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## PEDAGOGICAL CONTENT KNOWLEDGE (PCK) PROFILES OF SENIOR SECONDARY BIOLOGY TEACHERS AT PUBLIC SCHOOLS IN BIREUEN DISTRICT ACEH INDONESIA

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DOI: 10.22373/biotik.v10i1.10915

### ABSTRACT

The combination of pedagogical competence and good professional competence becomes a necessity for teachers. PCK is a knowledge developed by teachers over time, through experiences on how to teach the material in various techniques and approaches to gain a wealth of student understanding. This research was conducted to find out the profile of PCK of Biology teachers of senior high schools. The study was conducted in April 2018. The population in this study was all Biology teachers of senior high schools in Bireuen district (N=137). While the samples of this study were 32 Biology teachers selected by cluster sampling. The method used in this research was the quantitative method with descriptive analysis through survey design. Teachers' PCK was obtained by CoRe (Content Representation) instrument and triangulated data with students' questionnaire. The results showed that PCK profile of Biology teachers at senior high schools in Bireuen district was at the growing PCK level.

**Keywords:** Pedagogical content knowledge (PCK), content representation (CoRe), growing PCK.

### INTRODUCTION

The article 1 paragraph 1 of education, basic education and Law No. 14 of 2005, concerning secondary education. To be able to teachers and lecturers, states that carry out these tasks, the teacher must teachers are professional educators have several prerequisites including with the main task of educating, academic qualifications, competencies, teaching, guiding, directing, training, educator certificates, physical and assessing, and evaluating students in spiritual health, to reach the national early childhood education, formal education goals.

The government through Government Regulation No. 74 of 2008 describes that teacher competencies include pedagogical competencies, personality competencies, social competencies, and professional competencies obtained through professional education. The combination of pedagogic competence and good professional competence is a necessity for teachers. Since a professional teacher must have one knowledge tool that will support his duties as a teacher. In other words, the teacher must master the teaching material while knowing the way to teach it to students. Also, efforts to improve the quality of education and learning are the subject of research and priority for current educational researchers. Teachers should be able to master the material to improve the quality of graduates who can act critically in solving various problems [1]. Teacher's knowledge in conducting learning activities in the classroom has a close relationship with how well and how much students learn [2]. Teachers must understand and be able to integrate content knowledge into knowledge about the curriculum,

strategies, characteristics of students, and evaluation according to the specificity of each material. This knowledge model is expressed as Pedagogical Content Knowledge or called PCK [3].

PCK was first introduced by Shulman while leading the American Educational Research Association. PCK is a meeting point between teacher professional knowledge and teacher expertise. Therefore, many researchers conclude that PCK is a knowledge that teachers develop all the time, through experience, about how to teach the material in a variety of techniques and approaches to gain students' understanding [4]. Teacher's PCK can be evaluated and measured using instruments developed by Loughran et al (2012), through CoRe (Content Representations) instruments. The results of the CoRe analysis show the effectiveness of learning activities according to the objectives to be achieved [5].

Based on preliminary studies, learning Biology in Bireuen District High School has implemented the 2013 curriculum with a scientific approach. Although there are still discrepancies in

the application of models and methods to some material. This was likely due to Biology teacher's PCK who had not reached a high level. So that the mastery of students on Biology material was still not capable.

Based on this background, it was deemed necessary to know the teacher's PCK so that it could obtain an overview of the quality and flexibility of mastering their content. PCK results were expected to be the basis for improving teacher professionalism and training in the future. Therefore, research needed to be done with the title "Profile of Pedagogical Content Knowledge (PCK) of Biology Teachers in Bireuen District Public High Schools".

## **METHODOLOGY**

The method used in this study was a quantitative method with descriptive analysis. Rationalization of the selection of this design was economic and speed in presenting research data. Data collection was carried out using several instruments and data sources including the contents of the teacher in the CoRe instrument, student questionnaire, and the

principal's supervision sheet. The data in this study were analyzed descriptively (descriptive analysis) in each sample. Furthermore, descriptive statistical tests were conducted using SPSS version 16.0 which was run by computer media, tabulating and interpreting quantitative data by concluding the problem formulation that had been analyzed [7].

