

Building an Applicative Model of Integration-Interconnection of Mathematics and Islamic Sciences

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ABSTRACT

The idea of scientific integration-interconnection initiated by Amin Abdullah still cannot be applied in pure science study programs. The unique and very formal character of mathematics causes almost all lecturers of the Department of Mathematics and Mathematics Education to learn how to implement the concept of integration-interconnection when they teach some mathematical courses. This article offers a design for implementing the integration-interconnection paradigm of mathematics and Islam in the Tri Dharma of higher education activities for the Department of Mathematics and Mathematics Education. The integrative-interconnective model of mathematics and Islam includes an integrative learning, research, and community service model. We used the grounded theory method to form the integration-interconnection model. The resulting model is expected to be used as a guide for the academic community of the Department of Mathematics and Mathematics Education under the Islamic Religious Universities (Perguruan Tinggi Keagamaan Islam) in carrying out all activities of the Tri Dharma of higher education in terms of teaching and learning, research and community service.

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INTRODUCTION

The implementation of a curriculum based on scientific integration is a demand for learning at all state Islamic universities in Indonesia, including UIN Sunan Kalijaga Yogyakarta (Hidayah et al., 2023). All study programs within UIN Sunan Kalijaga must apply this concept to all activities of the Tri Dharma of higher education (education and teaching, research, and community service). Thus, from the profile of graduates, learning outcomes, curriculum design, and its implementation in learning to its evaluation, there must be an integrative paradigm between Islam and the science taught.

The concept of scientific integration applied at UIN Sunan Kalijaga Yogyakarta is

called integration-interconnection (Syihabuddin et al., 2024). This concept was initiated by Amin Abdullah in 2004 when there was an institutional conversion from IAIN to UIN. Problems arise when integration-interconnection is applied to pure science study programs such as the Department of Mathematics. The distinctive and very formal character of mathematics causes almost all lecturers of the Department of Mathematics at UIN Sunan Kalijaga to learn still how to implement the concept of integration-interconnection when teaching mathematics courses (Kusno et al., 2020). According to Fadilah (2023), most lecturers teaching mathematics courses are still limited to exploring the aspects/content of mathematics and have yet to be able to integrate or interconnect with Islamic aspects and values.

The failure to implement the integration-interconnection concept when teaching mathematics courses impacts the profile of graduates produced by this department (Thoib, 2021). According to our survey of several alums, it can be concluded that they understand the idea of the scientific integration paradigm applied at UIN Sunan Kalijaga in general. However, they have yet to derive the paradigm of integration or interconnection between mathematics and Islam. In fact, according to the alumni, the insight into the concept of scientific integration that they have is their advantage compared to graduates of other mathematics departments.

The same case applies to research. Most lecturers in the Department of Mathematics still need help conducting research integrating mathematics with Islamic studies. So, the minimum target of integrative research as one of the quality objectives of the study program is always only sometimes achieved. Research in the mathematics department is still dominated by pure mathematics research, as found in mathematics departments in other universities (Kuteeva & McGrath, 2015).

This article intends to design an implementation model of the integration-interconnection paradigm of mathematics and Islam in the Tri Dharma of higher education activities in the Department of Mathematics at UIN Sunan Kalijaga. The integrative-interconnective model of mathematics and Islam includes an integrative learning, research, and community service model (Kurniawan, 2020). The model built can be used as a guide for the academic community of the Department of Mathematics in carrying out all activities of the Tri Dharma of higher education in terms of teaching and learning, research, and community service. Although the model built explicitly implements the concept of scientific integration-interconnection at UIN Sunan Kalijaga, the resulting model can also be applied

in all mathematics departments in Islamic state universities throughout Indonesia.

As far as the author's search goes, research and literature on the concepts and models of integration and interconnection that specifically discuss mathematics and Islam still need to be made available. Most research and literature still target integrative learning models in school education (Anggreni, 2019), and very few target higher education. The results of the research and literature are still limited in terms of learning (Huda et al., 2019; Mubarok, 2021; Rahmadhani & Wahyuni, 2020; Rahmawati & Rizki, 2017), and none have targeted aspects of research and community service. Meanwhile, research on building an applicative model of integration-interconnection of mathematics and Islam in the Tri Dharma of higher education has never existed.

