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Research Article

Pre-Service Science Teachers' Images about Their Past and Future Classrooms: Scratches from Indonesian Teacher Training Program at Islamic University

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Abstract
This study explores the science class experiences of pre-service science teachers (PSTs) and reveals their images of own future classrooms. This study involved 176 first-year pre-service science teachers taking the teacher training program at two Islamic universities, namely Institut Agama Islam Negeri Kudus and Institut Agama Islam Negeri Salatiga, Indonesia. Data collection used the modified Draw-A-Science Teacher Test Checklist (DASTT-C) instrument. The results showed that the teaching style drawn by pre-service teachers was dominated by teacher-centered (65%), neither student-centered nor teacher-centered (24%), and student-centered (11%). There is no significant relationship between teaching style and gender, the type of institution at the previous level, the meaningfulness of science subjects, and the desire to be a science teacher in the future, but the description of their teaching style has a significant relationship with their responses to school-science teachers' instruction. The response of PSTs to their past learning leads to how they present the future learning environment.

Keywords:
pre-service science teachers; draw-a-science teacher test checklist instrument; teacher training program; teaching style; teachers' image.

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Introduction

Teaching science plays an important role in the field of education. Critical thinking trained through science learning is so significant to solve various problems faced in everyday life, make choices, and solve problems. There are many reports such as "UNESCO Science Report Toward 2030" (United Nations Educational & Scientific and Cultural Organization, 2016), "TIMSS 2015 International Results in Science" (Martin, Mullis, Foy, & Hooper, 2016), and "PISA 2015 Result in Focus" (The OECD Programme for International Student Assesment, 2016) which have been published related to the quality of science and technology education in various countries. Science literacy should be promoted in low and middle-income countries, especially in the case of a lack of use of science in managing human and natural resources. Furthermore, science development is also needed by developed countries. Therefore science has an important role in realizing the fourth Sustainability Development Goals on quality education (United Nations Educational & Scientific and Cultural Organization, 2016).

Changes in the science school curriculum have occurred in Indonesia from the elementary level until the high school level. At the primary level, science is integrated with other subjects through thematic learning. At the middle level, science is taught integrated into the fields of physics, chemistry, and biology. Furthermore, at the high school level, science begins to be taught separately through subjects in physics, chemistry, and biology. Various studies have been conducted extensively that focus on how to change the science learning process to make students more active in the process. These studies have been greatly influenced by the ideas of Piaget, Vygotsky, Ausubel, Gagne, Bruner, and other psychological figures. Learning models are developed based on psychological learning theory related to learning methods and strategies to encourage independent learning through student-centered learning. In this case, the teacher is an agent of change in the learning process that decides to shift or not the learning process. In practice, the curriculum that applies in Indonesia requires student-centered learning. The main actors reflecting a student-centered approach are in-service and pre-service teachers (Namsone, 2002).

Pre-service teachers are teachers who will implement a new program, science teachers' perspective on themselves in the future classroom have a great significance and value in the course of their process of becoming a science teacher (Elmas, Demirdogen, & Geban, 2011; Patrick, Anderman, Bruening, & Duffin, 2011). PSTs initiate teacher education programs with a range of values and beliefs about the nature of science, student learning methods, and appropriate strategies to be applied in the classroom (Simmons et al., 1999; Thomas, Pedersen, & Finson, 2001). Pre-service teachers have years of experience with the education that was textbooks-driven, teacher-centered, and questions on tests or examination (Tobin, Briscoe, & Holman, 1990). This learning style influences the views and beliefs of

pre-service teachers about teaching and learning in the future (Kardanova, Ponomaryova, Safuanov, & Osin, 2014; Pajares, 1992).

Pre-service teachers play an important role in the process of internalizing information given in their courses related to subjects and pedagogy (Anderson & Holt-Reynolds, 1995; Kardanova et al., 2014). Knowledge and beliefs, as a result of their experience, are stored in various types of cognitive structures such as associations, lists, scripts, plans, schemes, and images (Barker, Schaik, & Hudson, 1998). An image is a representation of student experience that wraps knowledge and belief in the minds of students. Therefore, images of PSTs from their science teaching can serve as a source to explore their knowledge and beliefs about science teaching and learning. Pre-service teacher beliefs influence their perceptions and ideas which in turn affect their classroom actions and their style of teaching (Pajares, 1992). Therefore exploring images and beliefs about science classroom can also support the process of designing more effective pedagogical courses for pre-service teachers.

This research begins to draw attention to exploring their past experiences and describing mental models and beliefs in pre-service teachers to present their own future science learning versions. Mental models contain various manifestations of problems, footage of events, and possibly imaginary stories (Edwards-Leis, 2012). Mental models provide (a) belief systems, which reflect beliefs obtained through observation, instruction, or inference; (b) observability, providing correspondence between mental models and the physical world; and (c) predictability, which allows one to understand and anticipate the behaviour of the physical system (Norman, 1983). Calderhead & Robson (1991) recognized that students who draw good teaching processes seem to come from one or more of the teachers they know, and sometimes connect their positive images with their own characteristics. Teacher training programs can shift teachers' beliefs toward constructivism, but it was difficult to transform their old perspective on science education developed through their teaching experience (Lumpe, Czerniak, & Haney, 2012). The education given to teachers is effective in reducing unexpected student behaviour, improving the quality of teacher-student interactions, creating a student-centered learning environment, and creating a good quality school environment (Kaya & Ataman, 2017). Thus, teachers must build confidence in constructivist science education before they actually serve in class. College courses in science education should provide an opportunity to consider and reconstruct PSTs' beliefs about science teaching.

