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Evaluating Islamic-Integrated General Chemistry Course Using CIPP Model: A Comprehensive Assessment of Context, Input, Process, and Product at Islamic Higher Education

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Abstract
The integration of Islamic values into science education remains a critical challenge in Islamic higher education, particularly in General Chemistry courses where the disconnect between spiritual and scientific knowledge persists. Despite widespread recognition of the importance of integrating religious values with scientific learning, systematic evaluation of such integrated programs is limited. This study comprehensively evaluates an Islamic-integrated General Chemistry course program using the Context, Input, Process, and Product (CIPP) evaluation model to assess program alignment with institutional vision, quality of educational inputs, effectiveness of learning processes, and student learning outcomes. A mixed-methods approach was employed, combining document analysis, classroom observations, questionnaires, and interviews with 31 chemistry education students, one course lecturer, and the program head at a State Islamic University in Jakarta. Quantitative data were analyzed using descriptive statistics, while qualitative data underwent thematic analysis. Results indicate strong program alignment with institutional vision (100% compliance in context evaluation) and adequate student motivation (78% enthusiasm). However, significant challenges exist in learning resources (only 62% of students own reference books), interactive learning implementation, and conceptual mastery in kinetics and thermodynamics topics (average final exam score: 56.86). Holistic and integrative learning characteristics scored lowest in process evaluation, indicating insufficient student engagement and creativity development. The study provides evidence-based recommendations for improving Islamic-integrated chemistry education through enhanced teaching materials, diversified learning methods, improved integration quality between Islamic values and chemistry concepts, and strengthened input and process aspects. This research contributes to the theoretical understanding of science-religion integration in higher education and offers practical implications for developing more effective, meaningful, and holistic Islamic-integrated science programs.

Keywords: Program evaluation; islamic integration; CIPP evaluation model, general chemistry

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INTRODUCTION

General Chemistry lectures are one of the essential courses in the chemistry education curriculum that aim to build a scientific foundation for students in understanding chemistry concepts in depth. The competencies expected from this course include mastery of chemistry theory, critical thinking skills, and problem-solving abilities (Casey et al., 2023). In Indonesian Islamic higher education, integrating Islamic values into science education is mandated by Act Number 12 of 2012, making chemistry courses a strategic venue for creating cognitively and spiritually transformative learning. Although the integration of Islamic values has been a focus in various religion-based higher education programs, its implementation in general chemistry lectures still faces challenges. Literature reviews indicate that implementing spiritual values integration in science education often remains limited to theoretical aspects and has not been fully adopted in daily teaching practices (Aswie, 2023; Tursinawati et al., 2024). On the other hand, there is a gap in programmed evaluation that assesses student learning outcomes and examines the program's contribution to character development, holistic competency development, and relevance to societal needs. Therefore, a comprehensive evaluation is necessary to identify the strengths, weaknesses, opportunities, and threats associated with implementing the integrated Islamic values general chemistry course program (Saputro et al., 2022).

Religion and science are inseparable; they are interconnected and interdependent. The Quran itself states that there is no doubt about its contents, which discuss everything related to religion and science (Dalimunthe, 2022; Nasir, 2022). Although some argue that religious knowledge and science rely on their respective egos, scientific knowledge, for example, relies heavily on precise empirical data to confirm whether something is real. Conversely, religion examines and accepts rational or irrational discussions based on faith and belief in each individual (Norazmi et al., 2013; Turgut, 2016; Tursinawati et al., 2024). Discussing the integration of Islam and science means combining Islam and science without eliminating the original identity of each. From an Islamic perspective, the integration of science and religion is possible. However, there are several negative paradigms related to integrating faith and education. Nevertheless, we can draw a realistic and objective connection between these two discussions, which can have implications for the world of education. Education is the best means to achieve the goal of integrating religion and education. Because if both can be united, it can impact the world of education, producing students who have scientific, religious, and responsible attitudes (Norazmi et al., 2013; Saputro et al., 2022; Tursinawati et al., 2024).