The novelty of this research lies in explaining how the implementation of integration and interconnection between mathematics and Islamic science is applied in teaching, research and community service. So the purpose of this research is to build a model for the implementation of integration and interconnection between mathematics and Islamic science in universities.

RESEARCH METHOD

To construct the integration-interconnection model between mathematics and Islamic concepts, we used the grounded theory method. The grounded theory method is a qualitative research approach used to systematically construct a model from the collected data (Cutcliffe, 2000). In this method, concepts in mathematics and Islamic studies are analyzed continuously to identify patterns or designs that can be integrated or interconnected. With this approach, new models of scientific integration can be developed from the data inductively, allowing for a deeper understanding of the relationships between the integrated concepts.

The subjects in this study are those who are the focus of observation and will be given a series of treatments or observations to measure the response to the implementation of the concept of integration and interconnection between mathematics and Islamic science. They are lecturers in the Mathematics Study Program at several State Islamic Universities in Indonesia. While the object of this study focuses on the specific aspects under study, namely the ability of lecturers to implement the concepts of integration and interconnection between mathematics and Islamic science.

The data collection techniques used in this research are in-depth interviews,

participatory observation, and document analysis. In-depth interviews allow researchers to gain rich insights into the experiences and perspectives of research subjects, while participatory observation allows researchers to understand the social and cultural context in which the subject is located. while document analysis provides additional data sources that can be used to complement the data obtained from the interview method, observation.

The data analysis used in this research is interpretative and inductive, using thematic analysis, narrative analysis, and content analysis. The data analysis is used to identify themes, patterns, and meanings from the qualitative data that has been obtained

RESULT AND DISCUSSION

The Concept of Scientific Integration-Interconnection at Uin Sunan Kalijaga

The concept of scientific integration-interconnection at UIN Sunan Kalijaga was initiated by Amin Abdullah (Hamami, 2004). This concept places religion and science as entities that greet each other so that they become a unified concept. The integrity of the concept of scientific integration-interconnection is described in three dimensions of science development, namely: *badlarah al-nash* (text), *badlarah al-'ilm* (science and humanities) and *badlarah al-falsafah* (ethics).

The integration-interconnection paradigm initiated by Amin Abdullah can be illustrated with a scholarly spider web (see Figure 1). Following is the detailed explanation about the concept of scholarly spider web. The paradigm is centered on the Qur'an and as-Sunnah as the source of Islamic teachings, which are studied creatively and innovatively using various *methods and approaches*. This will inspire the emergence of various scientific disciplines that are interrelated and mutually reinforcing one another.

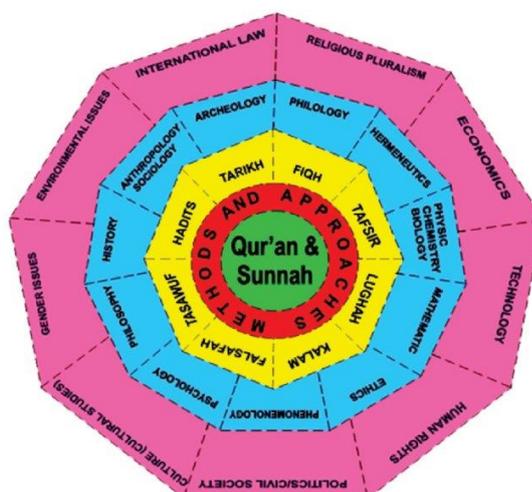


Figure 1. Scholarly Spiderweb

The domains and models of study on scientific integration-interconnection can be explained as follows (Hamami, 2004).

Integration-Interconnection domain

1. Philosophical Domain

Integration-interconnection in the philosophical domain is an existential realization that a discipline always depends on other disciplines. Each discipline must be given fundamental existential values about other scientific disciplines and their humanistic values. Each discipline is not independent or *self-sufficient* but needs to develop together with other disciplines (Abdullah, 2014).

