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Investigation on Scientific Attitude of Students Based on Gender and Grade Level

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Abstract:
This research explores students' scientific attitudes and investigates the correlation between gender and grades on scientific attitude. The study sample was 171 students (57 males, 114 females) selected by clusters and snowball random sampling techniques. The research design was a combination of correlational method and semi-structured interview. Then the data were collected using the scientific attitude questionnaire and the interview guidelines. The results show a significant difference in scientific attitude based on gender in favor of females and among the pre-service teachers based on their grades in favor of sophomores. The significant difference is shown in the sensitivity to the environmental dimension in terms of grades. In addition, there is no significant correlation between gender and grades in scientific attitude. However, there are positive and significant correlations among the dimensions. Therefore, it is recommended that lecturers develop a positive attitude through a problem-oriented and collaborative learning environment.

Keywords: investigation (I), scientific attitudes (SA), gender differences (GD), grade levels (GL).

基于性别和年级的学生科学态度调查

摘要：
本研究探讨学生的科学态度，并调查性别与科学态度年级之间的相关性。研究样本是通过聚类和滚雪球随机抽样技术选出的171名学生（57名男性，114名女性）。研究设计是相关方法和半结构化访谈的结合。然后使用科学态度问卷和访谈指南收集数据。结果表明，基于性别的科学态度偏向女性，而职前教师之间基于年级偏向大二学生的科学态度存在显着差异。显着差异体现在对环境维度的敏感度方面。此外，性别与科学态度等级之间没有显着相关性。但各维度之间存在显着正相关。因此，建议讲师通过以问题为导向的协作学习环境培养积极的态度。

关键词：调查（一世）、科学态度（萨）、性别差异（广东）、年级水平（GL）。

1. Introduction

Regarding the demands of 21st-century learning, learning prioritizes the cognitive aspect and develops SA and skills (Sumardi et al., 2020). The development of students' cognitive ability, attitude, and skills will result in individuals ready to face complex problems in the era of globalization. These efforts can hamper the emergence of moral and spiritual crises, which impacts the occurrence of multidimensional crises (Asmani, 2012; Luvat et al., 2011; Asrori, 2015). However, based on the results of previous research, they showed that current learning tended to improve the cognitive aspect. On the other hand, the development of scientific attitude and the formation of character and social skills in science learning (Cheung, 2007; Hofstein et al., 1977; Ismiani et al., 2017; Shinta & Khumaedi, 2015), as well as social science, especially Islamic studies (Ibrahim et al., 2016; Al-Attas, 1979) were ignored.

SA is very important for students because it can develop critical thinking and deal with everyday problems. Through the development of SA, graduate students are intellectually, emotionally, morally, and spiritually intelligent. According to Lawson (1982), a scientific attitude is necessary to bring a more balanced perspective in dealing with conflict and social problems to lead to a better world change. In addition, the cultivation of SA as one of the affective aspects can improve the ability of students to understand teaching materials to gain knowledge and even improve the quality of their thinking (Olasahinde & Olatoye, 2014; Sharma, 2007). However, the problem faced by students is that teachers only emphasize the understanding of concepts to be recorded and linked in daily life without developing SA (Ismiani et al., 2017; Cheung, 2007; Ebenezer & Zoller, 1993; Zeidan & Jayosi, 2014). This shows that educators are responsible for developing SA at the primary, secondary, and tertiary levels.

Attitude is defined as a psychological tendency to learn positively or negatively and as emotional feeling, which is shown through the level of kindness or displeasure towards concepts, people, or conditions (Oskamp & Schultz, 2005; Zeidan & Jayosi, 2014; Eagly & Chaiken, 2005). Psychologically, attitude is an internal condition of an individual that can be concluded through observations or responses (Krosnick et al., 2005; Eagly & Chaiken, 2005). Therefore, attitude is not behavior but a tendency to act and respond to certain objects, and it is related to mental processes (Eagly & Chaiken, 2005). Attitude is an expression that arises from human needs and reflects one's intellectual processes (Wheeler et al., 1974). Therefore, SA is an important aspect that must be developed in the learning process to prepare individuals to face global challenges.

