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# PCK In Science Education: Perception of Science Teacher on PCK Instruments

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***Abstract.****This study aims to describe the use of the PCK instrument on science teacher training in Lampung province. Research method is a survey method using purposive sampling technique. Qualitative data in the form of questionnaire data on 2013 Curriculum training. The selected sample consisted of 75 science teachers who were members of the MGMP in Lampung Province, gave 2013 Curriculum technical guidance (bimtek), and used all training instruments. Teacher perceptions data in the form of data collected with various profiles (gender, age, teaching time, and highest education). The results showed that training training was very high (90%) for PCK teachers. Meanwhile, in the profile comparison, information instruments for PCK were very high (97.4%) for female science teachers; Information instruments for PCK is very high category (100%) for science teachers aged 25-29 years and 50-59, teaching time 0-5 years, and 16-20 years, and diploma and master education levels.*

***Keywords****: PCK, science teacher, training instrument.*

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## I. Introduction

Teachers are an important element of the education system that acts as a role, executor and evaluator (Permenpan no 16 tahun 2009; Ayu, Susilawati, and Patonah, 2011; Baumert and Kunter, 2013; Ansari and Malik 2013). Teachers play a role in obtaining quality education that is of a high quality (Saragih, 2008; Dalyono and Agustina, 2016).

Teachers are categorized as science teachers when mastering the curriculum and general skills teaching science including assessment and the relationship between science and society (NSES, 1996). Science teachers who master Pedagogical Contain Knowledge (PCK) IPA can be declared as professional science teachers (NRC, in Masril, 2005; Permenpan no 16 tahun 2007; Ajaja and Eravwoke, 2013; Imaduddin, Hidayah, and Astuti., 2014) .

Science teachers in carrying out their duties are not only bound to teaching methods and problem solving that have been determined but can modify and adapt to the environment and school (Ansari and Malik, 2013) with the basis of their competencies (Saragih, 2008). According to UUGD no 14 tahun 200, teacher competence consists of four competencies, namely pedagogic, personality, social, and professional competence. The important competence for teachers is PCK (Agustina, 2015).

PCK science teachers are knowledge of science teachers about science and how to teach science (Imaduddin, Hidayah, and Astuti., 2014; Resbiantoro, 2016). Steps that can be taken to achieve this are the development of professional science teachers for example, training (Jones, 2005; Sari, 2013; Febrianis, 2014; OECD, 2016; Gore, et al., 2017) .

Training needs to be carried out by a science teacher on an ongoing basis in order to remain a professional science teacher. The training is able to develop teacher's Pedagogical Contain (PC) knowledge and skills (Loewenberg and Forzani, 2009) including choosing and making judgments (Kusno, 2015). Therefore, equipping science teachers with training is the right step to develop a PCK science teacher.

PCK teacher training was held at the 2013 Curriculum training technical guidance. Based on the survey, it was found that 225 (98.25%) of the 229 science teachers in Lampung Province had attended the technical guidance The 2013 curriculum and 89% of science teachers stated that the 2013 Kurikulum guidance had an impact on PCK. The assessment instruments used in the 2013 curriculum curriculum include pretest and posttest, activity observation sheets, teacher teaching observation sheets and learning tools (Dirjen Pendidikan Dasar dan Menengah, 2017).

Organizers and trainees can measure changes in PCK through the assessment instruments used (Mendikbud, 2014). In order to reveal more about the impact of the training instrument on the PCK of science

teachers, the authors consider it very necessary to conduct research on the perceptions of science teachers on PCK training instruments.

Based on the explanation above, this study aims to find out the PCK training instruments that are meaningful for science teachers so that it can be a reference for the government and other parties who are looking for references to make training instruments or hold science teacher PCK training programs.

