Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Readiness of Chemistry Teachers of Riau Province Viewed from Attitude Aspect in Applying 4C (Critical Thinking, Creative Thinking, Communication and Collaboration)

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ARTICLE INFO

Article history:

Received: 27 Feb 2020
Revised: 21 June 2020
Accepted: 22 June 2020
Published online: 24 July 2020

Keywords:

4C Skills
Attitude
Academic Qualifications
Chemistry Teacher Readiness

A B S T R A C T

This study aims to determine the readiness of chemistry teachers in applying 4C skills (critical thinking, creative thinking, communication and collaboration) in terms of attitude aspects. The 4C skills are needed to prepare students to compete in the era of globalization and teachers which are the main factors for students success in mastering 21st century learning. This research was a descriptive and inferential study involving as many as 115 high school chemistry teachers in Pekanbaru City and Pelalawan district. The instruments used a Likert scale questionnaire 5 consisting of demographics of respondents and 4 variables to measure the ability of the 4C. The results of the analysis showed that the readiness of chemistry teachers in Pekanbaru City and Pelalawan regencies in Riau Province was seen from the aspect of attitudes at a high level. Data were analyzed descriptively based on mean values and standard deviations as well as independent t tests and one way anova to determine differences in the readiness of high school chemistry teachers based on gender, years of service and educational qualifications. Thus, there were significant differences in the readiness of chemistry teachers in high school levels based on educational qualifications

1. Introduction

The 21st century is a century of knowledge and technology, it is necessary to have quality human resources Quality human resources are closely related to the quality of education whose spearhead is teachers. Educator activities in teaching students is not an easy thing because these activities will be successful if carried out by educators who have a professional attitude, (Nasir et al., 2017). Educators

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Doi: https://doi.org/10.31258/jes.4.3.p.501-510

in the implementation of 21st century learning must begin one step of change, namely changing conventional teacher-centered learning patterns into student-centered learning patterns, because according to Elder (2007) teacher-centered learning does not develop students' intellectual abilities so teachers do not practice their abilities students' level of thinking, ability to communicate and collaborate. 21st Century learning gave rise to a new learning paradigm which postulated that students now need to be taught a skill adapted by P21 known as 4C skills.

The 4C skill is a super skill for the 21st century because it helps develop the qualities students need to have in the 21st century to succeed in college, career and citizenship (Saxena, 2015). According to the American National Education Association (NEA), any subject in schools, teachers must apply 4C skills to prepare students who are able to compete in the globalization economy (Partnership for 21st Century Skills, 2011; Roekel, 2017; Herdini et al., 2018)

According to Schleicher (2012), the 21st century skills should not only be used as accompaniment effects in learning, but must be really carefully designed so that these skills are well trained in learning. The teacher must be able to develop a learning plan that contains activities that challenge students to the 4C skills that must be visible in every learning plan they make. Responding to the enormous challenges as a teacher and to achieve the goals set by the government namely towards Creative Indonesia in 2045, teachers need to have high determination and be able to prepare themselves in applying the 4C skills. According to Norazlin (2018), teacher readiness is a major factor for students' success in mastering 21st century learning.

The same research conducted by Ravitz (2014) in West Virginia on teachers through the Problem Based Learning model shows that teachers who apply 4C skills through the Problem Based Learning model are able to increase the academic value of students compared to teachers who don't use 4C skills. Likewise research conducted by, Sipayung et al. (2018) shows that teachers who teach with 21st century learning oriented to 4C skills are able to improve 21st century skills in students. From the results of these studies it can be concluded that teachers must be able to apply 21st century learning so that students master and understand the contents of the lesson clearly and create creative and competitive learners.

Several studies related to teacher readiness in 21st century learning show different results. Research conducted by Dewi et al. (2015) on the readiness of chemistry teachers in Palembang shows that chemistry teachers are not fully prepared to carry out 21st century learning, this is seen from the aspect of teacher training and the development of lesson plans. While research conducted by Norazlin (2018) shows that the readiness of teachers in the teaching and learning process of the 21st century is at a high level. In contrast to research conducted by Badrul et al. (2016) which shows that the application of 21st century learning is at a moderate level. Of course this is a tough job for the government in realizing superior human resources and need high determination from all parties, especially educators as

facilitators and motivators, so it needs to be prepared especially in the teaching and learning process.