The preparation program for PSTs is carried out at the undergraduate level held by the university. The implementation of formal education in Indonesia does not only consist of public institutions, but there are religious-based institutions from the pre-school level until the higher education level. Likewise, in the implementation of teacher training programs, there are programs implemented at

non-religious universities and Islamic universities. The difference between science teacher training programs held by non-religious universities and Islamic universities is in terms of efforts to integrate and synthesize Islamic sciences (religions) with the sciences in the building of Islamic civilization that must be understood and mastered by pre-service teachers (Salahuddin, 2014). PSTs have previous levels of educational background in various institutions both religious and non-religious, as well as science, non-science and even vocational majors. Thus, it is interesting to see how the illustration of PSTs' past and future classroom, especially by looking at how Islamic values enter the area of their understanding of science. Although researchers have realized the important impact of belief in teacher thinking, little attention has been paid to the structure and function of teacher beliefs about their roles, their students, subject matter, and school (Nespor, 1987; Yilmaz, Turkmen, Pedersen, & Cavas, 2007). This study aimed to explore the science class experiences of PSTs and reveal the images of their future classrooms. The study expanded concerning the relationship between teaching style based on PSTs' images, gender, the type of educational background, the response to school teacher's instructional style in the past, the meaningfulness of science subjects, and the desire to be a science teacher in the future.

Method

Research Model

This study used a cross-sectional survey research model with respondents, namely pre-service science teachers (PSTs) who study at Islamic Universities. The cross-sectional survey collects data from a sample of the target population at a particular time point and evaluates various variables at a particular time (Cohen, Manion, & Morrison, 2007). Variables evaluated include gender, the type of institution of educational background, the hope to be a science teacher, the meaningfulness of science, and the response to the learning of science teachers in the past. These variables are related to how the interpretations of the PSTs' image about themselves when teaching science in the future.

Sampling

This study involved 176 first-year science teacher candidates (145 female, 31 male) at two Islamic Universities, namely Institut Agama Islam Negeri Kudus and Institut Agama Islam Negeri Salatiga in Central Java Province, Indonesia. Their educational background comes from 119 different institutions.

Instruments

Data collection used the Draw-A-Science Teacher Test Checklist (DASTT-C) instrument, which has been modified in several sections. DASTT-C is one of the instruments that can be implemented to measure pre-service teachers' belief in teaching science. DASTT-C is a modified tool developed from the original Draw-A Person-Test (Goodenough, 1926) and Draw-A Scientist-Test (DAST), which

was used to explore students' perceptions and images of scientists (Chambers, 1983). Finson, Beaver, & Cramond (1995) revised DAST into Draw-A Scientist-Test Checklist (DAST-C) to simplify the assessment process. Furthermore, DASTT-C is modified and used by many researchers to explore the ideas of students and pre-service teachers about teaching (Elmas et al., 2011; Go & Kang, 2015; Thomas et al., 2001; Yilmaz et al., 2007). The main concept of DASTT-C is a list of science teaching styles consisting of teacher-centered and student-centered at the primary level (Carnes, 2003; Thomas et al., 2001; Yilmaz et al., 2007). Although most of these instruments are used with pre-service primary school teachers, it is recommended that these instruments and processes can also be used with pre-service secondary school teachers (Thomas et al., 2001). This instrument was modified into three parts.

The first part, pre-service teachers are asked to provide information related to demographic information which includes the origin of their last school, their major, and hopefulness to be a science teacher. In addition, they were asked to describe and respond to science, physics, biology, or science learning organized by their teachers at the previous level. In this section, information is obtained about how prospective teachers respond to science learning in the past. Responses are categorized as positive, negative, and neutral. The positive response category is shown by the presence of good, satisfied, and happy impressions of science learning. Negative responses are given if there is an unpleasant impression on science learning. Neutral categories are pinned if the prospective teacher only describes learning without providing feedback on the impression of good or bad on science learning. Furthermore, the information also included the meaningfulness of learning science for pre-service teachers regarding with the usefulness at the daily life and at the level of the understanding for increasing admiration for Allah (God), the Creator of the Universe. This refers to the integration of science with Islamic values that have been, are being, and will be studied by PSTs at the Islamic University.

In the second part, PSTs were asked to describe the science learning they will present in the future. The images are identified in three components. The first component is the teacher section which consists of two subcomponents, namely the teachers' activity, and position. The second component is the student component which also consists of students' activity and position. The last component is the environmental section that will be categorized in indoor learning, outdoor learning, indoor-outdoor, and undetected. These categories are identified in student desk settings in rows, teacher desks, laboratory management, teaching symbols and symbols of scientific knowledge.

