Kaffah Science Learning Model: The Meaning and its Influence on the Character of Pre-service Teachers

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Abstract. This research aims to eliminate the perception of science learning as difficult and boring and to examine its influence on the character of pre-service teachers. Meaningful refers to the concept of science acquired in learning, linked to the perspectives of the Quran and Hadith, natural phenomena (learning from nature), and the meaningfulness of formulas obtained. This study follows the Borg & Gall research and development model with stages of research and information collecting, planning, developing a preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination, and implementation. The developed Science Kaffah Learning Model must be valid and tested. The improvement of the character of PGMI UIN Mataram pre-service teachers is determined based on the n-gain. The research results indicate that the developed Science Kaffah learning model is valid, reliable, and suitable for use and can enhance the character of pre-service teachers.

1 Introduction

Kaffah science learning is comprehensive education that encompasses religion, science, applications, and meaningfulness [1]. Applications include aspects of technology, the environment, arts, and mathematics, while meaningfulness involves the connection of science with the Quran and Hadith, natural phenomena (learning from nature), and the meaning of formulas acquired in learning. A concept obtained in Kaffah science learning provides comprehensive knowledge for pre-service teachers, making this learning meaningful and engaging. This learning approach is a combination of problem-based learning, project-based learning, and holistic learning, harmoniously encompassing the intellectual, emotional, physical, social, aesthetic, and spiritual potentials of pre-service teachers [2]. [3], the holistic approach is far more effective than the traditional approach.

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Natural science is the study of the universe, encompassing both inanimate objects and living beings [4]. The vast universe can serve as a teacher, a source of learning. Natural phenomena, when observed, studied, and analyzed, become knowledge. Knowledge obtained based on the guidance of Allah SWT is referred to as wisdom (hikmah). Wisdom becomes a source in Kaffah science learning as it provides comprehensive knowledge for pre-service teachers. Comprehensive knowledge is crucial for pre-service teachers to address the multidimensional issues occurring today, such as moral degradation and the idolization of dry knowledge and education [5]. Adab or character is the moral attitude developed through the educational process, expected to be acquired by pre-service teachers after undergoing Kaffah science learning, while *akhlak* is the moral attitude obtained through worship. Kaffah science learning integrates these two aspects, providing an answer to the meaningfulness of learning.

In reality, the curriculum already accommodates all of these aspects, with indicators in the graduation competency standards specifying the minimum abilities that must be possessed to complete a particular education [6]. Attitude involves demonstrating behaviours that reflect the qualities of a faithful, morally upright, knowledgeable, confident, and responsible individual who interacts effectively with the social and natural environment, positioning oneself as a reflection of the nation in global interactions [7]. Knowledge entails possessing factual, conceptual, procedural, and metacognitive knowledge in science, technology, arts, and culture, with insights into humanity, nationality, citizenship, and civilization related to the causes and impacts of phenomena and events. Skills encompass effective and creative thinking and action in both abstract and concrete domains, building on what has been learned in school independently [8]. However, all of this is mostly theoretical and needs more practical application. The reality in the field is that religious activities leading up to national exams are not rational actions; they waste time and energy. Nevertheless, these activities strengthen spiritual values, which serve as a supporting factor for academic achievement [4].

Science learning, up to this point, has been partial in its goals; even if written in the curriculum, its application often needs to be improved. For example, STEAM and TPACK-based learning is more focused on science and technology. There is still no comprehensive integration of these approaches to make learning engaging and meaningful. Kaffah science learning provides holistic education so that pre-service teachers have genuine competence covering religion, science, applications, and meaningfulness. Learning indeed requires innovation and creativity, representing an investment for the future [9].