Evaluation is crucial in designing and implementing a lecture program (Sagin et al., 2024; Umam & Saripah, 2018). The achievement of a program's objectives cannot be determined without evaluation. On the other hand, it can be determined by assessing the degree to which a program's goals have been achieved. Analyzing the program's success rate significantly influences strategic choices and actions. To determine the value of an evaluation object (the value or benefit associated with a criterion), evaluation identifies, clarifies, and applies the requirements. On the other hand, program evaluation is a methodical investigation into the object's value and usefulness (Fitzpatrick et al., 2011). The extent to which a program has been achieved and its effectiveness can be assessed by evaluating each program implementation. In education, evaluation is crucial for strategic decisions in educational institutions and policy decisions that encourage higher-quality institutions. Lecture programs created in academic institutions to promote student learning are highly dependent on the conclusions of the institution's evaluations, which are manifested in decisions or regulations. The General Chemistry course is one of the

compulsory General courses in the chemistry education study program, developed to support mastery of General chemical concepts.

Stufflebeam's CIPP (Context, Input, Process, Product) evaluation model provides a theoretical framework to determine overall program quality and excellence. The CIPP model requires consideration of multiple program aspects, including input from representative stakeholders, to conduct a comprehensive assessment. These aspects are assessed through four key evaluations (Context, Input, Process, and Product), which collectively provide data for evaluating the program (Stufflebeam, 2003). The CIPP model has a comprehensive format (Lei, 2024) and greatly benefits educators and administrators (Sagin et al., 2024). The CIPP model takes a holistic approach to evaluation, encompassing both summative and formative assessment. Furthermore, the CIPP model can enhance an institution's strategies in implementing its educational programs. The CIPP model provides a robust framework for decision-making and policy-making for new program designs (Hartati et al., 2018).

The CIPP model has also been applied in various educational contexts outside chemistry education, such as science learning, mathematics, spatial problem-based learning, and science programs (Alvianita et al., 2022; Hartati et al., 2018; Ichsan et al., 2023; Silviariza et al., 2023). The CIPP evaluation model's adaptability across multiple disciplines underscores its versatility and effectiveness in evaluating educational initiatives. By following the CIPP model, educators can gain insight into their programs' strengths and weaknesses, identify areas for improvement, and make informed decisions to optimize students' learning experiences (Umam & Saripah, 2018). The CIPP model serves as a robust framework for evaluating General chemistry courses by providing a structured approach to assessing the various components of the educational process. Its systematic nature enables educators to conduct comprehensive evaluations considering the context, input, process, and products of learning activities, leading to informed decision-making and continuous improvement in educational practices (Stufflebeam, 2003).

Some previous studies have shown the effectiveness of integrating religious values in learning to increase spiritual awareness, learning motivation, and ethical attitudes of students (Norazmi et al., 2013; Saputro et al., 2022; Turgut, 2016; Tursinawati et al., 2024). However, studies evaluating General Chemistry courses based on Islamic integration using the CIPP approach are still minimal. This study aims to fill this gap by conducting a comprehensive evaluation of a General Chemistry course integrated with Islamic integration, including an analysis of the relevance of the program context, the quality of the input used, the effectiveness of the learning process, and student learning outcomes.

The research questions guiding this study are: (RQ1) To what extent does the Islamic-integrated General Chemistry program align with institutional vision and study program objectives? (RQ2) How adequate are the input components (student readiness, resources, lecturer competency, facilities) for effective program implementation? (RQ3) How effectively are Islamic values integrated into the learning process, and to what extent does the process engage students actively? (RQ4) What are the learning outcomes in terms of conceptual mastery and student perceptions of the integrated program?.

METHODS

Research Design

This study used a mixed-methods convergent parallel design, collecting quantitative and qualitative data simultaneously, analyzing them separately, then merging for comprehensive interpretation (Creswell & Clarck, 2018). The evaluation approach used is the CIPP evaluation model developed by Stufflebeam (2003). This model is built on four

main program stages: Context, Input, Process, and Product, reflecting the importance of context in considering evaluation questions and the emphasis on standards and usage. Stufflebeam, the developer of this model, underlines that the most essential goal of evaluation is not to prove, but to improve, although this does not exclude proof as a goal (Fitzpatrick et al., 2011).