The third part, PSTs were asked to draw themselves when they become a science teacher in the future. They were asked to write a short narrative explaining their pictures and specifically answer the questions, "What is the teacher doing?"

and "What are students doing?" according to their pictures. The narrative section supports the exploration of PSTs' images in more detailed and meaningful ways. Oral interviews with each participant are not an efficient way so that this narrative can help with certain aspects of these images (Thomas et al., 2001). The estimated application time for the instrument is 25-30 minutes.

The dichotomous appraisal mode is used in each subsection with highlights as "present" or "not present" in the image. If "present", the teacher-centered element found in the image, the sign "√" is used to mark the element in the checklist. Then the sign can be calculated to get a score for the subsection and add each score to get the overall checklist score. The total checklist score starts from 0 to 13. Scores are grouped into three ranges on a continuum, with scores of 0-4 representative of *student-centered* teaching style, 10-13 representative of *teacher-centered* teaching style, and 5-9 representative of *neither student-centered nor teacher-centered* teaching style. Thomas et al. (2001) described "*student-centered*" is a representation of the exploratory or inquiry/constructivist teaching, where students are actively involved and the teacher guides or facilitates learning and where students choose and conduct exciting and essential investigations for them. "*Teacher-centered*" is a representation of explicit/didactic teaching in which the teacher is the central image and one who is predominantly transferring information, while students are relatively passive and often in desks arranged in rows. The middle scores (*neither student-centered nor teacher-centered*) are represented by conceptual teaching that shows the existence of students at the center, but the teacher's dominant role is still present in the main aspects in the teacher's direction to students to lead groups of students in the discussion process and explore concepts and investigations (Thomas et al., 2001).

Validity and Reliability

Three science teachers were asked to validate the feasibility of instrument content including printing clarity, font size, sufficient space to draw and narrate, use of language, and clarity of the direction of expected answers. Because the data produced by DASTT-C is dichotomous, the reliability of the instrument is determined from the coefficient alpha which is equivalent to Kuder-Richardson 20 (KR20) using the rational equality method (determining internal consistency). Thomas et al. (2001) reported the alpha coefficient for DASTT-C is 0.82 indicating a high degree of internal consistency in the instrument. Yilmaz et al. (2007) presented reliability results using KR-20 at 0.71. In this study, ten images of pre-service teachers were randomly selected and used to determine inter-rater reliability. Four science teachers separately evaluated the images. Because the data is categorical and there are four raters, Fleiss' kappa has been calculated as a measure of inter-rater reliability. The Fleiss' Kappa calculated for this study is 0.77, which indicates a substantial agreement among raters.

Testing the Significance of Relationships

Investigation of the relationship between gender, the type of institution of educational background, the hope to be a science teacher, the meaningfulness of science, and the response to the learning of science teachers in the past with instructional styles depicted by PSTs in their future classes is another objective of this study. For this reason, testing is done using the Cramer's V method because the data tested is in the form of nominal data. The testing criteria are if the test results show the Sig. <0.05, there is a significant relationship between the variables tested (Hinkle, Wiersma, & Stephen, 2003).

Results

On the first page of the DASTT-C instrument, we can identify the type of PSTs' educational background. Educational background is distinguished based on the type of school, whether Islam or general, as well as majors taken by PSTs. These are divided into five categories, namely madrasa majoring in science (42%), Islamic-based high school majoring in science (6%), general high school majoring in science (38%), vocational school (11%), a madrasa or high school majoring in non-science (3%). Distribution of pre-service teacher's educational backgrounds is shown in Figure 1.

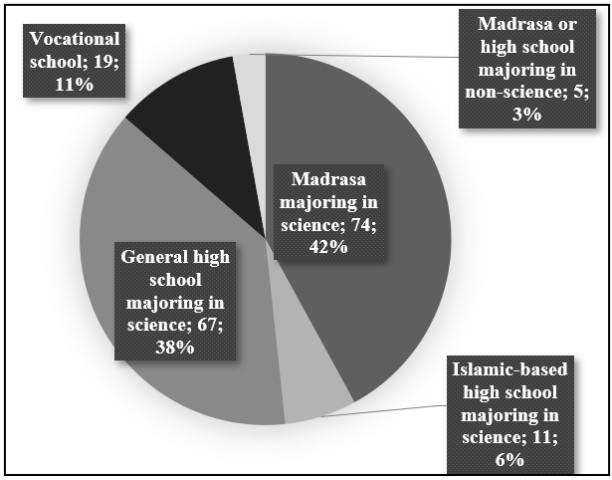


Figure 1.

The Distribution of PST's Educational Background

Surveys about the occurrence of science subjects (physics, chemistry, or biology) showed the PSTs' perceptions of lesson content as long as they study. This meaningfulness will be related to the educational background of PSTs, most of whom come from Islamic-based schools. As well as its relation to the first Core Competency applied in the Indonesian national curriculum, namely religious attitude competence which reads "respecting and practicing the knowledge of religion" (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2016).

