The influence of chemistry learning attitudes in coastal areas on understanding of knowledge related to climate change

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Abstract. Climate change has become a global threat, especially for coastal areas. Prospective chemistry teachers in coastal areas must have a deep understanding of climate change because of their strategic role. It has never been investigated before how attitudes toward learning chemistry in coastal regions affect understanding about climate change. This study looked at how attitudes toward learning chemistry in coastal areas affected students' understanding of climate change. The participants consisted of 77 chemistry teacher candidates from a maritime university in Indonesia. Data was collected using the ALCh Instrument and the Climate Change Concept Inventory (CCCI). Simple linear regression analysis results indicated a significant effect of chemistry learning attitudes on understanding related to climate change (sig. $0.018 < 0.05$). Additionally, the findings revealed that positive attitudes towards learning chemistry positively influenced the understanding of climate change, with a regression coefficient of 1.518 and R Square of 0.072.

1 Introduction

Aspects of the learning process that are rarely measured are learning attitudes. Since it has been shown to be one of the factors influencing learning achievement, the aspect of learning attitudes is crucial [1]. Learning attitudes are also one of the determining factors for future career choices [2]. Therefore, chemistry learning attitudes must be measured periodically and followed up on so that they can support achievement and career choices in the field of chemistry education.

A solid understanding of chemical concepts and their applications is necessary for prospective chemistry teachers. One form of application of chemistry in life is in the phenomenon of climate change and its handling. Humanity has a global challenge in the form of climate change, and many nations are taking notice of the problem. When it comes to mitigating climate change, chemistry is crucial. The significance of prospective chemistry teachers' comprehension of climate change is determined by their strategic role.

Previous studies have shown that students often lack a clear understanding of climate change. Students often struggle to differentiate between the ozone layer, global warming,

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and greenhouse effect [3]. Additionally, they lack a clear understanding about greenhouse gases at the particulate level. This gap in knowledge makes it challenging for them to grasp how the greenhouse effect works and how increasing carbon dioxide concentrations are connected to climate change [3].

Several factors that influence the understanding of climate change have previously been found. The curriculum, learning process, socialization of science assisted by social life experiences and information technology are some of these factors [4]. The influence of chemistry learning attitudes on understanding knowledge related to climate change has yet to be studied before. The influence of chemistry learning attitudes of prospective chemistry teachers in coastal areas on understanding climate change is a particularly intriguing area for further research, given the unique environmental characteristics of coastal areas and their differences from continental areas.

2 Method

The research method used is associative quantitative. The instrument used to collect data on learning attitudes is the Attitude to Learning Chemistry Instrument (ALChI) [2], which consists of 18 Likert scale questionnaire items. The Indonesian version of ALChI was tested and analyzed using the Rasch model. The Climate Change Concept Inventory (CCCI) [5] was used to collect data on understanding climate change, consisting of 27 multiple-choice test items. CCCI was translated into Indonesian and reviewed by a panel of 4 reviewers. The results of the panel review were analyzed using Aikens's V formula. Both translated instruments (ALChI and CCCI) were given to a diverse group of prospective chemistry teacher students from one of the maritime universities in Indonesia. The participants, totalling 77, included 10 men and 67 women from the first to the fourth year of college. Simple linear regression was used in data analysis. Before being analyzed, the data was first transformed using natural logarithms so that the analysis prerequisites (normality, linearity, non-heteroscedasticity) were met.

3 Result and discussion

The Rasch model analysis results show that the Indonesian version of ALChI fits the model. Aiken's V analysis of the panel review results of the CCCI translation shows that the V value of each item ranges from 0.75-1.00. This result shows that the translated instruments of ALChI and CCCI can be used to collect data. The linear regression analysis results in Table 1.

Table 1. Result of linear regression analysis

Model		Unstandardized Coeff.		Standardized Coeff.	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.243	2.646		-1.604	.113
	XLN	1.518	.629	.269	2.414	.018
a. Dependent Variable: YLN						

Table 1 shows a significant influence of learning attitudes on understanding related to climate change, in which the Sig. indicates a value of $0.018 < 0.05$. From Table 1, the regression coefficient is obtained with a positive value, which is 1.518. This value means that for every 1% increase in the level of learning attitudes, understanding related to climate change will growth by 1.518. Regression coefficient has a positive value (+), so, learning attitudes have a positive effect on understanding related to climate change. The constant number, as stated in Table 1, is -4.243, which means that if there is no learning attitude, the consistent value of understanding related to climate change is -4.243. Therefore, the equation is obtained in Equation 1.

$$Y = -4{,}243 + 1{,}518X \tag{1}$$

The results are in line with previous studies, where learning attitudes are one of the determining factors of learning achievement. Understanding climate change is one form of learning outcomes. In addition, one aspect of the attitude of learning chemistry is the atomic molecular perspective in chemistry learning. A good molecular perspective in learning attitudes will make it easier for students to understand the greenhouse effect, one of the climate change concepts [3]

The analysis results also indicated that the influence of chemistry learning attitudes on understanding related to climate change is 7.2%. This indicated by the R Square value of 0.072, as in Table 2. Meanwhile, 92.8% of understanding related to climate change is influenced by other factors not measured in this research. In addition to learning attitudes, several factors can influence understanding of climate change, including their social life experiences and science popularisation in social media [4].

Table 2. Output of model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.269[a]	.072	.060	.57207
a. Predictors: (Constant), XLN				

Several efforts can be made to improve learning attitudes related to the theme of climate change. Project-based learning activities on carbon dioxide capture can be used to improve scientific attitudes [6]. Bringing up phenomena that are close to students can also be one solution. Contextual learning can improve students' learning attitudes. [7].

4 Conclusion

Chemistry learning attitudes in coastal areas has positive effect on understanding of climate change. Improving attitudes toward chemistry learning in the learning process is essential for a better understanding of climate change.

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