SA refers to individuals' behavioral traits, including honesty, awareness, responsibility, and critical thinking (Hamilton & Swortzel, 2007; Mei et al., 2007). The SA dimensions are rationality, curiosity, open-mindedness, honesty, objectivity, tolerance, respect for other people's views, creativity and invention, collaborating with others, critical thinking, and caring towards the environment (Harlen, 1999). The components of SA must be developed from the level of basic education to the level of higher education. Moreover, developing a positive attitude towards science or SA is one of higher education goals (Thomas et al., 1985).

The development of SA in higher education must create an intellectually, emotionally, socially, morally, and spiritually intelligent young generation. This is in line with the KKNI or the Indonesian National Qualifications Framework curriculum demands. However, empirical studies in Indonesia show that scientific aspects and skills are only the accompanying effects of learning processes and results by merely emphasizing the cognitive aspect mastery in each lesson in the fields of science (Nurhayati & Subroto, 2012; Irwanto et al., 2018; Nurhayati, 2009) and Islamic studies (Asrori, 2015; Sadia, 2013; Lonto, 2015; Aziz, 2011). Based on these empirical studies, it was revealed that these conditions were caused by more teacher-centered learning practices and a lack of application of scientific methods in the learning process. This has become a very urgent problem to find an alternative solution to influence the SA of Islamic studies students.

Numerous previous literature studies have proven a positive relationship between increasing SA and student learning outcomes and differences in SA in terms of gender and grades. Prior research by Cheung (2007), George (2006), Zeidan and Jayosi (2014), and Hacieminoglu (2016) showed that there were differences in SA based on gender and grades. Interestingly, however, gender was the most significant factor in influencing scientific attitude (Jones et al., 2000; Oakes, 1990; Cheung, 2007). Furthermore, male students had a more positive attitude towards women (Jones et al., 2000; Hacieminoglu, 2016; Piburn & Baker, 1993; Greenfield, 1996). However, there were different findings showing no differences in scientific attitude based on gender (Dhindsa & Chung, 2003; Miller et al., 2002).

In addition to gender and grades, other factors influence SA: learning environment and learning approach. This condition is proven by Simpson and Oliver (1990), Fraser (1978), Aldridge and Fraser (2000), suggesting that the class environment has a positive correlation with attitude. This means that the monotonous learning process and the lack of activating students in constructing their understanding will result in students' negative attitudes towards the scientific procedure, especially among students in Islamic studies. The negative attitude results from a lack of habituation in conducting scientific procedures in the learning process. The condition is particularly relevant to Ajidagba's (1990) research concerning the students in Islamic studies, which found that positive and negative attitudes shown in the learning process affected the

students' learning achievement. Furthermore, Schibeci and Riley (1986) point out that attitude influences achievement rather than vice versa. Students with a positive attitude tend to have higher scores on achievement measures (Weinburgh, 1995). However, in previous studies, the measurement of SA among students in Islamic studies receiving Islamic higher education is very limited because researchers might only focus on science and technology students.

The novelty in this study aims to reveal how the scientific attitude of students based on gender in Islamic universities in Indonesia is still very rarely done. This study is the first to reveal students' scientific attitudes in Islamic universities based on gender. The reason this research was conducted refers to the findings of research by Cheung (2007), stating that gender is one of the factors that influence scientific attitudes. However, different findings show no difference in scientific attitudes based on gender (Dhindsa & Chung, 2003). Different findings based on the literature review have become a reference for researchers in conducting this research. The research findings are hoped to provide facts related to the relationship between gender and scientific attitudes. Moreover, research that reveals scientific attitudes is focused on students majoring in natural sciences compared to students in Islamic universities.

Thus, the researcher strongly believes that this research provides a very important contribution to the real condition of the SA of Islamic studies students. In addition, it provides benefits for mapping student performance before planning and improving SA as a bridge to linking teaching and research in higher education. It is also expected that assisting students to improve their SA can improve the quality of graduates and education programs at the tertiary level. Therefore, it is urgent to conduct research related to the SA of Islamic studies students to balance information of SA research from Islamic and science studies. The purpose of this study is to determine:

1) The level of SA of the pre-service Islamic teachers in terms of gender and grades;

2) The typical SA of the pre-service Islamic teachers;

3) Whether there is a relationship between gender and grades of the pre-service Islamic teachers on SA.