The relationship between the meaningfulness of science subject and their type of educational background is tested using the Cramer's V method because the table is larger than 2 by 2 (Hinkle et al., 2003). The result showed there is significant relationship (Cramer's V=.000, n=176, $p < .05$). Thus, the majors they take and the types of schools that are of religious or non-religious background have a relationship with the scientific meaning understood by pre-service teachers. It was as the expression of a PST coming from Madrasa (R4, Male) namely "*Studying chemistry I increasingly understand the power of God in managing the order that exists on this Earth*". Details of the distribution of meaningful science based on the type of institution can be seen in Figure 2.

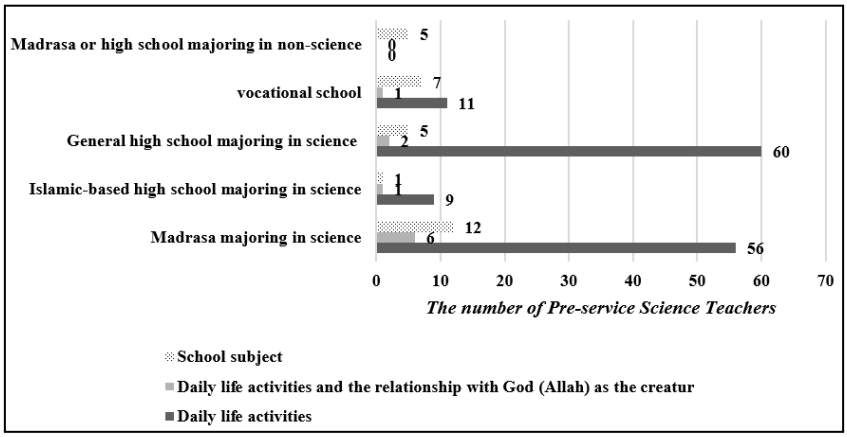


Figure 2.

The Distribution of Meaningfulness of Science Subject based on the Educational Background Type

PSTs' past science learning was explored through their responses to learning presented by school-science teachers in physics, chemistry, biology, or integrated science. They were allowed to write their impressions to their own teacher freely. Then the brief narrative presented was identified in three categories, namely positive, negative, and neutral. The PST's response to school science learning is shown by giving a positive response like the following statement.

R1 (Female): "*My chemistry teacher taught chemistry clearly. Learning activities were carried out in the classroom and also in the laboratory to practice the theories. The students were delighted when carrying out the practicum. I still really remembered the practice of making ice cream to learn the colligative properties of the solution* ".

Negative responses are shown through statements of dislike, lack of enthusiasm, laziness, or feeling difficult with the learning process presented by the teacher. The example statement is as follows.

R2 (Male): "*Chemistry is one of the boring subjects. The teacher taught with a voice that is not clear and too fast. Teachers also often did not attend the class. Learning activities were often just some exercises and were not fully explained*".

The example of a neutral response is shown through the learning description of the school teacher, without responding to positive or negative impressions in the process.

R3 (Female): "*My science teacher usually starts learning by asking about the material. Next, he gave an explanation, gave a problem exercise, asked students to come to the front of the class, and several discussions*".

We can also explore the tendency of PST to desire to become a science teacher. This tendency can later be attributed to teaching styles that might be described by PSTs. The categories are divided into "Want", "Do not want", "Hesitant" to be a science teacher. Comparison of the distribution of PSTs' responses to the school teacher's classroom, the meaningfulness of subjects, and the desire to be a science teacher in the future can be seen in Figure 3.

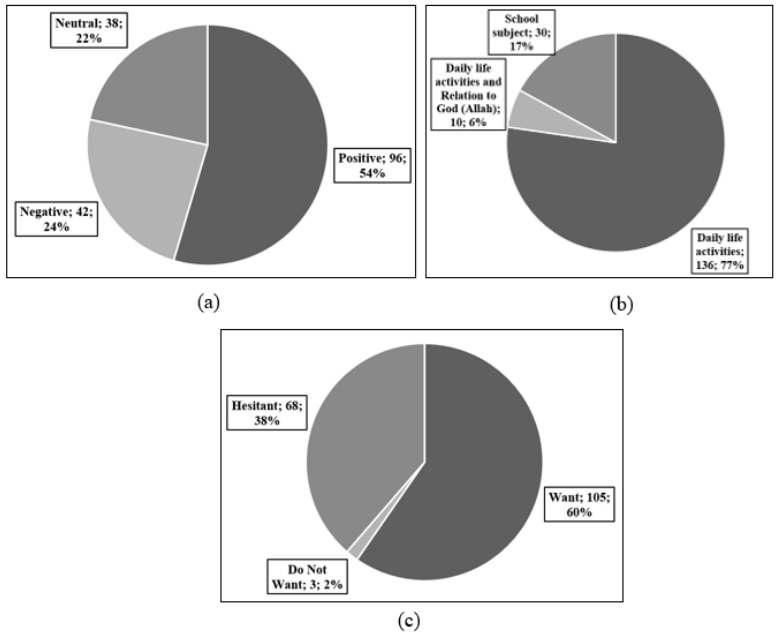
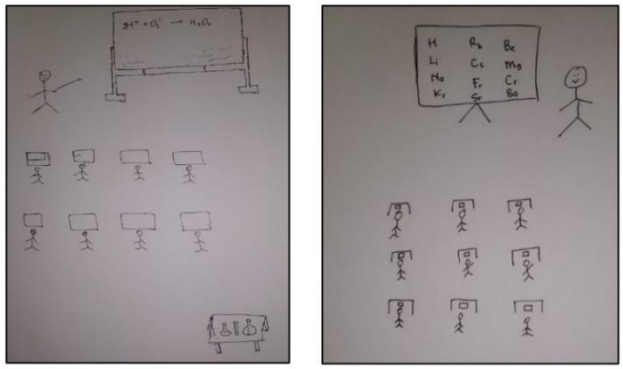