2 Methodology

This study is a research and development study using the Borg & Gall model. There are 10 stages in this research model, namely: research and information collecting, planning, developing a preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination, and implementation. The research data consists of input and suggestions from expert validators and validation data on the Kaffah learning implementation plan, pre-test and post-test data on the understanding of science concepts through Kaffah, and data on the response of pre-service teachers. Data analysis involves the validation test by using the equation (1) of the average value of the validator:

$$NA = \frac{V_1+V_2+V_3+V_4}{4} \quad (1)$$

The results of the average value of validators are consulted in Table 1, validity assessment criteria [10], namely :

Table 1. Validity Assessment Criteria

Average	Categories	Decision
1,00 - 1,75	Invalid	Total revision
1,76 – 2,50	Valid enough	Revision
2,51 – 3,25	Valid	Revise as suggested
3,26 – 4,00	Very valid	No revision needed

The expert validation data from trials of the Kaffah science capability evaluation tool was analyzed using the equation (2) *Percentage Agreement* [11].

$$Percentage\ Agreement = \left(1 - \frac{A-B}{A+B}\right) 100\% \quad (2)$$

According to the criteria, the reliability is ≥ 75%. The effect of product testing on pre-service teachers in the PGMI UIN Mataram department is seen by N-Gain from the initial and final tests conducted. According to [12], the Gain value is calculated using the equation (3):

$$< g >= \frac{S_{post}-S_{pre}}{S_{maks}-S_{pre}} \quad (3)$$

Where the $< g >$is the N-Gain score, S_{post} is the final test score, S_{pre} is the beginning test score, and S_{maks} is the maximal score.

Table 2. Criteria for N-Gain Score

The N-Gain Score Classification	Categories
$0{,}7 < \langle g \rangle \leq 1$	High
$0{,}3 < \langle g \rangle \leq 0{,}7$	Medium
$\langle g \rangle \leq 0{,}3$	Low

3 Results and Discussion

The results and discussion in this article cover the Kaffah science learning model, the validation and reliability results of the Kaffah learning tools, the results of the Kafah science ability test, and the questionnaire results on the character of PGMI UIN Mataram pre-service teachers:

Based on the research and development results, the Kaffah science learning model is an instructional model that teaches science comprehensively (kaffah). Comprehensive here means that for every concept acquired in the learning process, pre-service teachers gain genuine abilities. Genuine abilities are obtained by associating each concept with religion, science, applications, and meaningfulness. For example, the concept of pressure, in science, is the force applied per unit area of the object's cross-sectional area. Science provides knowledge that the pressure applied will be greater if the cross-sectional area is small and vice versa. In Kaffah science learning, the connection of formulas to real-life situations is explained:

$$P = F/A \quad (4)$$

The formula for pressure, when interpreted as a formula in human life, becomes the pressure of life (p) generated from the lifestyle force (F) divided by the cross-sectional area or capacity of the individual in physical, material, intellectual, and spiritual aspects (A). In other words, the perceived pressure in human life can originate from the magnitude of the lifestyle force without a corresponding large self-capacity. Lifestyle is the pattern of behaviour undertaken to fulfil desires, interests, and attractions. The pressure within an individual will be significant if the lifestyle pursued or desired is larger than the breadth or capacity of their heart. According to the formula, if someone does not want to experience greater life pressure, they must choose between two options: 1) the lifestyle force (F) must be smaller, or one should not have excessively high ambitions, or 2) if one has lofty aspirations, then the individual must increase their capacity and abilities (A).

The application aspects in Kaffah science learning consist of science, technology, the environment, arts, and mathematics. Regarding the concept of pressure, these aspects can be taught to pre-service teachers as follows: in science, prospective teachers can explain the concept of pressure in the form of duck feet, snowshoes, and mud-specific car tires; in technology, the idea involves using bamboo and tree roots to design a prototype building foundation to reduce pressure; in the environment, prospective teachers create teaching aids for the pressure concept using available or recycled materials and environmental resources such as plastic, bamboo, tree roots, and more; in arts, prospective teachers design teaching aids that can be used to enhance understanding and can be used or utilized by other prospective teachers; in mathematics, each group measures the cross-sectional area and force applied to determine the resulting pressure. The discovery of these Kaffah aspects is facilitated through the discovery process by pre-service teachers. The discovery process follows the scientific process, starting from identifying problems to drawing conclusions by pre-service teachers [13]. The Kaffah aspects can also be provided to pre-service teachers in the form of projects due to the time required to achieve these genuine competencies. Kaffah learning associates a concept with religion, application, and meaningfulness, providing prospective teachers with holistic knowledge and skills that impact their character in daily life [14]. Kaffah learning can be applied to all subjects, including science.