## II. Method

The method used in this research is descriptive qualitative with purposive sampling technique. The study population consisted of 229 junior high school natural science teachers in Lampung Province and sample of 75 science teachers who were members of the MGMP throughout Lampung Province, had attended the 2013 Curriculum and had used pretest and posttest, individual and group assignments, and individual and group presentations in technical guidance. 2013 curriculum.

The research sample had various profiles (age, gender, length of teaching, and last education) which would result in different perceptions of the PCK training instruments. The answer response from the research sample is described in the form of percentages according to each aspect that you want to know then the data is interpreted qualitatively.

The formula used to calculate the percentage of answers for each item is as follows:

$\% J_{in} = \frac{\sum J_i}{N} \times 100\ \%$

Information:

$\% J_{in}$ = Percentage of answer options

$\sum J_i$ = Number of respondents answering answers

N = Number of all respondents

(Sari, 2017)

**Table 1. Impact criteria training instruments for PCK science teacher**

| Percentage | Criteria |
|---|---|
| 81,00–100,00 | Very high |
| 61,00–80,00 | High |
| 41,00–60,00 | Average |
| 21,00–40,00 | Low |
| 0,00 –20,00 | Very low |

(Arikunto, 2011)

## III. Result

Lampung has followed the 2013 Curriculum but only 32.75% have ever used PCK training assessment instruments which include pretest and posttest, group work, individual work, group representative presentations, class representative presentations, and individual presentations.

The results of the study also revealed that the training instrument that had the most impact on the PCK of science teachers was individual presentation (94.67%) and the less impacting was pretest and posttest (85.3%). However, all instruments have a very high impact on PCK science teachers. The percentage and criteria for the impact of the training instrument on the science teacher's PCK are presented in Table 2.

**Table 2. Impact of training instruments on PCK teachers (n=75)**

| Jenis Instrumen | Dampak (%) | Kriteria |
|---|---|---|
| Pretest-postest | 85,33 | Very high |
| Group work | 89,33 | Very high |
| Individual work | 94,67 | Very high |
| Group representative presentation | 89,33 | Very high |
| Class representation presentation | 86,67 | Very high |
| Individual presentation | 94,67 | Very high |
| Average | 90 | Very high |

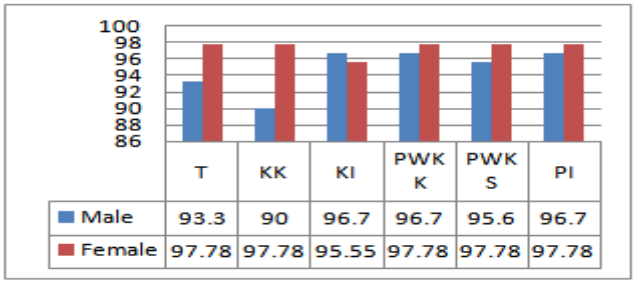
Based on research data it is known that there is diversity in each profile (gender, age, length of teaching, highest education) of science teachers. The number of science teachers for each profile is presented in the following table 3:

**Table 3. Number of science teachers based on profiles (n=75)**

| Profil | | Number (people) |
|---|---|---|
| Gender | Female | 45 |
| | Male | 30 |
| Age | 25-29 | 8 |
| | 30-39 | 19 |
| | 40-49 | 32 |
| | 50-59 | 16 |
| | >60 | 0 |
| Teaching time | 0-5 | 10 |
| | 6-10 | 13 |
| | 11-15 | 19 |
| | 16-20 | 15 |
| | 21-25 | 18 |
| Highest education | Magister | 10 |
| | Sarjana | 63 |
| | Diploma | 2 |

Meanwhile, the results of the analysis revealed that in the comparison of profiles, assessment instruments impacted the very high category of PCK (97.4%) for female science teachers; assessment instruments have an impact on PCK in the very high category (100%) for science teachers aged 25-29 years and 50-59, teaching time 0-5 years, and 16-20 years, and diploma and master education levels. The impact of each training instrument on the science teacher's PCK in each profile is presented in the figure below.