The Government in this case the Ministry of Education and Culture of the Republic of Indonesia in preparing students to have 4C skills is through the 2013 curriculum which has been revised in 2017, but in reality has not shown the expected results because based on the TIMSS test results in the VIII class of 2015 science category, Indonesia is located ranked 46th out of 48 test-taking countries with a score of 397. This shows that TIMSS test participants are still low in applying scientific knowledge and reasoning abilities. Thus, the readiness of teachers especially chemistry teachers to apply 21st century skills in learning chemistry needs to be known so that we know how prepared chemistry teachers in Riau Province especially Pekanbaru City and Pelalawan District that are in applying 4C skills in learning. According to Ganratchakan (2015), good teacher quality is shown through good knowledge and good attitude so that good teachers will certainly prepare the learning process well.

According to Saifudin, Azwar (2010) the attitude possessed by a teacher is certainly inseparable from the factors that influence the individual where the attitude is the readiness to react to certain objects manifested in the form of behavior. The results of research conducted by Nooraini et al. (2017) show that the teacher's readiness stage in carrying out learning and 21st Century Teaching is being for the aspect of attitude that is behavior and affective. Based on the background above, the authors are interested in knowing the readiness of high school level chemistry teachers in Pekanbaru City and Pelalawan Regency, Riau Province in terms of attitude aspects in applying 4C skills.

2. Methodology

This research was a quantitative survey which was conducted in two regencies in Riau Province, namely Pekanbaru City and Pelalawan Regency. This research was conducted in two stages, the first stage of a trial of research instruments conducted in July 2019, while the second stage of distributing questionnaires to chemistry teachers in two districts that were used as research respondents in October 2019. The study population was high school chemistry teachers in the city of Pekanbaru and Pelalawan Regency, Riau Province which 115 chemistry teachers consisting was sampled.

Data Collection Technique

The sampling technique used probability sampling technique with the type of cluster sampling area. Data collection techniques used in this study were questionnaire techniques (questionnaire). The questionnaire used in this study is a set of questionnaires consisting of 5 parts based on a framework adopted from Jimmi (2015).

The teacher readiness instrument was adopted from Norazlin (2018) and Partnership for 21st century skills (2015) and modified according to the researchers needs. Questionnaire was a Likert scale 5 consisting of respondents demographics in the form of gender, years of service and educational qualifications. The chemistry teacher readiness instrument on the attitude aspect consisted of 10 statements about the chemistry teacher attitude towards critical thinking, creative thinking, communication and collaboration skills (4C).

Data Analysis Technique

Data analysis techniques that was used in this study are descriptive analysis and inferential analysis techniques based on the results of questionnaire distribution. Before distributing the questionnaire, the questionnaire instrument was validated first and the instrument reliability level was based on Cronbach's Alpha values and the instrument reliability value was 0.760 with a high category. The next technique was the classic assumption test which includes the data normality test and the homegeneity test for inferential analysis techniques. The analysis shows that the data are normally distributed and homogeneous and valid. Hypothesis testing to determine whether there are differences in the readiness of chemistry teachers by sex, length of service and academic qualifications using the independent t test and the one-way ANOVA test using SPSS version 23.0.

3. Results and Discussion

Analysis of the preparedness of chemistry teachers in Pekanbaru City and Pelalawan Regency was done descriptively and inferentially. The mean (standard) and standard deviation are analyzed and interpreted, and the demographic analysis of the respondents was done as in the table 1.