The research proposed questions in this study were: What is the level of SA of the pre-service Islamic teachers based on gender and grades? What is the typical SA of the pre-service Islamic teachers? Is there a correlation between gender and grades towards the SA of the pre-service Islamic teachers?

2. Method

The research design was the mixed method (Creswell, 2009; Iyankova et al., 2006). The first stage of the research design was the correlational descriptive survey method. The reason for choosing a correlational design in the research was that it was very suitable to measure the pattern of relationships between research variables. This design measured the relationship between two or more variables (Stangor, 2004; Adegboyega et al., 2017). In addition, the survey method could describe, compare, analyze and interpret the situation of research objects both in the situation of individuals, institutions, and groups (Cohen et al., 2007). In the second stage, an interview was conducted to strengthen and deepen the previous survey results data; thus, the level of accuracy of the research data became stronger.

The samples were 171 students who were the pre-service Islamic teachers at the Islamic State University of Mataram in the 2018/2019 academic year consisting of Semester 1 students or freshmen (26.90%), Semester 3 students or sophomores (33.92%), and Semester 5 students or juniors (39.18 %) (Table 1). The sampling technique applied was random cluster sampling (Fowler, 2002), while a snowball random sampling technique was used for the interview phase (Creswell, 2009).

Table 1. Demographic characteristics of the respondents

Grade Level	Female	Male	Total
Freshmen	33	13	46
Sophomores	39	19	58
Juniors	42	25	67
Total	114	57	171

The research instrument was a SA questionnaire compiled by the researcher by synthesizing the SA indicators. This referred to the SA indicators that have been developed by Harlen (1999). Thus, eight SA indicators were synthesized: curiosity, critical reflection, open-mindedness, perseverance, collaboration, responsibility, appreciation, and sensitivity to the environment. These eight indicators were then developed into 50 statements. The statement categories were in the forms of positive and negative statements and referred to the Likert scale (5 scales). Before the instrument was used to retrieve the research data, it was first validated by the instructional experts and senior lecturers from 2 universities: Islamic State University of Mataram and *IKIP* (Institute of Teachers Training and Education) of Mataram. Furthermore, the questionnaire instrument was validated and tested empirically and in terms of reliability. Cronbach's alpha coefficient from the SA instrument was $\alpha = .83$. The reliability of the test coefficient was above the acceptable limit, namely .70 (Hair et al., 2010); therefore, the instrument was considered reliable.

Collecting research data was done using sequential mixed methods (Teddlie & Tashakkori, 2009). This was done by providing an SA questionnaire and data collection through interviews. Specifically, data collection in Phase 1 was conducted by filling out the questionnaire by the pre-service Islamic teachers, who were students in Semesters 1, 3, and 5. Furthermore,

Phase 2 was carried out through interviews with the respondents chosen through purposive sampling. Determination of the samples for the interview was based on the students' SA scores taken from 3 categories, namely low, medium, and high.

The research data analysis was divided into two phases. Thus, two types of data were obtained: quantitative data obtained from the questionnaire results and qualitative data obtained from the interview. The quantitative data were analyzed using parametric statistics, namely inferential descriptive, since the data fulfilled the homogeneous criteria with a p-value of .57 (Green & Salkind, 2008) to see the data characteristics, including mean, the standard of deviation, and percentage technique. Furthermore, the data were analyzed using regression analysis to see the causal relationship between the variables. After that, One-way ANOVA was conducted to identify whether there were significant differences between the average scores obtained by more than two independent groups. Pearson Correlation was then used to calculate the significance of the correlation between SA from gender and grades. In the meantime, analyzing the data gained from the interviews was implemented through the qualitative descriptive technique to strengthen the results of the quantitative data analysis, which were previously obtained.