**Figure 1. Percentage of perceptions of science teachers on the impact of PCK training instruments in terms of gender.**




Inf: pretest and posttest (t), group work (kk), individual work (ki), group representation presentation (pwkk), class representation presentation (pwks), and individual presentation (pi).

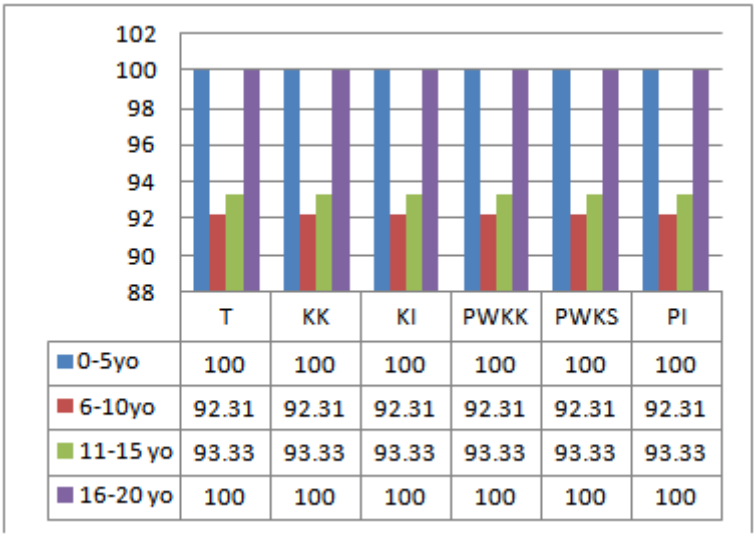
In Figure 1, it is known that the pretest and posttest (t), group work (kk), individual work (ki), group representative presentation (pwkk), presentation of class representatives (pwks), and individual presentations (pi) have more impact on PCK female science teachers compared to male science teachers. Comparison of the impact of all instruments on female and male science teachers by 97.41%; 94.83%.

**Figure 2. Percentage of perceptions of science teachers on the impact of PCK training instruments in terms of age.**

Inf: pretest and posttest (t), group work (kk), individual work (ki), group representation presentation (pwkk), class representation presentation (pwks), and individual presentation (pi).

In Figure 2, it is known that pretest and posttest instruments have less impact on the PCK of science teachers than other training instruments. Meanwhile, science teachers with the age range of 25-29 years and 50-59 years (100%) stated that all training instruments had an impact on PCK.

**Figure 3. Percentage of science teacher perceptions of the impact of PCK training instruments in terms of teaching time.**

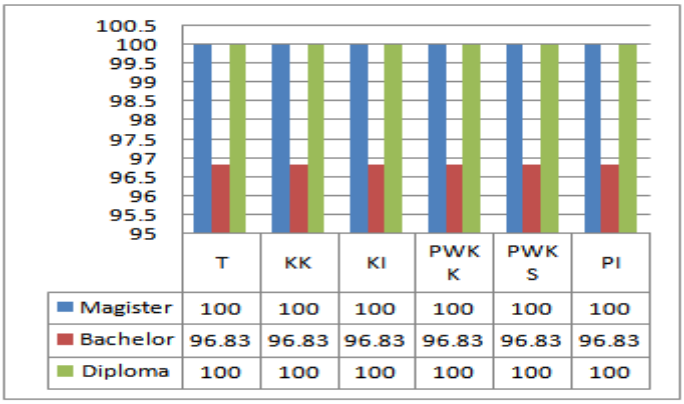



| | T | KK | KI | PWKK | PWKS | PI |
|---|---|---|---|---|---|---|
| 0-5yo | 100 | 100 | 100 | 100 | 100 | 100 |
| 6-10yo | 92.31 | 92.31 | 92.31 | 92.31 | 92.31 | 92.31 |
| 11-15 yo | 93.33 | 93.33 | 93.33 | 93.33 | 93.33 | 93.33 |
| 16-20 yo | 100 | 100 | 100 | 100 | 100 | 100 |

Inf: pretest and posttest (t), group work (kk), individual work (ki), group representative presentation (pwkk), class representation presentation (pwks), and individual presentations (pi).