One of the implementations of integration-interconnection in the philosophical domain is the attempt to take wisdom/learning from the connection of a learned scientific concept with the good traits and attitudes a learner should have. The mastery of scientific concepts will spur the growth of sound traits and attitudes in a learner

2. Material Domain

Integration-interconnection in the material realm is a process of integrating universal truth values owned by science with Islamic values, and vice versa Islamic values into the sciences. It also includes linking one scientific discipline with another in epistemological and axiological integration. The implementation of this domain integration-interconnection in the learning curriculum can be one of the following three models:

- a. model of integration in the curriculum package. The subjects taught for eight semesters are divided into two large groups: Islamic subjects and general science subjects. Scientific interconnectivity is left to the creativity of each student.
- b. a course naming model that characterizes the interdisciplinary relationship between Islamic and general sciences. In this model, all courses will include the word Islam, such as Islamic economics, Islamic politics, Islamic sociology, Islamic biology, etc., as a reflection of the scientific integration in the course.
- c. model of integration in course themes. In this model, every general course teaching must be enriched by presenting Islamic concepts and teachings related to the studied theme. Likewise, every teaching of Islamic courses must be associated with scientific concepts relevant to the material discussed. Each course does not need to be labeled with Islam in this model. This model's strength lies in preparing the course syllabus, which must describe the building of scientific interconnectivity. In addition, it is necessary to provide references supporting scientific interconnectivity development.

3. Methodology domain

Integration-interconnection in the realm of methodology is a process of developing a scientific discipline using the methodology used by other disciplines so that it will produce integrative science development (Wagner et al., 2011).

4. Strategy domain

Integration-interconnection in strategy is the implementation or praxis of an integrative-interconnective scientific learning process. This domain requires the skills and creativity of lecturers in teaching courses with various *active learning* models. As an alternative, the *team-teaching learning* model can be applied to anticipate the limitations of lecturers in integrating learning materials.

Models of the Study in Science Integration-Interconnection

Scientific integration-interconnection can take shape in several models (Hamami, 2004): informative, confirmative, corrective, complementation, comparison, similarization, parallelization, inductification, and verification. First, informative, discipline needs to be enriched with information from other disciplines to broaden the horizons of the academic community. Normative religious sciences need to be enriched with scientific and social science theories, and vice versa. Second, confirmative (clarificative), in order to build a solid theory, a particular scientific discipline needs to be confirmed by other disciplines. For example, verses that talk about the process of rain will become more apparent if they receive confirmation or clarification from modern science. Third, corrective, a particular scientific theory must be correlated with religious science or vice versa. So that one can correct the other. This will ensure an increasingly dynamic development of science.

Fourth, complementation, science and religion complement and strengthen each other but still maintain their existence. This model validates the relationship between science and religion. Fifth, comparison, comparing science concepts/theories with religious concepts/insights regarding the same phenomena. Sixth, similarization, that is, concepts in science are equated with concepts in Islamic teachings. For example, the concept of *ruh* in Islam is equated with the concept of soul in psychology. Seventh, parallelization, that is, consider the concept in the Qur'an parallel to the concept in science because of its similar connotations, although not to the point of equating. Eighth, inductification, abstracting scientific assumptions and theories towards metaphysical/supernatural thinking and connecting them with religious principles and the Quran. Ninth, verification, that is, it is to

expose the results of scientific discoveries that state the proof of the truth of the Qur'an and Hadith verses.

Characteristics Of Mathematical Sciences

Mathematics is the queen of science. This sentence is very appropriate to describe the characteristics of mathematics. This science has been constructed since the birth of human civilization. So, mathematics is a reflection of human civilization. The term *mathematics* comes from the Greek *mathein* or *manthenein* which means to study (Sion et al., 2021). Meanwhile, in Kamus Besar Bahasa Indonesia (KBBI), mathematics is defined as the science of numbers, relationships between numbers, and operational procedures used in solving problems regarding numbers (Alwi, 2002).

As a formal science, mathematics is defined as the study of abstract structures defined axiomatically using symbolic logic and notation (Weber, 2002). This science is built through a deductive reasoning process modeled with a language of symbols that form formal connection patterns (Kneebone, 2001). The basis of mathematics in the form of abstract logic makes mathematics present a distinctive and specific scientific. The characteristics of the mathematical science can be explained as follows (Fathani, 2009):

Has an abstract object of study. The object of study of mathematics is centered on thought and logic, whose concrete form is denoted by symbols and numbers. The object can be divided into four things, namely, facts, concepts, principles, operations, and relations. Facts contain all the agreements and conventions in mathematics. Concepts are abstract ideas used to group the same objects into a set. Operations and relations are formulations of ideas linking one concept to another. The principle presents the relationship between facts, concepts, and relationships logically and systematically. Principles in mathematics are presented as axioms, theorems, and consequences.