The syntax of Kaffah science learning is derived from the Kaffah learning structure. The syntax for Kaffah learning is as follows: phase-1, motivate and relate to religion; phase-2, guide pre-service teachers to identify problems; phase-3, ask for the opinions of pre-service teachers; phase-4, conduct activities and relate to religion; phase-5, guide pre-service teachers to draw conclusions and relate to religion; phase-6, Kaffah aspect project; phase-7, explain the meaningfulness of the concept [1]. The validation results from experts using a 4-point scale for the Kaffah learning implementation plan for the pressure concept yielded an average score of 3.85, indicating it is highly suitable for use. The same "highly suitable" rating was obtained for the Student Worksheet (LKMCG) on pressure and the evaluation tool for the character of pre-service teachers, each receiving scores of 3.75 and 3.90, respectively. The validation results from experts can be seen in Figure 1.

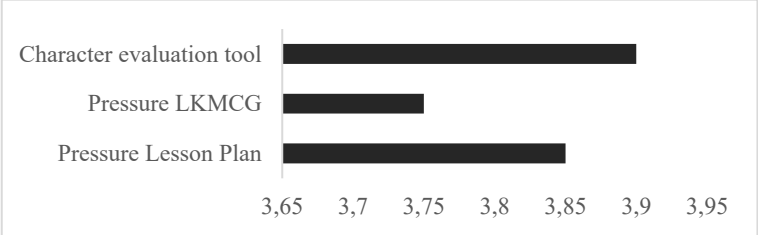

Fig. 1. The Expert Validation Results of the Kaffah Science Learning Tool

[15], Currently, there are five core character values derived from Pancasila values, namely religion, nationalism, integrity, independence, and mutual cooperation. Each value does not stand alone and develop independently; instead, they interact with each other, dynamically evolving and forming personal integrity. The initial test questions encompass the five core character values mentioned above. Questions that meet the requirements are used to measure the initial abilities of pre-service teachers. After the initial test, the learning process continues using the Kafah learning model, followed by a final test using the improved initial test questions. The results of the initial and final tests are presented in Figure 2:

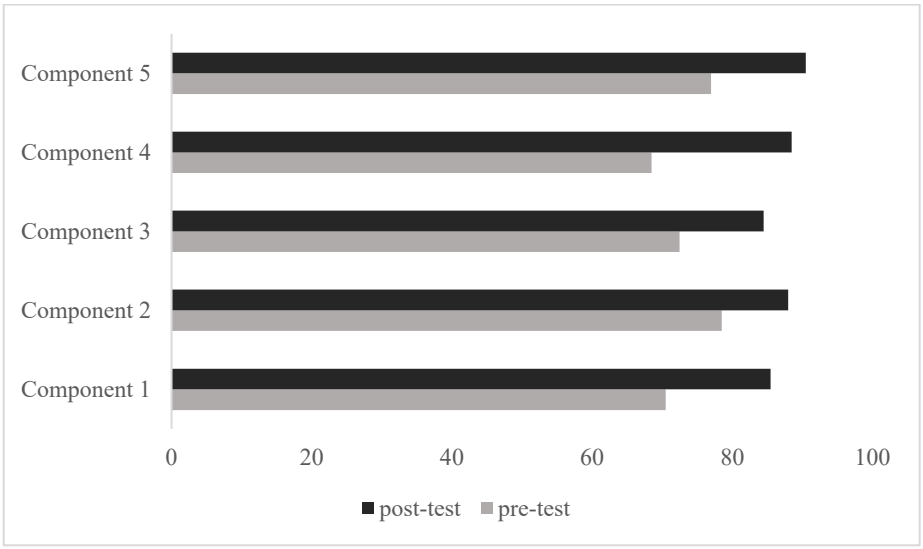

Fig. 2. The Pre-test and Post-Test Results for 5 Main Character Components

Figure 3 shows the N-Gain of the 5 main character components, all of which are in the medium category.