In figure 3 it is known that all training instruments have the same impact on PCK science teachers with a mean of 96.41%. Meanwhile, science teachers with teaching periods of 0-5 years and 16-20 years (100%) stated that all training instruments had an impact on PCK.

**Figure 4. Percentage of science teacher perceptions of the impact of PCK training instruments in terms of the highest education**




| | T | KK | KI | PWKK | PWKS | PI |
|---|---|---|---|---|---|---|
| Magister | 100 | 100 | 100 | 100 | 100 | 100 |
| Bachelor | 96.83 | 96.83 | 96.83 | 96.83 | 96.83 | 96.83 |
| Diploma | 100 | 100 | 100 | 100 | 100 | 100 |

Inf: pretest and posttest (t), group work (kk), individual work (ki), group representation presentation (pwkk), class representation presentation (pwks), and individual presentation (pi).

In Figure 4 it is known that all the entire training instruments have the same impact on PCK science teachers with an average of 98.94%. Meanwhile, science teachers with the latest masters and diploma education (100%) stated that all training instruments had an impact on PCK.

## IV. Discussion

PCK training assessment instrument used in the 2013 curriculum curriculum includes pretest and posttest, group work, individual work, group representative presentations, class representative presentations, and individual presentations. The results revealed that all training instruments had a very high impact (90%) for

PCK science teachers. The training instruments that had the most impact on the PCK of science teachers and classified as very high were individual work and individual presentations (94.67%). Meanwhile, the instruments that had less impact on the PCK of science teachers were pretest and posttest, although they were classified as very high (85.33%).

Individual work and individual presentations cause the individual to try optimally to present the material and possible questions that will arise from the material. Individuals will study independently indirectly. Individual independence is an individual's ability to determine goals, materials and learning experiences, and material evaluation (Mulyani, 2017). Some studies show that there is a relationship between independent learning and learning outcomes (Prayuda, 2014; Aliiyah, Puteri, and Kurniawati, 2017; Kulsum, Kustono, and Purnomo, 2017) and are categorized as positive. Therefore, the more independent the better the learning outcomes (Wijaya, 2014).

The presence of pretest and posttest gave a smaller impact than other instruments allegedly because the training participants (science teachers) did not know the test grid provided. The test grid is a blue print that plays a role in knowing the material boundaries and competencies to be tested (Syofyan, 2016). If the test grid is made well, the science teacher is able to predict the type of question with the level of depth and breadth of the material to be requested (Ekawatiningsih, 2009). The science teacher will learn and understand the material that is predicted to appear during the test. Thus the test will have a relatively large impact on PCK science teachers.

The material given to science teachers extends broadly to policies and dynamics of curriculum development, technical implementation and assistance to the implementation of the 2013 curriculum, document analysis, curriculum, and syllabus, material analysis in lesson textbooks (and resource books other relevant), development of learning materials, analysis of assessment of learning outcomes, good practice of developing implementation of lesson plan: hots (learning 21st century, 4c), strengthening character education, literacy in learning, good practices of learning and assessment based on good practices of the lesson plan, processing practices and reporting on the assessment of learning outcomes and the introduction of e_raport, the concept of integrated science learning, and the application of the scientific approach (Direktorat Pembinaan SMP, 2017). It is possible that the science teacher has difficulty predicting questions that will appear without the test grid with the breadth of the material.

PCK training instruments have a different percentage of impact for female and male science teachers. However, both are very high. Women's science teacher (45 people) stated that the instrument had an impact on him by 97.4% while male science teacher (30 people) stated that the instrument had an impact on him at 94.83%. Women are easier to input and are more motivated in terms of learning and work than men (Sofni, Dewi, and Novayelinda, 2015; Pasanda, 2016). Therefore, the training instruments used will have more impact on PCK female science teachers. The percentage comparison of the impact of the training instrument in terms of the sex of the science teacher is presented in Figure 1.