Based on an agreement. Agreements and conventions in mathematics are the foundation of mathematicians in providing definitions and symbols for each concept. Conventions start with agreeing on axioms and primitive concepts (basic concepts that do not need to be defined). The convention at this stage aims to avoid going round and round in proof (*circulus in probando*) and defining concepts (*circulus in defienindo*). Based on these two conventions, one can construct definitions, theorems, and effects of theorems.

Deductive thinking. Math works on the principle of deductive thinking. That is, thinking that starts from general things to specific things. Consistent in its system. Mathematical principles presented as axioms, theorems, and consequences will form a

mathematical system. Between systems in mathematics, there is interconnectedness and connectedness. It can be guaranteed that the interconnectedness and connectedness between these systems are very consistent. There is not a single contradiction in it. Once a concept is defined, it applies consistently to the system that contains it and to all other systems in mathematics. Even the definition remains consistent when mathematics is used for other disciplines.

Has symbols that are empty of meaning. Mathematics is a science of symbols arranged to form a mathematical sentence (mathematical model). These symbols are meaningless until they are placed in a specific context. Paying attention to the universe of speech. The meaning of a symbol that only exists when it is associated with a particular context requires one to pay attention to the context's universe of speech. In addition, mathematics has a different character from other sciences. The characteristics can be described with the following description (Sumardiyono, 2004):

Mathematics as an organized structure. Mathematics is a science with an organized scientific structure. The structure comprises axioms/postulates, definitions, theorems, properties, and consequences. Mathematics as a tool. Mathematics is a scientific tool used to solve problems in life. This is done by modeling the problem into a mathematical model and then solving it using appropriate mathematical theories. Furthermore, the solution is interpreted to solve the problem.

Mathematics as a deductive mindset. Mathematics is a science that has a deductive character. So, a fact will be said to be true if it can be proven deductively. Mathematics as a *way of reasoning (the way of thinking)*. Mathematics can be seen as a way of reasoning. This is because, in mathematics, a person must use his reasoning to prove the truth of a theorem and develop existing concepts (Lailiyah & Kurlillah, 2023).

Mathematics as an artificial language. The language of mathematics is a language of artificial symbols. The symbol is only meaningful if it is applied to a specific context. Mathematics as a creative art. The artistic aspect of mathematics lies in its logical and systematic reasoning, the regularity of its concepts and logic, and the consistency of its concepts and theories (Setianingsih & Purwoko, 2019).

Next, the mathematical concepts studied at the university are divided into four branches, namely: analysis and geometry, algebra, applied mathematics, and statistics. Algebra. This branch studies the structures in mathematics along with the relationships and characteristics of each structure. Structures in mathematics include *groups, rings, fields, vector*

spaces, and others. Courses in algebra consist of mathematical logic, linear algebra and its applications, algebraic structures, numerical linear algebra, set theory, module theory, number theory, finite group theory, coding theory, computational algebra, cryptography, etc.

Analysis and Geometry. This branch studies the properties of each structure in mathematics in detail, along with the concepts contained in each structure. The object of discussion of this family starts from the set of real numbers, the set of complex numbers, to functional sets in various mathematical spaces. Courses in analysis and geometry consist of differential and integral calculus, advanced calculus, multivariable calculus, vector analysis, real analysis, complex analysis, functional analysis, topology, plane and solid geometry, analytic geometry, projective geometry, spherical geometry, etc.

Applied Mathematics. This branch studies the application of mathematical concepts to other disciplines. The focus of discussion in this family is using mathematical concepts and methods to solve various life problems. Most problems solved are modeling and optimization, which translate problems into mathematical equations and functions and then find the optimal value (maximum or minimum) of a function that states the problem.