## **RESULTS AND DISCUSSION**

The PCK profile of teachers could be seen from their ability to fill in the CoRe format. Where to fill the CoRe format, the teacher must be able to represent how they thought about the concepts they were going to teach at a certain level, the ability to describe important concepts and the ability to choose the right learning and evaluating method for the concept. The ability of teachers regarding material structure could be seen from the teacher's considerations in determining important concepts. The ability to master concepts and describe concepts could be seen from the representation of content. While the ability of pedagogy can be seen from the choice of methods and teaching considerations

[8]. The following shows the complete PCK profile of teachers diagram in Figure 3.1:

From Figure 1, it can be seen that out of the 32 samples of teachers scattered in Bireuen Regency, PCK had the most of them at the growing level of PCK, which were 29 samples. The remaining 3 samples are at the pre-PCK level. And no single sample reached the PCK maturity level. The diagram also shows the achievement of the CoRe score on each aspect of the entire sample.

### PCK Teacher's Profile from Aspects of Purpose in CoRe Instruments

The PCK profile of teachers from the aspect of objectives in the CoRe instrument can be seen in Figure 2. below:

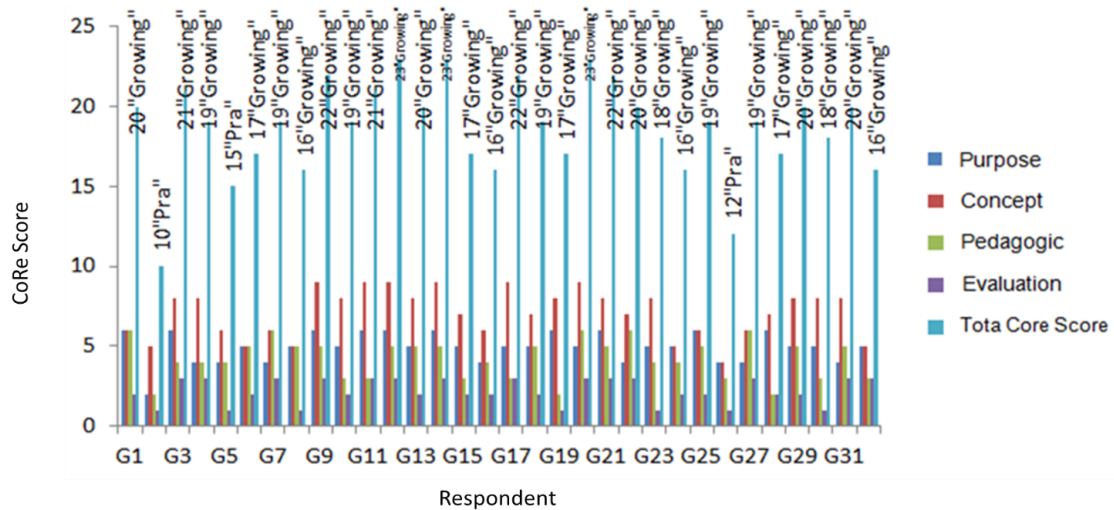


Figure 1. Complete Teacher PCK Profile Diagram

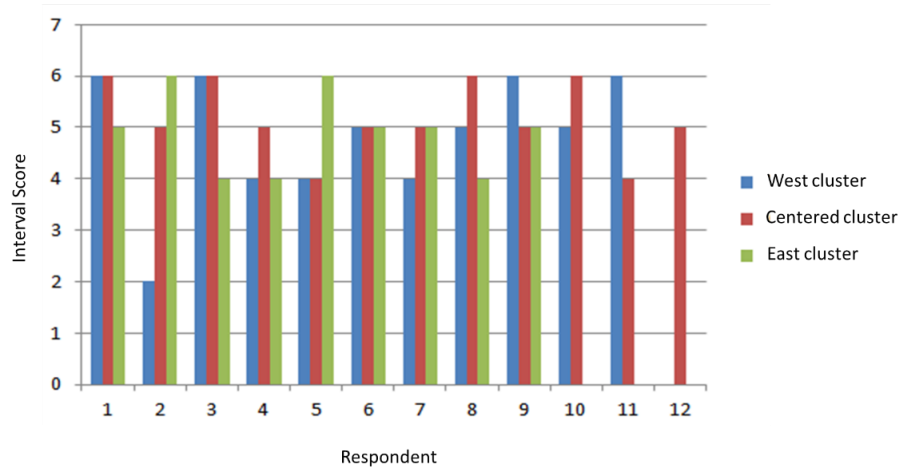


Figure 2. The PCK Profile of Teachers from the Aspect of Objectives in the CoRe Instrument