3. Findings

3.1. Level of SA of the Pre-Service Islamic Teachers Based on Gender and Grades

The results of this research indicate that, in general, the levels of SA of the pre-service Islamic teachers by gender are different. The results of data analysis (Table 2) obtain a higher average score of the females' scientific attitude (M = 4.015, SD = 0.302) compared to the males' one (M = 3.99, SD = 0.319). However, the difference is not significant based on the dimensions (Table 3). The t-test results show that the p-value of each dimension is > 0.05, indicating no difference in SA of the pre-service Islamic teachers based on gender.

Table 2. Descriptive statistics of SA of the pre-service teachers based on gender

Gender	N	Mean	SD
Male	57	3.999	0.319
Female	114	4.0148	0.302
Total	171		

Table 3. The results of the t-test for equality of means for each indicator based on gender

Indicator	No of Item	t	Sig. (2-tailed)
Curiosity	1-6	-0.321	.748
Critical Reflection	7-12	-0.374	.709
Open-mindedness	13-17	-1.229	.221
Perseverance	18-25	0.34	.973
Collaboration	26-31	-0.81	.936
Responsibility	32-39	-1.749	.082
Appreciative	40-45	1.817	.071
Sensitivity to the environment	46-50	0.157	.876
Overall		-0.314	.754

Meanwhile, the results of SA measurement based on grades show that the mean score of the sophomores' SA is higher than the freshmen and the juniors had (Table 4). Likewise, the dimensions of SA based on grades obtained p> 0.05 (Table 5). However, the sensitivity to the environmental dimension shows a significant difference by 0.038 < 0.05.

Table 4. Descriptive statistics of SA of the pre-service teachers based on grades

Gender	N	Mean	SD
Freshmen	46	3.989	0.297
Sophomores	58	4.060	0.298
Juniors	67	3.980	0.321
Total	171	4.009	0.307

Table 5. Significance of the scientific attitude indicator scores based on grades

Indicator	No of Item	f	Sig.
Curiosity	1-6	2.332	.100
Critical Reflection	7-12	0.189	.828
Open-mindedness	13-17	0585	.558
Perseverance	18-25	0.042	.958
Collaboration	26-31	1.163	.135
Responsibility	32-39	0.752	.473
Appreciative	40-45	0.441	.644
Sensitivity to the environment	46-50	3.338	.038
Overall		1204	.303

3.2. Typical SA of the Pre-Service Islamic Teachers

The answer to this research question is determined based on the mean score and standard of deviation from each dimension (Table 6). The results of data analysis show that the highest mean score is obtained by responsibility (4.251) and open-mindedness (4.146), while the lowest mean score is found for critical reflection (3.689). These indicate that the real condition of SA of the pre-service Islamic teachers is related to the specificity of the SA they have compared to other major students. This means the typical SA that the pre-service Islamic teachers have is a positive attitude towards responsibility and open-mindedness. However, they have a negative tendency towards the aspect of critical reflection.

Table 6. The mean scores of SA indicators based on grades and gender

Indicator	No of Item	Mean	SD
Curiosity	1-6	3.946	0.392
Critical Reflection	7-12	3.689	0.409
Open-mindedness	13-17	4.146	0.440
Perseverance	18-25	4.066	0.394
Collaboration	26-31	4.056	0.445
Responsibility	32-39	4.251	0.416
Appreciative	40-45	3.973	0.404
Sensitivity to the environment	46-50	3.946	0.482

In addition, identifying the typical SA possessed by the pre-service Islamic teachers is based on the highest mean score and continued with the Post Hoc test for

each dimension based on the grades (Table 9). The results of data analysis show that seven dimensions have significance values among grades with p > 0.05 (Table 9): curiosity, critical reflection, open-mindedness, perseverance, collaboration, responsibility, and appreciation. However, for sensitivity to the environmental dimension, the results show a significant difference between the freshmen and the sophomores (0.047 < 0.05).