The courses in applied mathematics consist of ordinary and partial differential equations, mathematical modeling, numerical methods, discrete mathematics, algorithms and programming, algorithm analysis, linear programming, operations research, graph theory, optimization theory, game theory, systems and control theory, financial mathematics, actuarial mathematics, mathematics of *hisab* and *rukyyat*, Islamic economic mathematics, biological mathematics, engineering mathematics, dynamical systems, *fuzzy* logic, mathematical computing, etc.

Statistics. This branch studies planning, collecting, analyzing, interpreting, and presenting data. The focus of discussion in statistics is using statistical concepts and methods to conclude in the form of predictions or estimates of a problem based on the data owned. Subjects in the statistics group consist of statistical methods, probability theory, mathematical statistics, sample survey methods, applied regression analysis, non-parametric statistics, data analysis, categorical data analysis, multivariate analysis, time series analysis, statistical quality control, experimental design, financial statistics, computational statistics, econometrics, etc.

Implementation of The Concept of Scientific Integration-Interconnection in The Mathematics Department

This section will describe the implementation of the concept of integration-interconnection between Islam and mathematics in the 'Tri Dharma' of higher education activities in the Department of Mathematics under the State Islamic Universities (Universitas Islam Negeri/UIN).

Education and Teaching

The implementation of the concept of integration-interconnection between Islam and mathematics in education and teaching activities can be divided into two: implementation of the concept of integration-interconnection between Islam and mathematics in scientific substance and the learning process.

Integration in Scientific Substance

Implementing the concept of integration-interconnection between Islam and mathematics in scientific substance is carried out by combining courses in mathematics with Islamic concepts in appropriate areas of integration. This will be easy to do if the realm of integration is adjusted to the branches of mathematics.

Integration-Interconnection of courses in analysis and algebra

The integration-interconnection between Islam and mathematics courses in analysis and algebra is a combination in the philosophical realm. Its implementation is an effort to take lessons from the link between a learned mathematical concept and the good traits and attitudes that a mathematics learner must have. In teaching mathematics courses (especially in analysis and algebra), lecturers can convey the wisdom and lessons that can be taken from studying mathematical concepts and theories in fostering good traits and attitudes in students. Some good traits and attitudes that can be explored include consistency, honesty, thoroughness, comprehensiveness of perspective, etc. In addition, lecturers can give students assignments to reflect on what wisdom can be taken from learning a concept and theory in mathematics.

For example, when a Calculus lecturer teaches the concept of *continuity*. So, after he finishes conveying the concept along with examples, he can continue by inviting students to think about what lessons can be taken from learning the concept of continuity. One of the lessons is that continuity teaches us the attitude of *istiqomah*. Bringing the graph of an uninterrupted function in the concept of continuity can be analogized to illustrate uninterrupted charity in the daily life of a servant. The interconnection of concepts in the

analysis with its wisdom is presented in the following table.

Table 1. The interconnection of concepts in the analysis and its wisdom

Concept	Wisdom
Archimedes Theory	Cultivating an attitude of <i>tawadhu'</i> (humility) and avoiding the nature of <i>takabbur</i> (arrogance) because, above the sky, there is still sky.
Concept of left limit and proper limit	Fostering a balance between the affairs of this world and the hereafter
<i>Trichotomy</i> properties of real numbers	Classification of human deeds into good deeds, futile deeds, and evil deeds
The concept of finite clusters	Avoiding <i>ifraṭh and tafriṭh</i> in life and making things easy.
Density theorem in real numbers	Understand the infinity of Allah's blessings to His servants (an-Nahl:18)
Concept of a fractional number sequence	Cultivating an attitude of <i>tawadhu'</i> (humility) and avoiding <i>takabbur</i> (arrogant) nature
Theorem proving method	Cultivate an attitude of <i>tabayyun</i> (clarification) of the information obtained.

Another example in algebra is when a lecturer explains the steps of proving a theorem. Then, after finishing explaining, the lecturer can invite students to think about what good attitudes we must have in proving a theorem. Some of the lessons are the attitude of thoroughness and comprehensiveness of perspective. A person will find it easier to prove a theorem with these two attitudes.

It is almost impossible (or very difficult) to integrate or interconnect Islamic concepts with courses in analysis and algebra in the material domain. This is because courses in this family cannot be directly applied to solve real problems in life. So, the most appropriate integration-interconnection for the analysis and algebra courses is integration-interconnection in the philosophical realm.