Table 1. Profile of Respondent Demographics

Demographics of Respondents	Frequency	Percentage (%)
Gender		
Male	18	15.7
Girl	97	84.3
Years of service		
0-10 years	34	29.6
10-20 years	61	53.0
> 20 years old	20	17.4
Educational Qualifications		
S1	97	84.3
S2	18	15.7

Furthermore, based on the attitude aspect, the data were analyzed using descriptive statistics including the mean and standard deviations in determining the level of readiness of the chemistry teacher in applying 4C skills to learning. The mean value obtained is interpreted using the views of Nunally & Bernstein (1994). The interpretation phase of the study data is grouped into 4 stages: high,

medium and low and very low as shown in the table 2 (Nunally & Bernstein 1994).

Table .2 Interpretation of Mean (average) Scores

Mean score	Interpretation
1.00-2.00	Very low
2.01- 3.00	Low
3.01-4.00	Is
4.01-5.00	High

Descriptive analysis results are presented in the table 3.

Table 3. Interpretation of data based on attitude aspects

No.	4C Attitude Item	Mean	Standard Deviation	Interpretation
1	I have tried to build students' critical thinking skills	3.91	0.89	Moderate
2	Diverse references really helped me to get a reliable source of information	4.29	0.50	High
3	HOTS questions need to be applied to learning to practice critical thinking skills	3.97	0.61	Moderate
4	Students need to be given the opportunity to convey ideas both in writing and orally	4.17	0.53	High
5	I have tried to build communication skills in learning activities	4.29	0.57	High
6	Communication skills are very necessary in the learning process	4.32	0.46	High
7	Presenting subject matter using media that is interesting to understand students about important concepts in chemistry lessons	3.97	0.65	Moderate
8	Computers, LCD, internet makes it easy for me in the learning process	3.97	0.66	Moderate
9	Collaboration trains students to act and take responsibility	3.91	0.69	Moderate
10	Collaborative skills are easy to implement in the learning process	3.73	0.92	Moderate
	Total	**4.05**	**0.65**	**High**

Table 3 shows the attitudes of chemistry teachers in applying critical thinking skills, creative thinking, communication skills and collaboration skills (4C) in Pekanbaru City and Pelalawan District, Riau Province. Overall the attitude of chemistry teachers in applying 4C skills is in the high category with an average value of 4.05 and SD 0.65. Each item of the chemistry teacher's attitude statement in applying 4C skills is at a high level. The statement items that have the highest

mean are communication skills that are needed in the learning process (mean = 4.32 and SD = 0.46), while statement items that have the lowest mean are collaboration skills easily implemented in the learning process (mean = 3.73 and SD = 0.92).

The difference in the readiness of chemistry teachers in Pekanbaru City and Pelalawan Regency in applying 4C skills to aspects of attitude based on sex, years of service and academic qualifications was determined using SPSS Window version 23.0 by using an independent t test for gender and academic qualifications while the length of service was used the ANOVA one test the road with an Alpha significance of 0.05. Prior to data analysis, this test fulfilled the classic assumption test requirements, namely the normality test data Sig. (2-tailed) for the attitude aspect is 0.061> 0.05 and the homogeneity test of attitude data (P-value = 0.327)> from 0.05. Chemistry teacher readiness from gender based attitude aspects with independent t test can be seen in the following table:

Table 4 Independent chemistry teacher readiness t-test applies 4C skills based on sex.

Aspect		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Attitude	Equal variances assumed	0.968	0.327	0.469	113	0.640	0.390	0.832	-1.259	2.039
	Equal variances not assumed			0.531	26.926	0.600	0.390	0.735	-1.118	1.898

The table above shows that the Sig. (2-tailed) is 0.640 where 0.640> of 0.05, with the null hypothesis (H0) accepted and Ha rejected means that there is no significant difference in the chemistry teacher's readiness from the attitude variable based on sex. Chemistry teacher readiness based on work period using one way ANOVA test can be seen in the table 5.

Table 5. Anova Test Chemistry teacher readiness from the aspect of attitude based on years of service

Aspect		Sum of Squares	Df	Mean Square	F	Sig.
Attitude	Between Groups	7.971	2	3.986	0.397	0.673
	Within Groups	1124.603	112	10.041		
	Total	1132.574	114			
	Total	5947.861	114			

Table 5 shows that the P (P-value) based on attitude is 0.673, indicating that the null hypothesis (H0) is accepted and Ha is rejected which means there is no significant difference in the chemistry teacher's readiness from the attitude variable based on years of service.