3.3. Correlation between Gender and Grades on SA of the Pre-Service Islamic Teachers

For addressing the problem and null hypothesis, the data were tested by measuring the value of the Pearson correlation between gender and grades. Based on the data analysis results, the value of r for the grades aspect is = -0.024; p = 0.759 (Table 7), meaning no correlation between grades and SA. The same results are found for the gender aspect with a value of r = 0.027; p = 0.722, also showing no correlation between gender and SA. This means that the null hypotheses are accepted.

Table 7. The correlation between gender and grades on SA

Variable	N	Person Correlation	Sig.
Gender		0.024	0.754
Males	57		
Females	114		
Grades		-0.024	0.759
Freshmen	46		
Sophomores	58		
Juniors	67		
Total	171		

For more comprehensive findings, the Pearson correlation test was carried out among the dimensions of SA. Based on the statistical test results, the correlation coefficient of p-value is < 0.05 (there is a significant correlation between the dimensions). As shown in Table 8, for the dimension "curiosity/C" there is a positive and significant correlation with the dimension of critical reflection (r = 0.436; p = 0.000), open-mindedness (r = 0.423; p = 0.000). The further details are presented in Table 8.

Table 8. The Pearson correlation coefficient among SA indicators

Var.		C	CR	OM	D	CO	R	MR	SE
C	Person (r)		0.43	0.42	0.44	0.41	0.51	0.41	0.46
	Sig.		.000	.000	.000	.000	.000	.000	.000
CR	Person (r)	0.43		0.44	0.45	0.414	0.38	0.32	0.36
	Sig.	.000		.000	.000	.000	.000	.000	.000
0M	Person (r)	0.42	0.44		0.52	0.45	0.54	0.42	0.41
	Sig.	.000	.000		.000	.000	.000	.000	.000
P	Person (r)	0.44	0.45	0.52		0.49	0.70	0.451	0.45
	Sig.	.000	.000	.000		.000	.000	.000	.000
CO	Person (r)	0.41	0.41	0.45	0.59		0.52	0.44	0.36
	Sig.	.000	.000	.000	.000		.000	.000	.000
R	Person (r)	0.51	0.38	0.54	0.70	0.52		0.50	0.49
	Sig.	.000	.000	.000	.000	.000		.000	.000
A	Person (r)	0.41	0.32	0.42	0.51	0.44	0.50		0.48
	Sig.	.000	.000	.000	.000	.000	.000		.000
SE	Person (r)	0.46	0.36	0.41	0.45	0.36	0.49	0.48	
	Sig.	.000	.000	.000	.000	.000	.000	.000	

After the Pearson correlation test, a post hoc test was done for each dimension based on grades. The analysis results show seven dimensions having significance values among grades > 0.05 (Table 9): curiosity, critical reflection, open-mindedness, perseverance, collaboration, responsibility, and appreciation. Meanwhile, for the sensitivity to the environmental dimension between "freshmen" and "sophomores," the significant difference is 0.047 < 0.05.

Table 9. Post hoc test of the SA indicators based on grades

Dependent Variables	Grades	Semesters	Sig.
Curiosity	Freshmen	Sophomores	0.122
		Juniors	1.000
	Sophomores	Freshmen	0.122
		Juniors	0.362
	Juniors	Freshmen	1.000
		Sophomores	1.000
Critical Reflection	Freshmen	Sophomores	
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	1.000
	Juniors	Freshmen	1.000
		Sophomores	1.000
Open-mindedness	Freshmen	Sophomores	1.000
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	0.844
	Juniors	Freshmen	1.000
		Sophomores	0.844
Perseverance	Freshmen	Sophomores	1.000
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	1.000
	Juniors	Freshmen	1.000
		Sophomores	1.000
Collaboration	Freshmen	Sophomores	1.000
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	0.467
	Juniors	Freshmen	0.808
		Sophomores	0.467
Responsibility	Freshmen	Sophomores	1.000
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	0.690
	Juniors	Freshmen	1.000