Figure 2 shows that the aspect of objectives has a diverse score for each teacher in each cluster. For example, teacher 1 in the western cluster had a score of 6, teacher 1 in the middle cluster had a score of 6, while teacher 1 in the eastern cluster had a score of 5. Likewise, teacher 2 in the western cluster got a score of 2, teacher 2 from the middle cluster got a score of 5, and teacher 2 from the eastern cluster got a score of 6. So onwards to teacher 11 in the western cluster got a score of 6, teacher 12 in the middle cluster got a score of 5, and teacher 9 in the eastern cluster got a score of 5 for the objective aspect of the total score of 8.

The average Core score on the teacher's PCK profile from the objective aspect can be seen in Figure 3 below:

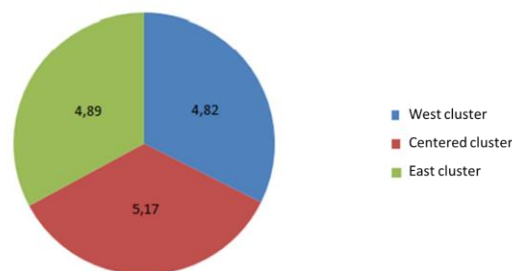


Figure 3. The Average CoRe Score on the Teacher's PCK Profile from the Objective Aspect

Based on the contents of the teacher on the CoRe sheet, information was obtained that on the aspect of the average goal the teacher obtained a score of 5 out of a total score of 8 if the CoRe was filled in properly. This shows that the teacher has begun to set goals to achieve the competencies of the concepts taught by those specified in the curriculum accurately. This can be seen from several things: (a) Already able to set operational verbs in the learning objectives to achieve competencies according to the demands of Basic Competencies (KD); (b) Start to determine the dimensions of

knowledge according to the competencies specified in the curriculum, namely factual, conceptual, procedural, and metacognitive knowledge according to the 2013 curriculum implementation policy at the high school level (Permendikbud, 2013); (c) Can bring out important values from the chosen concept and its relevance to the subsequent concepts and daily life of students.

#### **PCK Teacher's Profile from Concept Aspects of CoRe Instruments**

The PCK teacher profile from the concept aspect of the CoRe instrument can be seen in Figure 4 below:

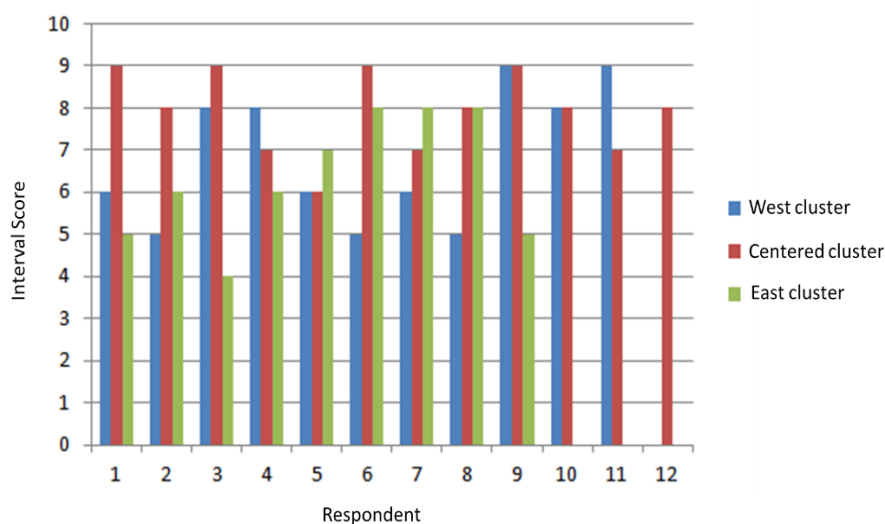


Figure 4. The PCK Teacher Profile from the Concept Aspect of the CoRe Instrument

The figure 4 shows that the concept aspect has a diverse score for each teacher in each cluster. For example, teacher 1 in the western cluster had a score of 6, teacher 1 in the middle cluster had a score of 9, while teacher 1 in the eastern cluster had a score of 5. Likewise, teacher 2 in the western cluster got a score of 5, teacher 2 of the middle cluster got a score of 8 and teacher 2 from the eastern cluster

got a score of 6. So onwards to teacher 11 in the western cluster got a score of 9, teacher 12 in the middle cluster got a score of 8, and teacher 9 in the eastern cluster got a score of 5 for the concept aspect of the total score 12.

The average Core score on the teacher's PCK profile from the concept aspect can be seen in the following Figure 5:

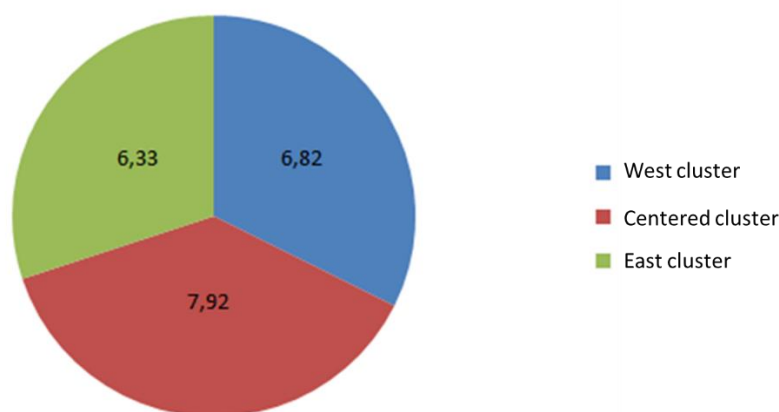


Figure 5. The average Core score on the Teacher's PCK Profile from the Concept Aspect

In the concept aspect, it is seen that the Biological concepts raised have referred to and are related to the core concepts of the material of the Human Reproduction System. Although the teacher's average score on the concept aspect is 7 out of 12 maximum scores if CoRe is filled properly, the teacher's ability to

determine the breadth and depth of material is sufficiently related to the important concepts raised. It's just that, generally, teachers still seem to have difficulty identifying and anticipating misconceptions or misconceptions of students. So that filling in the CoRe instrument tends not to write down student misconception points in detail.

Though the ability to predict the potential of student learning difficulties with content is an important aspect of PCK science teachers. Driver et al., (2003) places students to develop conceptions of science through their experiences, observations, and interactions with peers. Therefore, students are not blank whiteboards, on the contrary, they bring students into the knowledge and experience of previous students who may have inaccurate perceptions and disrupt learning [9]. Say that teachers must understand the knowledge that students bring into the classroom to accurately predict potential learning difficulties with content[10].

On the other hand, the teacher also appears to have been able to raise boundaries in learning the concept while anticipating the difficulties that will be faced. For example, in the delivery of concepts about the process of coitus and childbirth processes which are generally considered to be taboo for both teachers and students.

### PCK Teacher Profile from Pedagogical Aspects of CoRe Instruments

The PCK teacher profile from the pedagogical aspects of the CoRe instrument can be seen in Figure 6 below:

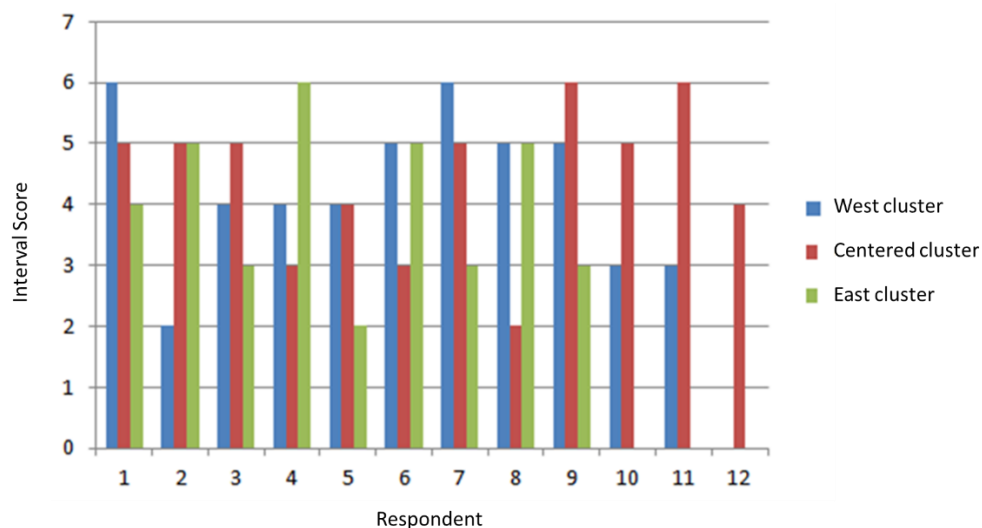


Figure 6. The PCK Teacher Profile from the Pedagogical Aspects of the CoRe Instrument



Figure 6 shows that pedagogical aspects have diverse scores for each teacher in each cluster. For example, teacher 1 in the western cluster had a score of 6, teacher 1 in the middle cluster had a score of 5, while teacher 1 in the eastern cluster had a score of 4. Likewise, teacher 2 in the western cluster got a score of 2, teacher 2 of the middle cluster got a score of 5, and teacher 2 from the eastern cluster

got a score of 5. Then onwards to teacher 11 in the western cluster got a score of 3, teacher 12 in the middle cluster got a score of 4, and teacher 9 in the eastern cluster got a score of 3 for the pedagogical aspect of the total score of 8.

The average Core score on the teacher's PCK profile from the pedagogical aspect can be seen in Figure 7 below:

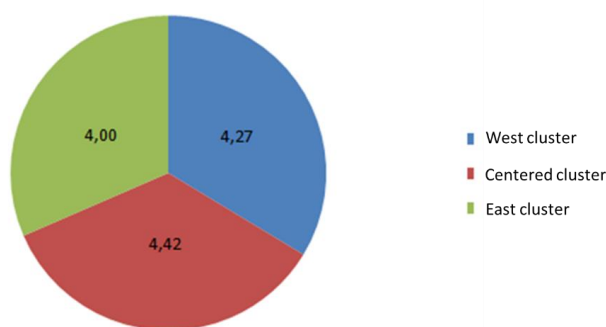


Figure 7. The average Core Score on the Teacher's PCK Profile from the Pedagogical Aspect

The pedagogical aspect referred to, in this study, the ability of the teacher to adjust the learning strategy to the characteristics of the concepts in the material and the competencies to be achieved. After completing the CoRe instrument, the average teacher score for pedagogical aspects was 4 out of a maximum score of 8 if the CoRe instrument is filled

properly. That was, the teacher had considered the use of media and limitations in the use of the facilities needed. But the teacher was not seen considering the time and state allocation of students and only a few teachers who seemed to mention the use of scientific approaches suggested by the 2013 curriculum [11]

The Ministry of National Education (2008) said that an experienced teacher can present material to students, and students easily absorb the material delivered by the teacher perfectly by using a method developed based on their experience. Without the right order, if some of the learning material has a prerequisite relationship, it will be difficult for students to learn it. The teacher has not been seen considering the state of the student, which makes it difficult to create meaningful learning. Whereas knowledge about the characteristics of students can help the learning process to be well understood [12]

Likewise with a variety of learning models that were not mentioned in the CoRe instrument.

Such as Problem Based Learning (PBL), jigsaw, and inquiry that match the material character of the Human Reproduction System. This was due to the lack of teacher competence in the use of these learning models. investigate teacher beliefs concerning the application of inquiry-based instruction and find teacher beliefs about student limitations, maturity, or learning difficulties with content influencing the implementation of inquiry-based instruction.