The results of the independent t test analysis based on academic qualifications can be seen in the table 6.

Table 6 Independent t-test chemistry teacher readiness to apply 4C skills based on academic qualifications

Aspect		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Attitude	Equal variances assumed	.114	.736	-2.94	113	.004	-2.366	.803	-3.957	-.775
	Equal variances not assumed			-3.15	25.314	.004	-2.366	.750	-3.910	-.822

Table 6 above shows that the Sig. (2-tailed) is 0.004 where 0.004 <of 0.05, with the null hypothesis (H0) rejected and Ha accepted means that there is a significant difference in the chemistry teacher's readiness from the attitude variable based on academic qualifications. The different aspects of these attitudes based on academic qualifications can be explained in more detail in the following table 7.

Table 7. Mean (average value) of chemistry teacher readiness to apply 4C skills based on academic qualifications

	Qualification	N	Mean	Std. Deviation	Std. Error Mean
Attitude	S1	97	40.13	3.171	0.322
	S2	18	42.50	2.875	0.678

Based on the data in table 7 above, it appears that chemistry teachers with S2 academic qualifications (mean = 42.50) are higher in applying 4C skills than chemistry teachers with S1 academic qualifications (mean = 40.13).

Discussion

This research was assembled with the readiness of chemistry teachers at the Pekanbaru City and Pelalawan District High Schools in terms of attitude. The results obtained by the chemistry teacher readiness level is at a high level. This result is in line with research conducted by Norazlin Mohd Rusdin (2018) who found that the readiness of teachers to implement 21st century learning is at a high level. According to Ganratchakan Ninlawan (2015), good teacher quality is

demonstrated through good knowledge and good attitude so that good teachers will certainly prepare the learning process well.

The Attitudes based on knowledge will be more lasting than attitudes based on knowledge. Chemistry teacher readiness based on aspects of attitude on communication skills with the statement of communication skills is needed in the learning process (mean = 4.32 and SD = 0.46) is at a high level while the statement items that have the lowest mean among the other statement items are collaboration skills with items the statement of collaboration skills is easy to implement in the learning process (mean = 3.73 and SD = 0.92) but overall aspects of attitude are at a high level (mean = 4.05 and SD = 0.65).

The attitude of chemistry teachers by sex does not show a significant difference between men and women meaning that between men and women have the same readiness in applying 4C skills as well as the attitude of chemistry teachers based on tenure does not show significant differences both teachers above 20 years, 10-20 years or under 10 years means that an experienced teacher with an inexperienced teacher has the same readiness in applying 4C skills. The absence of significant differences either based on sex or based on years of service shows that chemistry teachers have the same responsibilities as professional educators.

The attitude of chemistry teachers based on academic qualifications shows a significant difference where chemistry teachers who qualify for S2 education are better prepared to apply 4C skills compared to chemistry teachers who qualify for S1 education, these results are consistent with the opinion expressed by Purwanto (2001) that the higher the level of education then will be followed by a change in mindset about something changing.

4. Conclusion

The readiness of chemistry teachers in Pekanbaru City and Pelalawan Regency is at a high level with a mean of 4.05 and a standard deviation of 6.05. The difference in the readiness of chemistry teachers in applying 4C skills based on clement type and length of service does not show a significant difference while based on academic qualifications shows a significant difference where chemistry teachers with master academic qualifications have higher readiness than chemistry teachers with bachelor academic qualifications.

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How to cite this article:

Saputri, A. E., Copriady, J., & Erna, M. (2020). Riau Teachers Province Preparation Readiness Viewed from Attitude Aspect in Applying 4c (Critical Thinking, Creative Thinking, Communication and Collaboration). *Journal of Educational Sciences*, *4(3)*, 501-510.