Continuation of Table 9

		Sophomores	0.690
Appreciative	Freshmen	Sophomores	1.000
		Juniors	1.000
	Sophomores	Freshmen	1.000
		Juniors	1.000
	Juniors	Freshmen	1.000
		Sophomores	1.000
Sensitivity to the environment	Freshmen	Sophomores	0.047
		Juniors	1.000
	Sophomores	Freshmen	0.047
		Juniors	0.164
	Juniors	Freshmen	1.000
		Sophomores	0.164
Overall	Freshmen	Sophomores	0.715
		Juniors	1.000
	Sophomores	Freshmen	0.715
		Juniors	0.445
	Juniors	Freshmen	1.000
		Sophomores	0.045

4. Discussion

The first research objective is to determine the SA level of the pre-service Islamic teachers based on gender and grades. Based on the research findings, in general, the SA of the females is higher than that of the males. Similarly, there is no difference found in the tendency of every dimension. This means there is no big difference in curiosity, critical reflection, open-mindedness, perseverance, collaboration, responsibility, appreciation, and sensitivity to the environment. These present research findings are supported by the results of previous studies by Zeidan and Jayosi (2014), Haciemnoglu (2015), and Jones et al. (2000), who revealed that gender difference is a very influential factor on SA. However, there are various research findings of positive SA between men and women. Several studies have shown that women had a more positive SA (Menis, 1989; Villafane & Lewis, 2016). On the contrary, research by Jones et al. (2000) and Hacieminoglu (2016) found that male students had a more positive attitude. Besides, other studies also reported no differences in SA based on sex (Miller et al., 2002; Dhindsa & Chung, 2003). The tendency of females' SA is higher than that of the males because they have a stronger commitment to solving problems scientifically. Furthermore, Wahyudiati (2016) and Sumardi et al. (2019) also state that women have a more positive attitude and motivation than men.

The levels of SA based on the grades in this study show some differences. The finding is in line with the results of Cheung (2007), George (2006), Zeidan and Jayosi (2014), and Hacieminoglu (2016), who proved the existence of SA differences based on grades. This research also revealed that the sophomores' SA is higher than freshmen's and juniors' one. This phenomenon occurs because second-year students have carried out more problem-oriented problem-solving activities that make them have better attitudes and experiences. However, they generally have not shown satisfactory results. Moreover, the questionnaire findings have been strengthened by the interview results, such as a statement from Student M (sophomore), "In the second year, the experiment is conducted more intensely than in the first year. For all the work, skill courses in that year are demanded experiment as a requirement for accomplishing the courses. Meanwhile, in the first year proportion of work skill courses that require experiment activities is fewer than in the second year". Student W (freshman) further stated, "The intensity of experiment activities still needs to be improved again while problem-oriented learning methods are only applied to certain courses." On the other hand, Student H (junior) pointed out, "The intensity of experiment activities in this grade decreases in the work skill courses because of focusing on only the courses that support the completion of a thesis as a graduation requirement in the college." Therefore, according to Cheung (2009), a positive attitude towards SA must be developed from the beginning of education in school. To instill SA from the first year becomes the main task of the lecturers.

The next finding in this research is the typical SA from the pre-service Islamic teachers. In this case, responsibility and open-mindedness get the highest position. Meanwhile, critical reflection is in the lowest position. The questionnaire results are also supported by the results of the interview conducted. From the interview, several important findings are gained. First, according to L, "the low attitude of critical reflection is caused by the monotonous classroom learning environment and dominated by the lecture methods." The L statement is reinforced by R's opinion that "the lecture system applied to almost all courses tends to be teacher-centered while the scientific methods are very rarely applied in the learning process." This condition has made the students passive and unaccustomed to applying scientific methods in understanding scientific concepts and skills, thus impacting the low ability of SA. These findings are very relevant to various research results that show that the learning environment greatly influences SA (Aldridge & Fraser, 2000; Puacharearn & Fisher, 2004; Shinta & Khumaedi, 2015). In addition, Ismiani et al. (2017) state that negative attitudes held by students are caused by traditional learning and ignoring the application of the constructivist approach in the learning process. Therefore, the learning environment must be designed to develop students' SA (Hacieminoglu, 2016).