Based on Figure 1, it is known that female science teachers consider that pretest and posttest, group work, group representative presentations, class representative presentations, and individual presentations have more impact on PCK than individual work (ki). Although the difference is actually not far from 2.23%. The cause was allegedly due to individual work being done when the female science teacher did not understand and was reluctant to ask her colleague. Women tend to be sensitive (Pasanda, 2016) and be more careful in behaving with others (Sofni, Dewi, and Novayelinda, 2015) so as to be ashamed to ask. Therefore, female science teachers will reveal that individual work tends to have less impact on him.

Male science teachers consider that individual work, group representative presentations (pwkk), and individual presentations have more impact on PCK than other instruments. The reason for this was allegedly because the three instruments allowed male teachers to work alone and present their work. Male science teachers do not hesitate to ask questions or discuss with other colleagues (Sofni, Dewi, and Novayelinda, 2015; Pasanda, 2016). Thus, the three instruments are able to make the training process meaningful.

The instruments that are considered to have a lower impact than others are group work. The cause of this is suspected because male science teachers assume that group work with the same division of labor is less effective in the learning process. The division of labor is not effective and group management is not good so the process becomes ineffective in achieving goals (Tarigan. Et al. 2012). This situation caused some groups to work and think while others only gave confirmation of agreement.

PCK training instruments have a different percentage of impact for science teachers of different ages. Instruments in the form of group work, individual work, group representative presentations, class representative presentations, and individual presentations are considered to have the most impact on science teachers with different age ranges. Working individually or in groups and presenting the results was considered to have an impact on PCK science teachers.

Training instrument that had the smallest impact on the PCK of science teachers in terms of sex was the pretest and posttest. The possible cause is that the science teacher cannot prepare the test because it is not given a test grid. The science teacher is unable to predict questions that will arise while the scope of the material

must be studied broadly and deeply. Percentage of comparison of the impact of training instruments in terms of the age of IP teachers Presented in Figure 2.

Based on Figure 2, it is known that all training instruments have a very high impact on PCK science teachers with ages 25-29 and 50-59 years. The cause of this is suspected because the age range of 25-29 years is the condition of science teachers who still lack experience. This condition causes the science teacher to have a high level of curiosity (Herawati, 2016). In addition, science teachers with the age range of 25-29 years are science teachers who have been prepared to deal with the 2013 curriculum. The advantages of the 2013 curriculum are authentic assessments used in this PCK training (Hariyatmi and Setyanto, 2015; Rosidin, 2016). The existence of authentic assessment found in PCK training is an arena for young science teachers to practice their learning outcomes at school.

Meanwhile, for science teachers with the age range of 50-59 years, this training allows to learn and practice material that has long been obtained by him and possibly forgotten (Pasanda, 2016). Another possibility is that science teachers of this age range have never tried training instruments like this so that this instrument is something new for them. Therefore, high curiosity becomes the basis for lack of knowledge (Herawati, 2016).

Science teachers with a age range of 40-49 years assume that assessment instruments have less impact on PCK than other age ranges. Natural science teachers in this age range are science teachers who have had a lot of experience and are starting to feel tired and bored teaching the same material and ways (Leksono, 2014; Mahfud, 2016; Pirmanika, 2017).

PCK training instruments have a different percentage of impact for different science teachers for their length of teaching. The entire instrument is considered to have the same impact on PCK science teachers. The reason for this was allegedly because the science teacher should use the type of instrument used in the PCK training (Direktorat Pembinaan SMP , 2017) so that he was accustomed to using the five types of assessment and considered that the instrument was equally important for learning outcomes (Permendikbud no. 53 tahun 2015) . Percentage of impact comparison of training instruments reviewed from the length of teaching of IP teachers Presented in Figure 3.