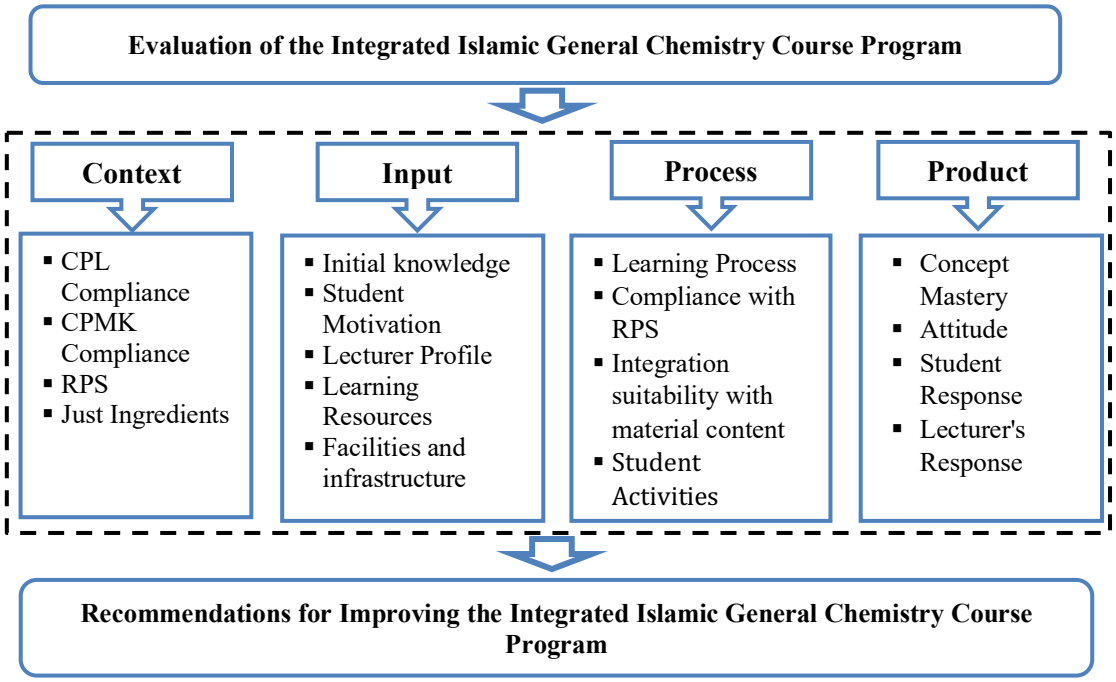

Figure 1. Design of Evaluation Model for Integrated Islamic General Chemistry Course Program

Participant

This study was conducted at one State Islamic University in DKI Jakarta during the 2024/2025 academic year. Participants were 31 chemistry education students (23 female, 8 male, ages 18-20 years), one General Chemistry lecturer (master's degree, 10 years' experience), and the program head. All participants provided informed consent, and ethical approval was obtained from the university's research ethics committee.

Instrument

Data were collected using six validated instruments: (1) Document Analysis Checklist for context evaluation; (2) a Likert-scale Student Readiness Questionnaire (Cronbach's $\alpha = 0.82$); (3) an 8-dimensional Learning Process Observation Sheet based on Permendikbud No. 3/2020; (4) a Semi-structured Interview Protocol; (5) a Student Perception Questionnaire (Cronbach's $\alpha = 0.88$); and (6) Academic Achievement Data from official records. Two researchers independently coded a subset of data, achieving an inter-rater reliability of 0.87 (Cohen's kappa).

Data Analysis Methods

Quantitative data (questionnaires, observations, and academic achievement) were analyzed using descriptive statistics, including percentages, means, and standard deviations for each CIPP component. Qualitative data underwent thematic analysis following Braun & Clarke's (2006) six-phase approach using NVivo 12. Data triangulation across multiple sources (documents, observations, interviews, questionnaires) enhanced validity.

Evaluation criteria: context alignment ≥ 90% (excellent), input scores ≥ 80% (high quality), and product scores ≥ 70 (good mastery).

RESULTS & DISCUSSION

1. Evaluation from the Context Aspect

The evaluation of the contextual aspect aims to ensure that the designed lecture program is aligned with the CPL of the study program and the vision and mission of the Islamic Higher Education institution to produce academically superior graduates, have noble character, and can make a real contribution to society. The document analysis results indicate that the alignment between the CPL and CPMK, as reviewed from the RPS document, is appropriate and comprehensive. As for the study materials, they have been adjusted to the minimum standards contained in the chemistry education study program curriculum book. This indicates that the General Chemistry RPS has substantially met the planning document component standards with a 100% compliance level. Thus, the RPS has been well-designed and has considered essential assessment aspects to evaluate the achievement of learning objectives.