Figure 3.

The Distribution of PSTs' Responses to School Teacher's Classroom in the Past (A), The Meaningfulness of Science Subjects (B), And The Desire to be a Science Teacher in the Future (C)

In the second part, the results can be identified into three categories of images. Teacher-centered images (Figure 4) place a teacher in front of the classroom. The arrangement of classroom furniture often shows the placement of traditional tables and chairs in a row and column arrangement. In addition, illustrations that are teacher-centered include students who play a passive role in their learning or learning that is centered on teacher instruction only.



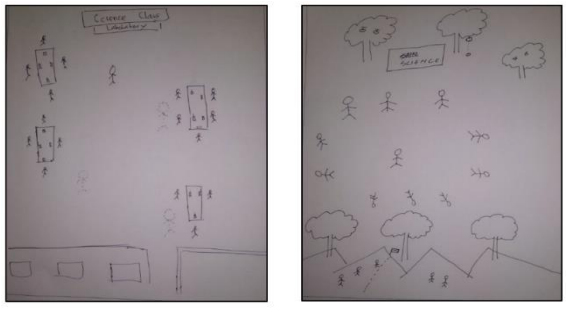
(a) (b)

Figure 4.

Two Examples of Teacher-centered Learning

The PST (female) explained in Figure 4a, she was teaching students about chemical processes in junior high school science subjects. He gave an explanation related to the material patiently. Students were taken notice and some are chatting. The condition of students tended to be calm and pay attention to the teacher. In Figure 4b. the PST (female) described herself who was explaining the chemical elements and the students was listening and taking notes. Both are forms of the teacher as the center of the science learning process.

In student-centered images (Figure 5), the teacher is usually not in a static position but walks around the tables and lines. The role of the teacher is not just transferring knowledge, he/she acts as a guide in the learning process. Students are responsible independently for learning and working together in groups. The learning area supports students to obtain information on whether it is carried out indoors, outdoors, or in a laboratory room. Students are encouraged to be involved in the process of investigation and learning led by students and guided by the teacher.



(a) (b)

Figure 5.

Two Examples of Student-Centered Learning in a Laboratory Classroom (A) And an Outdoor Class (B)

In Figure 5a, PST (female) stated: "*In the picture, I was accompanying, observing, and giving advice to my students. I described the dashed lines showing I was giving alternating directions and observations to each group when experiencing difficulties or obstacles*". Students were working in the laboratory and actively asking when there were obstacles in the lab. In Figure 5b, science learning activities are carried out outdoors by observing nature. PST (female) explained that he was teaching gravity. This is associated with falling fruit that can be observed by students. Also, prospective teachers give a statement that science learning will collaborate with the mountain climbing process that can be done during the school holidays. It shows the unusual pattern of learning of science.

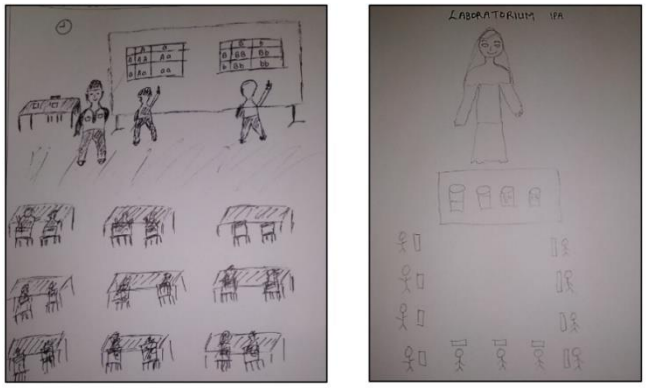


Figure 6.

Two Examples of Teacher-Centered Learning in a Conventional Classroom (A) And a Science Laboratory (B)

In Figure 6., this is a description of "*neither student-centered nor teacher-centered"* that is approved through students at the center, but the dominant role of the teacher still exists. Based on the question of what the teacher is doing, in Figure 6a PST (male) stated that he was giving questions to students, while in Figure 6b PST (female) was explaining and practicing experiments on the dangers of using certain chemicals in front of the class. In Figure 6a the students were working on answering the questions given by their teacher, while in Figure 6b students were listening to the teacher's explanation and trying to practice the experiments that have been taught. In Figure 6b there is no active inquiry process by students, students only work according to what the teacher demonstrates. This research also reviews the learning environment presented by PSTs in the future. The composition of the learning environment is shown in Figure 7. The choice of science learning environment is still dominated by traditional classroom learning environments.