**The ability of Teacher PCK from Evaluation Aspects of CoRe Instruments**

The PCK teacher profile from the evaluation aspect of the CoRe instrument can be seen in Figure 8 below:

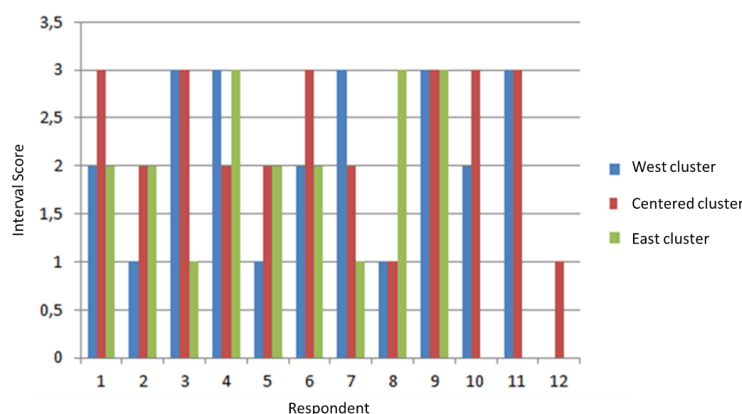


Figure 8. The PCK Teacher Profile from the Evaluation Aspect of the CoRe Instrument

Figure 8 shows that the evaluation aspect has a diverse score for each teacher in each cluster. For example, teacher 1 in the western cluster has a score of 2, teacher 1 in the middle cluster has a score of 3, while teacher 1 in the eastern cluster has a score of 2 as well. Likewise, teacher 2 in the western cluster got a score of 1, teacher 2 from the middle cluster got a score of 2, and teacher 2 from the eastern cluster got a score of 2. So

onwards up to teacher 11 in the western cluster got a score of 3, teacher 12 in the middle cluster got score 1, and teacher 9 in the eastern cluster got a score of 3 for the evaluation aspect of the total score 4.

The average acquisition of CoRe scores on the teacher's PCK profile from the evaluation aspect can be seen in Figure 9 below:

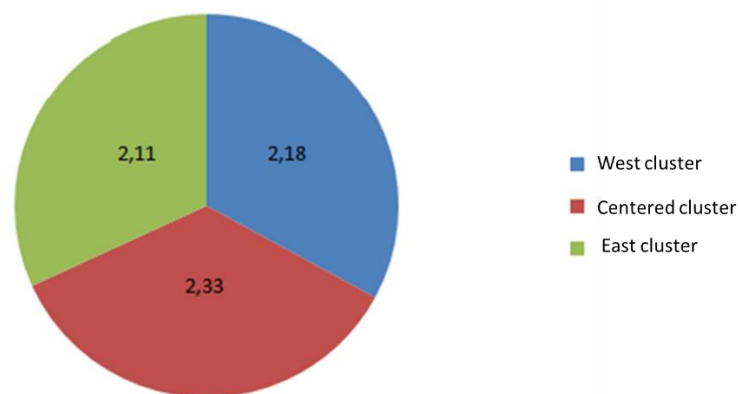


Figure 9. The average Acquisition of CoRe Scores on the Teacher's PCK Profile from the Evaluation Aspect

In the evaluation aspect, the teacher receives an average score of 2 from a maximum score of 4 if the CoRe instrument is filled properly. The teacher has used a written test. Some have used other forms of tests. The instrument developed has considered each concept for example by using

forms of essay and multiple-choice questions. The teacher also uses the principle of authentic assessment (Permendikbud, 2014) but has not been creative in developing other test instruments.

Classically as seen in Table 1 Biology teacher's PCK profile in the

Material of the Human Reproductive System in Bireuen District Public High School is at the growing level of PCK as many as 29 people and 3 people are at the pre-PCK level. Meanwhile, none of the sample people reached the PCK maturity level. The growing level of PCK means that there is already an integration between content knowledge and pedagogical knowledge of the teacher.

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## CONCLUSION

From the previous discussion, it can be concluded that the PCK profile of Biology teachers at Bireuen District Public High School is at the level of PCK growing as many as 29 people and 3 people were at the pre-PCK level. Meanwhile, none of the sample people reached the PCK maturity level. The growing level of PCK meant that there was already an integration.

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