The objectives of the lecture program, which emphasize the integration of Islamic values, align with the Islamic Higher Education institutional vision of producing a generation with noble character. Chemistry education is not only interpreted as a transfer of knowledge, but also as a means of drawing closer to the Creator through understanding His creation. This alignment reflects the institution's commitment to producing graduates who are not only scientifically competent but also spiritually grounded. The results of this lecture program evaluation align with previous research that suggests that lecture program planning is a critical component of effective teaching, ensuring that courses have clear objectives, relevant content, and are based on the latest evidence (Bhakti, 2017). The lecturer must set learning objectives and select authentic and appropriate materials for use in the lecture process to enhance the students' learning experience (Mufarrohah et al., 2022).

Appropriate lecture materials are crucial for engaging students and facilitating learning. Integrating science and Islam can enhance student interaction and lecture engagement (Fitriyawany et al., 2022; Turgut, 2016). Other research also found that the quality of the course program and course materials significantly impacts teaching effectiveness. Lecturers must prepare appropriate teaching materials for each lesson, prioritizing independent learning over simply describing the subject matter (Henukh et al., 2024; Irvani et al., 2024). In addition, the course program's suitability can impact the study program's accuracy in the curriculum, thus affecting the overall educational experience (Megasari et al., 2022). The perfect alignment found in this study (100%) provides a strong foundation for program implementation and suggests that institutional goals are clearly articulated and translated into course-level objectives.

2. Evaluation of Input Aspects

Input evaluation shows that 78% of students felt enthusiastic about the General Chemistry course, and 84.2% reported readiness to participate. These positive motivational levels reflect students' understanding of the course's career relevance and interest in Islamic-science connections. However, 22% expressing less enthusiasm suggests that pre-course orientation activities could benefit some students. Regarding initial abilities, students had a background in Islamic teachings but struggled to connect them to chemistry concepts. While students could recite Quranic verses about creation, they could not identify

specific connections to chemical phenomena such as atomic structure. This highlights the need for systematic, explicit instruction connecting religious teachings with scientific concepts (Tursinawati et al., 2024).

Based on a questionnaire regarding ownership of learning resources in the form of General chemistry reference books, only 62% of students reported owning a reference book. This indicates that students' learning resources are still not optimal, despite the crucial role in supporting the learning process (Liu & Liu, 2024; Sumarsono et al., 2021). After interviewing two students who stated they did not own reference books, they noted that General chemistry reference books are expensive, with prices ranging from IDR 200,000 to 500,000. They felt satisfied with the material delivered by the lecturer during the lecture and relied on lecture notes and handouts. Two interviewed students also stated that they owned e-books as learning resources and references for their General Chemistry courses. This resource limitation represents a significant input weakness that could affect learning outcomes. The institution should consider providing more affordable access to textbooks through library resources, e-book subscriptions, or developing comprehensive course materials.

The General Chemistry lecturer holds a master's degree in chemistry education with over 10 years of teaching experience, including three consecutive years teaching the integrated course. The lecturer uses Quranic verses related to creation and natural balance as integration sources and has produced Islamic-integrated chemistry teaching materials, representing a significant program strength (Fitriyawany et al., 2022). Regarding facilities, 73% of students rated classroom facilities (LCD projectors, whiteboards) as good or very good, while the lecturer indicated that advanced facilities, particularly laboratory equipment and multimedia resources, needed improvement. This discrepancy suggests basic facilities meet student expectations, but advanced facilities would enhance integration quality.

3. Evaluation of Process Aspects

Six classroom observations were conducted across different topics (atomic structure, chemical bonding, stoichiometry, chemical reactions, kinetics, and thermodynamics). The overall average score was 3.2 out of 4.0 across eight dimensions of learning characteristics specified in Permendikbud Number 3 of 2020, as summarized in Table 1.