Integration-Interconnection of courses in applied mathematics and statistics

By the character of applied mathematics and statistics courses, which are applicative and implemented, the integration-interconnection of courses in this group with Islamic concepts is in the form of a combination in the realm of material. The implementation of integration-interconnection in this domain is in the form of using mathematical concepts to solve Islamic/*ummah* problems, which are problems that specifically occur among Muslims.

In teaching applied mathematics and statistics courses, lecturers can take case examples included in Islamic problems. Here are some examples:

In teaching the mathematical modeling course, lecturers can use a *problem-based learning* (PBL) approach by asking students in groups to create mathematical models of Islamic/*ummah* problems, then find solutions to the models and analyze them. The following

figure is one example of the results of making a mathematical model of an Islamic/*ummah* problem.



Figure 2. Example of a mathematical model of an Islamic/*ummah* problems

Examples of other themes include mathematical models of the quality of justice in polygamous marriages, mathematical models of the development of the ability of students to read the yellow book (*kitab kuning*), mathematical models of the speed in memorizing the Qur'an with a specific method, mathematical models of increasing the faith of *muallaf*, mathematical models of the dynamics of marriage of early age couples, etc.

In teaching Operations Research courses, for example, on transportation problems, lecturers can provide examples of transportation problems raised from Islamic/*ummah* issues. The same applies to other subjects, such as assignment problems, finding the shortest route, etc.

In Game Theory courses, lecturers can take examples of game cases from Islamic/*ummah* problems. Furthermore, using the *problem-based learning* (PBL) approach, the lecturer asks students in groups to make an example of a game (conflict study) from Islamic/*ummah* problems and then find and analyze a model solution. The following figure is one example of a game problem from an Islamic/*ummah* problem.



Figure 3. An example of a game problem from an Islamic/*ummah* problems

Examples of other themes include competition in the spread of religion in Indonesia, competition between cosmetics manufacturers Wardah and Mustika Ratu in marketing halal cosmetic products, competition between student parties in winning the election of student government chairman, etc.

In the Econometrics course, the lecturer can provide examples of regression analysis in solving Islamic/*ummah* problems. Furthermore, the lecturer can give assignments to students by asking them to do the same thing. The following figure is one example of regression analysis in solving Islamic/*ummah* problems.

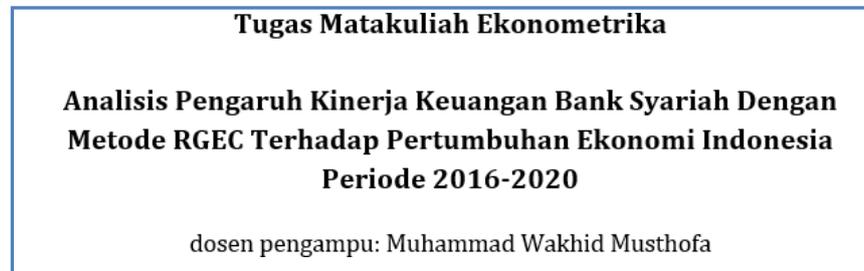


Figure 4. The use of regression analysis in Islamic/*ummah* problems

Examples of other themes include analysis of the effect of the financial performance of companies in the Jakarta Islamic Index (JII) on Indonesia's economic growth for a certain period, social influence, and hedonic motivation on interest in using mobile banking of Indonesian Islamic banks, etc.

For applied mathematics and statistics courses that are theoretical, such as probability theory, mathematical statistics, and optimization theory, the appropriate integration-interconnection domain is the philosophical domain, as well as courses in algebra and analysis.

Integration in the Learning Process

The implementation of integration-interconnection of Islamic concepts and mathematics in the learning process can be done through two things, namely designing an integrative learning agenda and creating an integrative atmosphere in the campus environment. Design an integrative learning agenda. To have an integrative nuance, the lecture agenda is filled with mathematics learning and an Islamic agenda such as reading (*tadarus*) al-Qur'an together and *kultum* (a brief sermon). So that the lecture agenda can be started with reading (*tadarus*) al-Qur'an together, followed by the delivery of a *kultum* by students. After that, the mathematics material is taught until the end of the lecture. The *kultum* delivered serves as a reminder that students always set the right intention in attending lectures, remember the manners in studying, and remember the duties and obligations of students as a *khalifatullah* on earth.