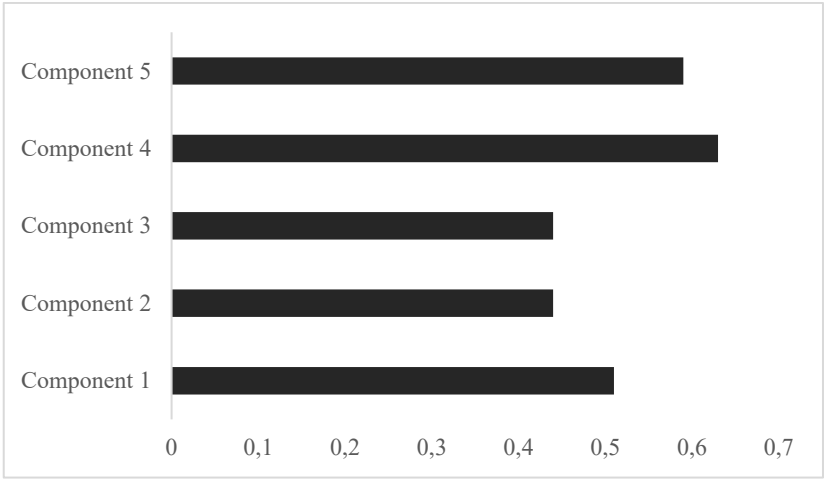

Fig. 3. The N-gain 5 Main Components of Character

The response of pre-service teachers to the Kaffah learning model was 89.95% said they were happy, 85.87% said it was easy to understand, and 90.65% said it was useful (Figure 4).

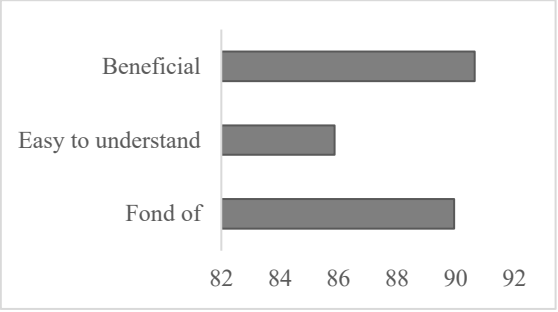

Fig. 4. The Response of pre-service teachers to Kaffah Learning

One concept in Kaffah science learning aims to achieve genuine competencies, encompassing religion, science, applications, and meaningfulness [1]. The foundation of Kaffah science learning is problem-based learning, project-based learning, and holistic learning. Holistic learning is a comprehensive approach where all parties are involved, and the presentation methods are varied and mutually supportive [2]. It has been concluded that holistic learning encourages the creative and spiritual development of learners [3], and it is more effective than traditional approaches. An essential aspect of Kaffah learning is the incorporation of religious elements in every step of the learning process. Religion, as a guide in life, adds meaningfulness to Kaffah learning [16]. Islamic education is expected to contribute significantly to the renaissance of the best education practices worldwide and for all of humanity. Islamic elements in this learning include the Quran, Hadith, wisdom-infused stories, and real-life narratives. Science concepts found in learning are associated with religious elements and their applications, such as technology, the environment, arts, and mathematics. The scientific formulas in those concepts are also related to their meanings in life, providing significance in the learning process.

Kaffah learning is designed with a focus on pre-service teachers. It integrates two learning models: problem-based learning and project-based learning. Problem-based learning inspires its syntax, and project-based learning is used for pre-service teachers to understand the application aspects of Kaffah learning. This combination creates an engaging and meaningful learning experience [17]. The mathematical creative thinking abilities of pre-service teachers improve through problem-based learning compared to discovery learning [17]. There are differences in science learning outcomes between problem-based learning and discovery learning [18]. Programs implemented by schools to instil faithful character are realized through habitual activities like praying together, Friday almsgiving, and religious education. Obstacles faced include a lack of self-awareness about the importance of praying on time, and this can be modelled by educators [19]. According to [20], project-based learning is a student-centered model that provides a meaningful learning experience for pre-service teachers. The learning experiences and concepts for pre-service teachers are built on the products produced in the project-based learning process. Project-based learning is a comprehensive teaching method that involves pre-service teachers in cooperative and continuous investigative activities. Pre-service teachers conduct their own investigations within their groups, allowing them to develop research skills beneficial for their academic development. They design, solve problems, make decisions, and engage in investigative activities by creating projects. Project-based learning focuses on a set of problems that can

motivate and encourage pre-service teachers to confront fundamental concepts and principles of knowledge directly as experiences [21]. In conclusion, Kaffah science learning with genuine competencies can be applied in science education, enhancing the character of PGMI UIN Mataram pre-service teachers.

4 Conclusion

The developed Kafah science learning model is declared valid and tested, making it suitable for use in education to enhance the character of pre-service teachers.

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