The findings regarding the typical SA from the pre-service Islamic teachers explicate some interesting facts. First, only the sensitivity to the environment shows significant differences based on grades, specifically between the grades "freshmen" and "sophomores." In the meantime, curiosity, critical reflection, open-mindedness, perseverance, collaboration, responsibility, and appreciation do not show any significant differences. These findings are in accordance with the results of previous studies by

Zeidan and Jayosi (2014) and Hacieminoglu (2016) that there are differences in the SA of men and women based on their grades. However, there is a tendency of the decline in SA to higher grades (Cheung, 2007). In addition, other factors such as teaching and motivational approach may affect the SA (Debacker & Nelson, 2000; Zhang, 2000). This factual condition is also strengthened by the statement from F (freshman), "In the learning process in the classroom, the lecturers only explain themselves in front of the class without any discussion activities so that my friends and I feel bored and not interested in attending the lecture." Al (sophomore) further stated that "the application of the scientific methods in learning increases in the second year, but only in certain courses because the lecturers are very comfortable with the lecture methods that do not increase our motivation in learning quite meaningfully." According to H (junior), "the application of learning methods and strategies is not much different in the first, second, and third years. They are still dominated by lecture methods and lack of students' activation in the classroom, so learning becomes unattractive, and we are not motivated in understanding the concept taught by the lecturers."

The research findings reveal differences in scientific attitudes based on gender, and the scientific attitudes of female students are higher than those of male students. The tendency of women to have a higher scientific attitude is because women prefer research activities in the laboratory than men and have stronger motivation and perseverance to do assignments to achieve maximum learning outcomes (Villafane & Lewis, 2016). The questionnaire findings were also strengthened by the results of interviews, such as the statement by NH (female), "I am very interested in doing practical or experimental activities because I can find new things by proving the concept of lecture material relevant to everyday life, so it is very interesting." Another opinion expressed by RF (Lecturer) stated that "Female students are more motivated to do assignments and active in the learning process so that it positively impacts their learning outcomes.

The other results of this research answer the third research question and research hypothesis. The research findings show no correlation between gender and grades on SA (null hypotheses are accepted). However, there is a significant correlation among the dimensions. For instance, the indicator of "curiosity/C" has a positive and significant correlation with the indicators of critical reflection, perseverance, collaboration, responsibility, appreciation, and sensitivity to the environment. In other words, the higher the curiosity one has, the higher are the critical thinking, responsibility, collaboration, open-mindedness, or other aspects of attitude. These findings are particularly relevant to the research by Cheung (2009), Zeidan and Jayosi (2014), and Ismiani et al. (2017) that declared that critical thinking, collaboration, curiosity, and open-mindedness affected the ability of SA. In addition, according to Ajidagba (1990), Xu et al. (2013), and Hacieminoglu et al. (2011), attitude is influenced by several factors, including the characteristics of the concept, the attitude of the educator to the concept, and the learning methodology applied by educators. In line with this statement, the application of collaborative-based learning can improve students' critical thinking and problem-solving skills (Freedman, 1997; Wahyudiati, 2016; George, 2006; Irwanto et al., 2018). Therefore, further research is very important for social science in measuring a more comprehensive SA from the primary, secondary, and tertiary levels. Moreover, there is a limitation of research on Islamic studies since the investigation merely concerned natural science.

5. Conclusion

Based on the findings, it can be concluded that: 1) there is a significant difference in SA based on gender in favor of females, 2) there are significant differences in SA among the pre-service teachers based on grades in favor of sophomores, that is for the dimension of sensitivity to the environment, 3) the typical SA of the pre-service Islamic teachers based on grades and gender is more positive on the dimensions of responsibility and open-mindedness, but have a negative response to critical reflection, 4) there is no significant correlation between gender and grades on SA, but there is a positive and significant correlation among the dimensions. The novelty of this research is revealing scientific attitudes based on gender in Islamic universities in Indonesia. The research results are that there are differences in scientific attitudes based on gender, where the scientific attitude of female students is higher than that of male students.

All in all, it is suggested that lecturers develop a positive attitude through a problem-oriented and collaborative learning environment. Further research is necessary to be more comprehensive, especially in social sciences and Islamic studies. It is hoped that factual condition and complete information regarding the condition and needs of prospective Islamic and science teachers can be gained.

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