Creating an integrative atmosphere on campus. An integrative academic atmosphere can be done in several ways, including holding scientific discussions with the theme of scientific integration concepts and their applications in mathematics, put up moral messages

on available media around campus, habituation of congregational prayer on campus, organizing a kultum/study at the campus mosque.

Research

Mathematics is a science that is developed through two methods: generalization and problem-solving. As part of the development of mathematics, mathematics research also uses generalization and problem-solving methods. The following describes how integration-interconnection is implemented in mathematics research.

Research with generalization methods

The generalization method in mathematics is used to develop concepts in mathematics. Starting from an existing concept in mathematics, the concept is then expanded (generalized) to construct a new concept that has not existed before. Generalization of the concept is conducted by modifying the properties and characteristics possessed by pre-existing concepts.

An example of applying the generalization method in mathematical research is the development of concepts in the calculus of real functions into the calculus of complex functions. Another example is the development of the concepts of stability, controllability, and observability from nonsingular systems into singular systems.

Implementing integration-interconnection in mathematics research with the generalization method strengthens the motivation and purpose of conducting research. Why does it need to be researched, and for what it is researched? This is a model of integration-interconnection in the philosophical realm. As a Muslim, the motivation and purpose in conducting research is found in the Qur'an surah al-'Alaq: 1-3

أَقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ۝ ١ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ۝ ٢ اقْرَأْ وَرَبُّكَ الْأَكْرَمُ ۝ ٣

"Recite in the name of your Lord Who created. He has created man from a clot of blood. Read, and your Lord is the Most Glorious".

The first verse teaches that the motivation for conducting research is *بِاسْمِ رَبِّكَ الَّذِي خَلَقَ*, which means that the research was conducted in the name of Allah. So researchers position their research activities to fulfill the commands of Allah swt and as a form of worship to Allah swt. While the purpose of researching is *وَرَبُّكَ الْأَكْرَمُ*, which means the research activities should lead to a growing sense of the greatness and majesty of Allah in the researcher. The research activity must lead to a growing sense of the greatness and majesty of Allah in the researcher. This is in line with Allah's words in Surah Ali Imran: 191

الَّذِينَ يَذْكُرُونَ اللَّهَ قِيَمًا وَقُعُودًا وَعَلَىٰ جُنُوبِهِمْ وَيَتَفَكَّرُونَ فِي خَلْقِ السَّمٰوٰتِ وَالْاَرْضِ رَبَّنَا مَا خَلَقْتَ هٰذَا بَطٰلًا
سُبْحٰنَكَ فَقِنَا عَذَابَ النَّارِ ٩١

"Those who remember Allah while standing or sitting or lying down and think about the creation of the heavens and the earth (and say): "O our Lord, you have not created this in vain, Glory be to You, so preserve us from the punishment of hell."

Likewise, his research activities will lead the researcher to become more devout and fearful of Allah SWT, as Allah says in Surah Fathir: 27-28.

اَلَمْ تَرَ اَنَّ اللّٰهَ اَنْزَلَ مِنَ السَّمَاءِ مَاءً فَاَخْرَجْنَا بِهٖ ثَمَرٰتٍ مُّخْتَلِفًا اَلْوَانُهَا وَمِنَ الْجِبَالِ جُدَدٌ بَيضٌ وَحُمْرٌ مُّخْتَلِفٌ
اَلْوَانُهَا وَغَرَابِيبُ سُودٍ ٢٧ وَمِنَ النَّاسِ وَالدَّوَابِّ وَاَلْاَنْعَامِ مُخْتَلِفٌ اَلْوَانُهُ كَذٰلِكَ اِنَّمَا يَخْشَى اللّٰهَ مِنْ عِبَادِهٖ الْعُلَمَآءُ اِنَّ اللّٰهَ
عَزِيزٌ غَفُوْرٌ ٢

"Do you not see that Allah sends down rain from the sky, and We produce fruits of every kind with it? White and red stripes of various colors between the mountains, and some are pitch black. Moreover, likewise among men, creeping things, and cattle, there are various colors (and kinds). Verily, only the scholars fear Allah among His servants. Verily, Allah is Mighty and Forgiving."