Observation data from lectures shows that the General Chemistry course integrated with Islamic values has generally been implemented well, with an overall average score of 3.2 out of 4.0 across all dimensions. However, several important points could be the focus of improvement: Classroom management and facilities scored 3.5, reflecting good classroom management with clear structure, appropriate pacing, and effective use of time. However, optimizing learning facilities such as digital media and interactive technology can provide a more dynamic learning experience. For instance, virtual molecular modelling software could help students visualize atomic structures while connecting them to Islamic concepts of divine design. Contextualization of chemical concepts with Islamic values scored 3.4, indicating that the integration of Islamic values with chemical concepts has been done well overall. The lecturer consistently made connections between chemistry topics and Islamic teachings, such as discussing atomic structure alongside Quranic verses about creation's precision, or chemical equilibrium alongside concepts of balance in Islamic cosmology. This success can be improved by providing more contextual, applicable examples to connect chemistry with Islamic teachings in everyday life. For instance, discussing halal food chemistry, environmental stewardship from an Islamic perspective, or ethical implications of chemical applications in industry. Fitriyawany et al. (2022)

emphasizes that meaningful integration requires moving beyond superficial mentions to deep, authentic connections that help students see coherence between religious and scientific worldviews.

Table 1. Observation Data of the Integrated-Islamic General Chemistry Course

No.	Observation Aspect	Criteria				Average Score
		Not yet implemented	Partially implemented	Well executed.	Very well executed	
1	Classroom management and learning facilities			✓		3.2
2	Delivery of material			✓		3
3	Contextualization of chemical concepts with Islamic values			✓		3.2
4	Teaching methods			✓		3
5	Use of learning media					3
6	Strengthening Islamic values in learning			✓		3.2
7	Interactive, collaborative, holistic, scientific		✓			2.6
8	Evaluating learning processes and outcomes			✓		3

Interactive, Collaborative, Holistic, and Scientific learning characteristics scored the lowest average at 2.8, indicating the need for innovation to increase student engagement in the learning process. Observations revealed predominantly lecture-based instruction with limited opportunities for student discussion, questioning, or collaborative problem-solving. While the lecturer posed questions to the class, individual student responses were infrequent, and group activities were rare. Strategies like problem-based group discussions, where students work together to solve chemistry problems while considering Islamic ethical dimensions, or collaborative projects based on Islamic values, such as researching environmental chemistry from an Islamic stewardship perspective, can be implemented. This certainly impacts the learning process, which should be interactive. Interactive learning is a method that involves active participation from students, allowing them to be directly involved in the learning process (Hasja et al., 2023; Sumarsono et al., 2021). This creates an environment where students can interact with the course material, explore concepts, and apply knowledge to real-world situations. This approach makes learning more engaging, facilitates profound understanding, and allows students to actively develop critical and creative thinking skills (Ijirana et al., 2022; Suciati et al., 2022). The low score in this dimension suggests that, despite good content integration, the pedagogical approach remains too teacher-centred and needs reform toward more student-active methodologies.

Efforts to improve the lecture program can be carried out through the use of a variety of teaching methods, such as inquiry-based learning, cooperative learning, problem-based learning, or flipped classroom approaches that promote active student engagement, additional training for lecturers in active learning pedagogies and technology-enhanced teaching, or improvements to technological infrastructure to maximize the benefits and effectiveness of integrating chemistry and Islam in the learning process (Ardi et al., 2024;

Suciati et al., 2022). Furthermore, professional development programs, such as training on integrating science and Islam through active pedagogies, are crucial for effectively integrating chemistry and Islam into learning. Therefore, improvements in the process can increase student engagement when Islamic values are contextually linked to chemistry concepts at Islamic Higher Education institutions in more interactive and participatory ways.

4. Evaluation of Product Aspects

Product evaluation assessed student learning outcomes through mid-term and final exams, assignments, and integration reflection papers. The General Chemistry course was evaluated for conceptual mastery, attitudes, motivation, and perceptions of the Islamic-integrated program.