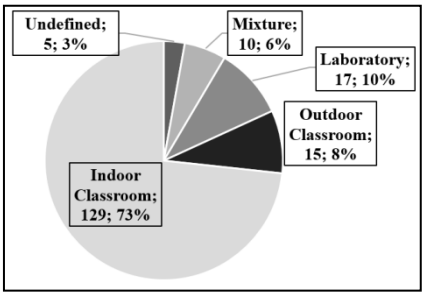


Figure 7.

The Composition of the Learning Environment for Presenting Science Learning.

The mean of total DASTT-C score of students is 11.4 represent an instructional method including characteristics of teacher-centered instruction. Figure 8 shows the percentages of students related to different teaching styles.

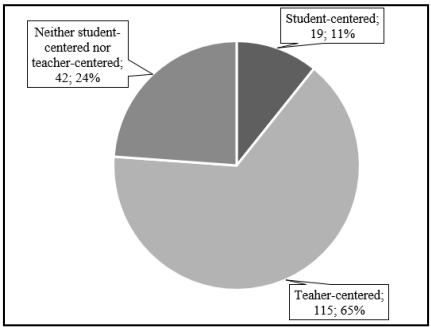


Figure 8.

The Image of PSTs' Teaching Style in the Future

The distribution of PST's teaching style images based on gender, the type of educational background, the response to school teacher's classroom in the past, the meaningfulness of science subjects, and the desire to be a science teacher in the future are illustrated in Figure 9.

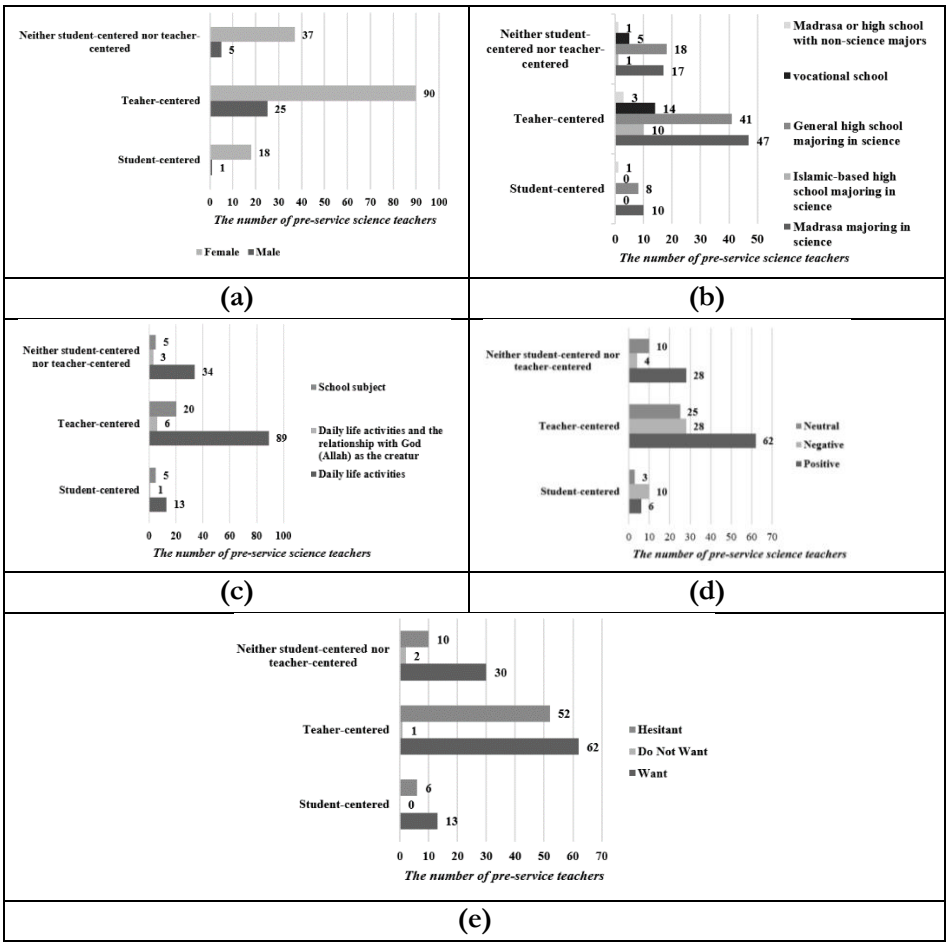


Figure 9.

The Distribution of PST's Teaching Style Images based on Gender ***(A)****, The Type of Educational Background* ***(B)****, The Desire to be a Science Teacher in the Future* ***(C)****, The Meaningfulness of Science Subjects* ***(D)****, And the Response to School Teacher's Classroom in the Past* ***(E).***

Cramer's V test results on variables associated with teaching style showed the significance of the relationship. The test results are shown in Table 1.

Table 1.