Based on Figure 3, it is known that the training instrument has the most impact on PCK science teachers with the least teaching time and the most experience. The cause of this was allegedly because science teachers who lacked teaching experience (Avalos, 2010) gained experience through PCK training. Science teachers feel interested in the training process. In addition, the science teacher with <5 years teaching experience is a science teacher who has been prepared to face the 2013 curriculum. The strength of the 2013 curriculum is the authentic assessment used in this PCK training (Hariyatmi and Setyanto, 2015; Rosidin, 2016). The existence of authentic assessments found in PCK training is an arena for science teachers with the least teaching time to practice their learning outcomes at school.

This PCK training allows science teachers with a teaching period of 16-20 years to study and practice material that has long been obtained by him and possibly forgotten (Pasanda, 2016). Another possibility is that the science teacher has never tried training instruments like this so that this instrument is something new for him. The results of this study are in line with the percentage comparison of the impact of training instruments in terms of age, which states that teachers with the youngest and oldest ages tend to consider training instruments to have an impact on PCK.

Meanwhile, science teachers who stated that the instrument had an impact on PCK with an average of only 92.31% were science teachers with 6-10 years of teaching time. The reason for this is that this assessment instrument has been used quite often by him and is no longer something new. Therefore, there is a possibility that the science teacher considers that the assessment instruments used are monotonous so that they have less impact on PCK (Leksono, 2014; Mahfud, 2016; Pirmanika, 2017).

The training assessment instrument that had the smallest impact on the PCK of science teachers in terms of teaching time was pretest and posttest. The possible cause is that the science teacher cannot prepare the test because it is not given a test grid. Science teachers are less able to predict questions that will arise while the scope of the material must be studied broadly and deeply.

PCK training instruments have a different percentage of impact for different science teachers with the highest education. The entire instrument is considered to have the same impact on PCK science teachers. The possible reason is because the science teacher is used to using these five types of assessment in class and considers that the instrument is equally important for learning outcomes (Permendikbud no 53 tahun2015) even though it has a different level of education. Thus, even though science teachers have different levels of education, science teachers tend to assume that all instruments have an impact on PCK. Percentage of comparison of the impact of training instruments in terms of the highest education of IP teachers is presented in Figure 4.

Based on Figure 4, it is known that science teachers with the highest and lowest levels of education assume that all instruments have an impact on PCK. Science teachers with a master's level of education are the natural science teachers who are the easiest to obtain and understand the newly acquired information (Pasanda,

2016). The possibility of the emergence of the opinion of science teachers with the level of master's education which states that all instruments have an impact on him is because the science teacher is accustomed to using these five types of assessment in class and considers that

## V. Conclusion

Based on the results obtained in this study it can be concluded that all training instruments have very high impact (90%) for PCK science teachers. The instruments that most impacted the PCK of science teachers were individual work and individual presentations (94.67%) and the less impacting on PCK on science teachers was pretest and posttest (85.3%). Meanwhile, in the comparison of profiles, assessment instruments have an impact on the very high category of PCK (97.4%) for female science teachers; assessment instruments impact on very high category PCK (100%) for science teachers aged 25-29 years and 50-59, teaching time 0-5 years, and 16-20 years, and level of diploma and masters education for Natural Sciences Teachers and different teaching times agreed that pretest and posttest had little impact on PCK compared to other assessment instruments. The possible cause is the absence of a test grid. Science teachers will have difficulty predicting questions that will appear in the test if the material coverage is too broad and deep. Test grids make it easier for science teachers to predict questions so they can prepare themselves to face the pretest and posttest. Based on this explanation, it is likely that the science teacher is able to improve PCK. Therefore, in order for the assessment instrument to obtain maximum value, it is better to provide a test grid to the science teacher before the test takes place.

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