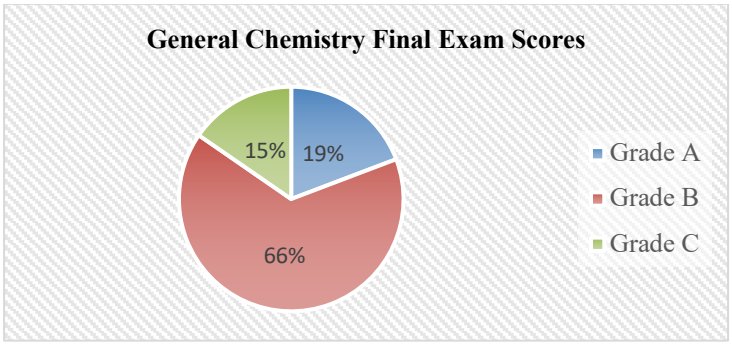

Figure 2. Percentage of General Chemistry Final Exam Scores

Based on the mid-term exam questions, there are five essay questions with a composition of 60% conceptual understanding questions (e.g., explain the aufbau principle and its relationship to atomic stability), 30% General chemistry concept application questions related to the integration of chemistry and Islam (e.g., how does the concept of chemical equilibrium reflect Islamic teachings about balance in creation), and 10% pure calculation problems. The mid-term exam results show that the average student score is 68.4 on a scale 100 (SD = 12.3). A total of 32.25% of students scored below 60, while 35.5% scored between 60-75, and 32.25% scored above 75. It can be concluded that students' understanding of General chemistry concepts is classified as good overall, though with considerable variation, indicating that some students struggle while others excel.

Seen from the final exam questions, there are five essay questions comprising 60% conceptual understanding questions, 30% conceptual application questions, and 10% analytical questions related to the integration of chemistry and Islamic concepts (e.g., analyze how the concept of activation energy in chemical kinetics can be related to the Islamic principle of striving and effort before achieving results). The average score obtained by students on this final exam is lower than the mid-term exam score, namely 56.86 (SD = 15.8), with a percentage of scores below 60 as much as 38.70%. This decline in performance from mid-term to final exam suggests that students faced greater difficulty with the more advanced topics covered in the second half of the course, particularly kinetics, thermochemistry, and thermodynamics. The scores obtained by students on the General Chemistry final exam are 19% of students get an A (80-100), 66% get a B (60-79), and 15% get a C (50-59). These final exam results indicate that students' conceptual mastery of General chemistry material is classified as adequate but below the desired level of good.

Student learning outcomes need improvement, particularly in kinetics, thermochemistry, and thermodynamics. Item analysis revealed students performed well on basic conceptual questions (average 72%) but struggled with application and integration questions (average 54%), indicating difficulty in transferring knowledge to new contexts. Improvements through interactive simulations, enriched teaching materials, and strategies such as concept mapping and reflective writing can help students make explicit Islamic-science connections (Ijirana et al., 2022; Sugiharti et al., 2019). Improvements can be directed at the input and process aspects of the lecture program, particularly enhancing student resources and implementing more active learning strategies.