Cramer's V Test Results on Variables associated with the Teaching Style

Item	Value of Cramer's V	Approx. Sig. (N=176)
Gender	0.156	0.117
The type of educational background	0.142	0.524
The meaningfulness of science subject	0.077	0.719
PSTs' responses to the school teacher's classroom in the past	0.196	0.009*****
The desire to be a science teacher	0.159	0.064

* = a significant relationship

Based on Table 1. the Sig. value <0.05 is only found in the PSTs' responses variable towards science learning in the past. Thus, the learning that has been experienced by pre-service teachers in the past has a significant relationship with their picture in teaching science in the future. Thus, the learning that has been experienced by PSTs in the past has a significant relationship with their images about the future classroom. The other variables discussed in this study do not have a significant relationship with the PSTs' teaching style.

Discussion

This study discusses PSTs' science class experiences and reveals the images of their own classrooms in the future. The findings from this study suggest that it is possible to have a connection between the images they show about their future as a science teacher with the type of gender, their background related to the type of education before, the meaning of science lessons for them, their response to their own science teacher, and their desire to become a teacher in the future. Scratches of prospective teachers reveal a picture of teacher-centered learning patterns in the majority of PSTs in their first year of training programs. There are many more reasons affecting the teaching style of the teacher, and it is a complex construct (Liu, Qiao, & Liu, 2006), this study discusses in part through the images and narratives presented by PSTs.

Some studies stated the influence of gender on teaching styles (Chudgar & Sankar, 2008; Elmas et al., 2011; Kuh, Laird, & Umbach, 2004), but this research shows that there is no significant relationship between gender and teaching styles which are dominated by teacher-centered patterns. The relation of gender on teaching styles may also be influenced by the communication skills of pre-service teachers, some studies have found that women feel more comfortable sharing their expertise with other people in contrast to men (Rahimi & Asadollahi, 2012; Tannen, 1991) and males are more comfortable in a lecturing role (Tannen, 1991). Besides that, one of the reasons for male pre-service teachers to choose is more

likely to be a teacher-centered teaching style maybe because they want to be an authoritative figure along with their social role in society. However, there are also many studies in the literature that do not capture the gap and the effect of gender on teaching styles as a result of this study (Laird, Garver, & Niskodé, 2007; Sabbe & Aelterman, 2007; Yilmaz et al., 2007). Studies of gender differences have not been able to reveal clearly the difference between male and female teachers. It is almost impossible to regard certain characteristics and effects for individuals exclusively based on their biological sex without considering the individual social and cultural context and gender construction (Sabbe & Aelterman, 2007). This study was conducted on first-year students whose teaching style may still be influenced after the educational process in the teacher training program.

The science teacher training program at the Islamic University is attended by high school alumni who come from various institutions both Islamic or non-religious based institutions, as well as science and non-science majors. PSTs have a different understanding of the usefulness of science and are significantly related to their educational background. Understanding of science as just a subject is owned by prospective teachers who previously took a non-science major at the previous level. Even so, there are still a few (10 PSTs) which state that the meaning of science is related to their closeness to God even though the majority of PSTs come from madrassas. From this result, criticism arises about the pattern of integration of science and Islam at school level learning, especially madrasas and Islamic-based schools. The fact that the Indonesian national education curriculum generally has placed religion and divinity on the core competency aspects to realize religious character education. Some studies of potential mapping of integration between Islam and science subjects have shown the placement of the Qur'an, Hadiths, or fatwas from Ulama in the process of learning science from the level of early childhood to high school level (Asmara, 2016; Imaduddin, 2017; Khairunnisa, 2015; Khoiri, Agussuryani, & Hartini, 2017; Minarno, 2017; Noor, 2012). The cognitive, affective, and social culture of students can be grown along with the growth of the spiritual domain (Imaduddin & Khafidin, 2018). The meaningfulness of science is not fully owned by students because in reality conflicts occur when the judgments required to be achieved are not relevant to contextual learning which is also directed at planting aspects of religiosity. This is supported by Conley et al. (2010) who noted that teachers can claim to expect students to think critically and holistically, but use assessment practices that encourage learning and memorization. Meaningful learning activities, when incorporated into teacher training programs, will provide authentic experiences for prospective teachers and will be useful for their learning and teaching practices in the future (Sailin & Mahmor, 2018). The implementation of teacher training at Islamic University leaves a severe job in incorporating Islam into the PSTs' hearts so that they can deliver Islamic da'wah through science subjects.

In contrast to students taking educational study programs, most students who take specific study programs at the university do not have well-developed ideas or theories related to the field of study they are taking (Posner, Strike, Hewson, & Gertzog, 1982). Medical students enter the hospital and law students enter the courtroom, but pre-service teachers enter the classroom where they have previously felt they have been doing activities for a long time. Pre-service teachers need new ideas and images to shift the old paradigm into a new paradigm following educational trends. These pre-service teachers are vital factors that must be prepared and stimulated to improve the quality of education, which is always dynamic in its development. A big picture of the past about science learning is revealed through responses to the learning presented by their teachers at the school level. The results showed that there is a significant relationship between teaching styles in the future with their responses to their school science teacher. PSTs that have a student-centered picture provide a greater proportion of negative responses to learning dominated by their previous teachers. The majority of PSTs still hold the teacher-centered style as the teaching image they describe through narratives about their science teacher.