Thus, the implementation of integration-interconnection in mathematics research with the generalization method lies in the researcher's motivation and purpose in conducting research activities.

Research with problem-solving method

The problem-solving method in mathematics is a method used to apply theories and concepts in mathematics to solve various problems found in various fields of life. For example, applying mathematical concepts to solve problems in economics, biology, medicine, agriculture, engineering, society, religion, etc.

The implementation of integration-interconnection in mathematics research with the problem-solving method is directed at an effort to implement one of the *maqashid sharia*. *Maqashid sharia* is the meanings and objectives inferred from the laws established by Allah swt. Or the purpose and secrets of the establishment of Allah's sharia for the benefit of His servants (Islam, 2013; Maulida & Ali, 2023). According to (Rasool et al., 2020), there are five *maqashid sharia*: safeguarding religion (*hifdzu din*), safeguarding self (*hifdzu nafs*), safeguarding intellect (*hifdzu 'aql*), safeguarding offspring (*hifdzu nasl*), and safeguarding property (*hifdzu mal*). In addition to these five things, some Muslim scholars see the need to add new *maqashids* relevant to current world problems. Among them are (Suryani, 2017) and (Ramadhan, 2019), who proposed protecting nature/environment (*hifdzu bi'ah*) as the sixth *maqashid sharia*.

The problems to be solved through research are, of course, not limited to

Islamic/*ummah* problems, but can be a variety of problems in the field of life. The following table provides some examples of problem-solving research themes and their relation to the intended *maqashid sharia*.

Table 2. Examples of problem-solving research themes

Research Theme	Aspects of <i>Maqashid Sharia</i>
Optimal portfolio formation	safeguarding property
Overcoming juvenile delinquency with mathematical models	safeguarding self
Development of prayer timing with spherical geometry concept	safeguarding religion
Optimization research themes	safeguarding intellect
Mathematical modeling of population and family planning problems	safeguarding offspring

In addition to implementing one of the *maqashid sharia*, integrating integration-interconnection in mathematics research with the problem-solving method is also related to motivation and goals in conducting research activities, as explained in the implementation of mathematics research with the generalization method. So, the motivation and purpose in conducting the proper research activities must be firmly embedded in the researcher, whatever research he does.

Community Service

Community service in the field of mathematics is the implementation of the practice of mathematics directly in the community through scientific methodology as an effort to develop the community's ability so that they can independently solve the problems they face. In practice, activities in community service can take the form of: Provide counseling and teaching to the community about the use of mathematical theories/concepts that can be used to solve problems in the community, it provides services to the community in the form of participation of the Department of Mathematics in solving problems in the community. Become a representative of the study program by holding positions in organizations or institutions in the community.

The implementation of the integration-interconnection of community service in mathematics can be realized in two ways, as follows.

Strengthen motivation and goals in conducting community service activities. Why it needs to be done and why it needs to be done. This is an integration-interconnection model in the philosophical realm. As a Muslim, one of the motivations and goals in carrying out community service activities is fulfilling the duties of *khalifatullah*. That is, to participate in trying to improve the quality of life of the community with the mathematics knowledge they have. In addition, it is also to benefit the community from applying mathematical

theories/concepts. As the Prophet said

خَيْرُ النَّاسِ أَنْفَعُهُمْ لِلنَّاسِ

"The best of men are those who are most beneficial to others." (HR at-Tabrani)

The activities carried out do not have to be directly related to religion. The difference with community service activities that are not integrative lies in the motivation and goals of the devotees in carrying out activities. Apply mathematical theories/concepts to solve various Islamic/*ummah* problems, such as counseling the community on using trigonometric concepts for measuring the direction of the qiblah, determining prayer times, and changing dates on the lunar calendar.

CONCLUSION

In this article, the design of implementing the integration-interconnection paradigm of mathematics and Islam in the Tri Dharma of higher education activities for the Department of Mathematics has been presented. Through the construction of the integrative-interconnective model of mathematics and Islam, it is hoped that it can help the academic community of the Department of Mathematics under the Islamic Religious Universities in integrating all activities of the Tri Dharma of higher education with Islamic concepts, both in terms of teaching and learning, research and community service.

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