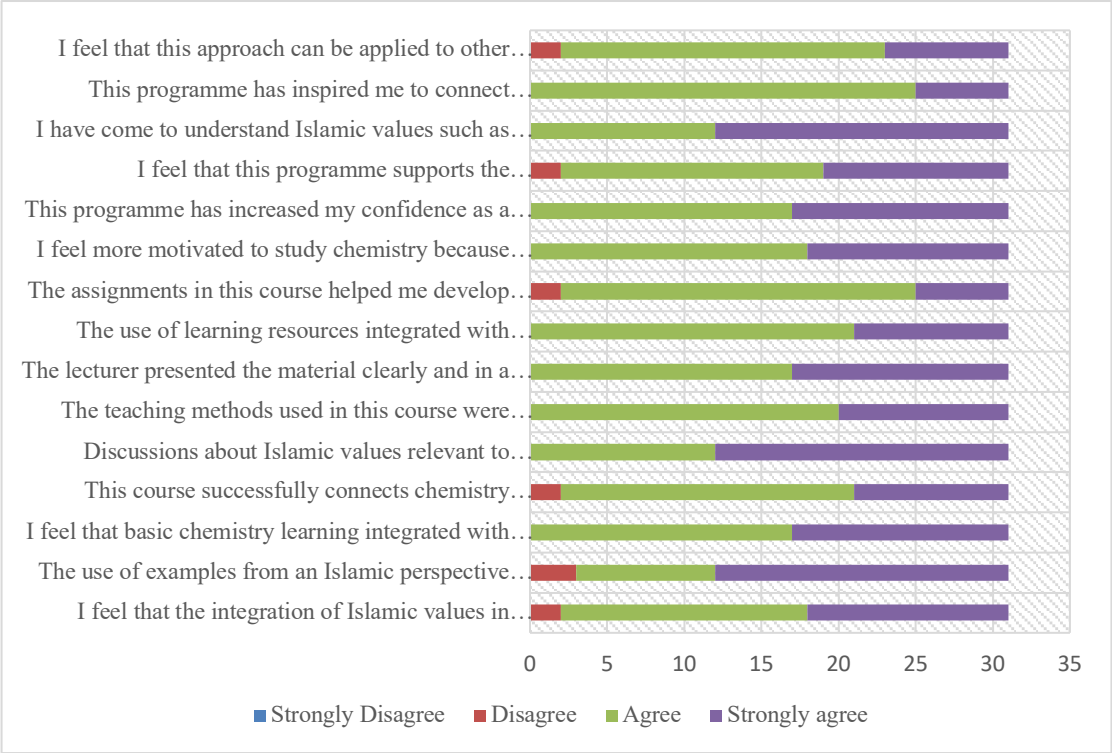

Figure 3. Student Responses To General Chemistry Course Program

In general, most students positively perceived the Islamic-integrated General Chemistry course, with an overall satisfaction rating of 3.8 out of 5.0. This was evident in the questionnaire results, which showed a predominance of positive responses (agree and strongly agree) in most statements. Specifically, 82% of students agreed that the course successfully integrated chemistry concepts with Islamic values in learning, such as honesty in reporting experimental results, responsibility for safe laboratory practices, and cooperation in group work reflecting Islamic principles of mutual assistance. 79% felt the integration helped them understand chemistry more meaningfully, 76% believed it strengthened their faith, and 85% thought the program was relevant for application in other courses. Most students (88%) thought the program supported the development of Islamic character and produced graduates who are not only scientifically competent but also spiritually grounded.

Based on interviews with the lecturers in charge of the course, students' mastery of General Chemistry concepts was considered quite good for basic topics but needed reinforcement for advanced topics. Students experienced difficulties in solving chemical kinetics and chemical thermodynamics problems, particularly those involving

mathematical calculations and abstract reasoning about molecular-level phenomena. Lecturers also highlighted that students often struggle to integrate chemical concepts with Islamic values spontaneously and need explicit prompting and scaffolding to make connections. For instance, when asked to explain chemical equilibrium, students could describe the scientific concept adequately but struggled to articulate Islamic perspectives without specific guidance. Therefore, a learning approach is needed that allows students to improve their understanding of General Chemistry through integration with Islamic values in more structured and scaffolded ways (Aswie, 2023; Az-zahra, 2023; Saputro et al., 2022). In this case, learning methods that emphasize integrating Islamic values into chemical concepts systematically and providing explicit frameworks for making connections can be an effective solution.

CONCLUSION

Several important conclusions can be drawn based on the evaluation results of the Islamic-integrated General Chemistry course program in the Chemistry Education Study Program. First, students' mastery of General Chemistry concepts needs to be improved through improvements to the course program, emphasizing concepts of kinetics, thermochemistry, and thermodynamics, and appropriate learning methods. Students experience difficulties understanding General Chemistry concepts, especially in the subtopics of reaction kinetics, thermochemistry, and chemical thermodynamics. The evaluation of the contextual aspect indicates that the objectives of the course program, as seen from the RPS, are aligned with the CPL of the study program and the institutional vision of Islamic Higher. From the input aspect, the evaluation highlights the importance of students' initial abilities, student motivation, lecturer profiles, limited learning resources, and adequate facilities and infrastructure. The process aspect shows that there are still shortcomings in the characteristics of holistic, integrative learning and the development of student creativity. The exam results indicate that most students have a reasonably good conceptual mastery of General Chemistry material. Thus, efforts are needed to improve the quality of General Chemistry lecture programs by increasing mastery of concepts, using effective learning methods, improving the quality of chemistry and Islam integration, and improving the quality of process and input aspects in General Chemistry learning.

CONFLICT OF INTEREST

There is no Conflict of Interest in this research.

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