PSTs insist on still maintaining a teacher-centered picture of future learning because of several reasons. The reasons referenced from Allamong (1976) showed that their ideas did not change because of previous experiences that presented the teacher as the center of the learning environment. The second reason, prospective teachers think that maybe most students will find it easier to succeed in a more structured environment. Both cases present the teacher as a source of activity in science learning. Their view of teaching activities is the teacher as the person who explains, and students pay attention to the teacher's explanation. This shows that students' dependence on teachers to understand science is very high. Understanding is not obtained by them constructively but through behaviourist learning that places the prospective teacher as an informed subject. The primary information on their past learning is the teacher.

In the socio-cultural aspects that exist in Indonesia, the role of the teacher or "*guru*" as a scientist and intellectual is already present in the Javanese proverb. The teacher is equal to the nobility (Javanese: *priyayi*) in the typology of Greetz (1989). The teacher or "*guru*" in Javanese society are known as abbreviations of "*digugu omongane lan ditiru kelakoane*" (trusted his/her words and imitated his/her actions). This term implies that "the teacher's words are always considered and his actions are always an example". Being a teacher is ideal for most children in ancient times because teachers occupy a high social status in the community (Natsir, 2007; Warsono, 2017). The teacher as the foundation of Islamic education has a very strong existence. In Islamic education according to Sheikh Az-Zamuji in his book "*Ta'lim Muta'lim"*, one of the requirements for someone to be able to learn successfully is respect (Arabic: *ta'dzim*) teachers (Arabic: *ustadz*) as well as

respecting knowledge. Moslem students (Indonesian: *santri*) will not get knowledge and benefit without respecting the knowledge and the teacher. The position and function of the teacher are so great that respecting it is better than just obeying it (Natsir, 2007). Thus the position of teacher-centered is possible still attached to this concept, especially for PSTs who are in Islamic boarding schools (Indonesian: *pesantren*) or have had experience with this concept. Further research studies can be deepened to reveal the perspectives of Moslem students (*santri*) on the concept of respect to teachers with a teaching style.

The response of PSTs to their past learning also leads to how they present the future learning environment. Science learning is still dominated by traditional classroom learning. Some have indicated the use of laboratories and outdoor classes for variations in learning activities. Nevertheless, no one has tried to integrate ICT to the fullest. The use of ICT focuses on indoor learning by utilizing projectors to explain the explanation of science lessons. Flipped classroom learning models, blended classroom, augmented reality, and virtual reality (AR/VR) using smartphones have not been shown in the picture. The learning environment should no longer be confined to classrooms but includes outdoors, workplaces, homes, public spaces, etc. Besides that, it was also enriched by ICT and facilitated by LMS (Learning Management System) and social networking (Scheurs & Dumbraveanu, 2014). Pre-service teachers in the 21st century are technologists. Students in the 21st century have grown in a fast-moving digital world, and easily overlook traditional lecture-based classes (Boholano, 2017). Pre-service teachers' attitudes in the experiment group towards the importance of technology as a teaching tool are more positive than those in the control group (Alkan & Koçak Altundağ, 2015). The general goal of science education is the achievement of scientific literacy, although there are different interpretations of its meaning. Science education needs to be related to society, and the need to connect science and technology (Holbrook, 2017). PSTs must be supported and encouraged by teacher educators to use supplementary materials, design student-centered activities and experiments and to design a creative and supportive learning environment in their class in the future (Elmas et al., 2011).

At the beginning of college, it turns out that not all first-year PSTs have a strong desire to become a science teacher. PSTs were willing to become science teachers from the beginning of the program (N = 105), still not decided to become science teachers (N = 68) and did not even want to become teachers (N = 3). Green & Greive (2007) showed the factors that most influence the desire to become a teacher include hobbies and interests, as well as encouragement from community members and the influence of the experience gained at school. The results of this study indicate that the PSTs' future class images are not significantly related to their desire to become science teachers. This is similar to Elmas (2011) showing that there is no significant relationship between the desire to become a

chemistry teacher and a teaching style. Therefore, it is essential for teacher training providers in this case the Islamic University to strengthen, motivate, and provide a clear and detailed description of future science teacher careers through the preparation of science education curricula that are in line with the times and in accordance with Islamic values.

Conclusion

Overall, this study provides an overview of the conditions of science learning experienced by PSTs and projects their picture of future science learning. This study also showed no significant relationship between the teaching styles of PSTs with gender, the background of their educational institutions, the meaningfulness of science, and the desire to become science teachers. The teaching style has a significant relationship with their personal response to their school science teachers' teaching style.

It must be borne in mind that the research activity provides a general picture of each variable. More exciting and exploratory facts on each variable related to teaching style have not been followed up with deep-interview studies. Therefore, further research is needed to explore the socio-cultural relationship between the pre-service teacher and teaching style, as well as further exploration related to the development of future teaching projections for PSTs at specific periods in the teacher training process held at the Islamic University.

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