could duplicate the current study in different geographical locations and for other educational levels.

Second, despite employing a robust mixed-method design, the relatively small qualitative sample size employed in the current study limits the generalizability of its findings. Large-scale qualitative studies would further test this study's findings.

Third, the study's purpose was primarily to explore teacher perceptions and not directly assess student outcomes or evaluate the effectiveness of classroom integration strategies. Subsequent research should therefore investigate student outcomes related to performance, attitudes, and moral development when exposed to integrative education, thus providing empirical evidence regarding its effectiveness.

Additionally, the study's cross-sectional design restricts understanding of changes in teachers' perceptions and practices over time. Longitudinal studies are necessary to capture evolving attitudes, beliefs, and pedagogical strategies, providing deeper insights into the developmental trajectory of integration practices among educators.

Finally, while the findings of this research contribute theoretically, integration frameworks remain largely untested. Future studies should therefore conduct experiments aimed at evaluating theoretical integration models in the context of classrooms, thus ensuring their relevance, practical applicability, and effectiveness within such culturally specific educational environments as Saudi Arabia.

Addressing these limitations would substantially enhance the understanding and implementation of integrating Islamic teachings into science education, ultimately contributing to evidence-based, culturally responsive practices aligned with Saudi goals related to holistic student development.

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Appendix A.

A list of Participating Schools:

- Abi Al-Tayyib Al-Mutanabbi Elementary School.
- Labid Bin Rabi'a Elementary School.
- Rub'i Bin Aamir Elementary School.
- Harith ibn Aws Al-Ansari Elementary School.
- Abdullah Bin Jahsh Elementary School.
- Amr Bin Qais Elementary School.
- Dawood Bin Urwah Elementary School.
- Othman Bin Hunaif Elementary School.
- Mundhir Bin Qais Elementary School.
- Anas Bin Malik Elementary School.
- Ka'b Bin Malik Elementary School.
- Dhu Al-Hulaifah Elementary School.
- Osama Bin Zaid Elementary School.
- Forty-Seventh Elementary School for Girls.
- Thirty-Fourth Elementary School.
- Twenty-Fourth Elementary School and Eighty-First Kindergarten Annex.
- Sheikh Abdul Aziz Bin Saleh Elementary School.
- Salman Al-Farisi Elementary School.
- Ezz Bin Abdul Salam Elementary School.
- Amr Bin Sahl Bin Al-Harith Elementary School.

- Fifty-Fifth Elementary School for Girls.
- Ahnaf Bin Qais Elementary School.
- Second Elementary School for Girls in Al-Madinah.
- Zaynab Bint Othman Bin Maz'oon Elementary School for Girls.
- Seventh Elementary School.
- One Hundred and Fourth Elementary School.
- Thirty-Second Elementary School.
- Amr Bin Al-Jamouh Elementary School.
- Abdullah Bin Amr Bin Al-Aas Elementary School.
- Saeed Bin Harith Al-Qurashi Elementary School.
- Fifth Elementary School.
- Seventy-Ninth Elementary School for Girls.
- Fifty-Second Elementary School.
- Ninety-Second Elementary School.
- Al-Mundassah Elementary and Intermediate School.
- Al-Buwair Elementary School.
- Imam Bukhari Balumblyleih Elementary School.
- Eighty-Ninth Elementary School.