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The Contribution of Epistemic Curiosity and its Relevance to Science Process Skills on Biology Prospective Teacher

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Abstract: The purpose of this study was to determine the contribution of epistemic curiosity (EC) to the science process skills (SPS) of prospective biology teachers. Ex post facto research design with research subjects 32 students of the third-semester biology education study program at the Mandalika University of Education. Samples were taken using the purposive sampling method. The instruments used were the State Curiosity Scale (SCS) to collect epistemic curiosity data, Student Worksheets, and the Science Process Skills rubric to collect SPS. The results showed that the magnitude of the correlation value or R relationship was 0.600. From the output, the coefficient of determination (R Square) was 0.359, this shows that EC is correlated with SPS. Meanwhile, in terms of the results of simple regression analysis, it was found that the variable X (EC) obtained the value of t_{count} = 4.103 > 1.697 t_{table} and sig. = 0.000 < 5%. This means that the EC variable contributes significantly to the SPS variable. The results obtained have not been able to describe the contribution of EC to each SPS indicator, so further research needs to analyze the contribution of EC to each SPS indicator.

Keywords: Epistemic Curiosity; Science Proses Skills; Biology; Teacher

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Introduction

Curiosity is an individual's desire to know everything in depth through observation, observation, and study. Curiosity becomes a character that has an important role in the learning process to explore the level of student enthusiasm and determine the level of understanding of the subject matter through the learning activities provided. Curiosity is important to develop because; 1) The reasoning power of students becomes active so that it is beneficial for themselves and others, 2) Students become active observers, 3) what is observed and studied always has interesting challenges for them to learn, and 4) Curiosity will eliminate student boredom to continue learning (Jannah et al., 2021).

Curiosity is an important character to be developed in learning and learning (Rowson et al., 2012). The character of curiosity is an attitude and action that always seeks to know more deeply and broadly from something that is learned, seen, and heard (Kemdiknas, 2010). (Hong et al., 2016) The individual's attitude towards an object of study is influenced by a sense of belief and evaluation of the object.

Curiosity is developed into several dimensions. (Berlyne, 1954) divides curiosity into four dimensions namely; Epistemic Curiosity (EC), perceptual curiosity (PC), specific curiosity (SC), and diverse curiosity (DC), (Mcevoy et al., 2013) *Empathic curiosity*, (Weible & Zimmerman, 2016) *Scientifik curiosity.*

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Epistemic Curiosity (EC) encourages students to engage in learning and intellectual activities to know and understand the subject matter being taught (Berlyne, 1954; K.g. et al., 2020). This is reflected in students' actions to seek new knowledge, eliminate gaps in their understanding of a topic, and engage in intellectual activities (Biggs et al., 2001). (Litman, 2008) EC affects the learning goals that students set for themselves, and determines the level of persistence or effort made to achieve the goals that have been set, both long-term goals and short-term goals.

EC reflects the desire to get new information that motivates knowledge exploration behavior through learning activities (Eren, 2009). (Berlyne, 1954; Litman, 2012) EC is the desire to acquire new knowledge (for example, concepts, ideas, and facts) which is expected to stimulate intellectual interest (type I) or eliminate the condition of lack of information (type D). (Kang et al., 2009; von Stumm et al., 2011) defines EC as the drive to seek information and eliminate gaps in knowledge which are considered important predispositions for learning complex skills. Whereas (Metcalfe et al., 2020) defines EC as a form of attention to objects in learning to explore and solve without any compelling external need. (Subaşı, 2019) EC becomes an intrinsic motivation to study and understand the material so that it can be accepted by the mind. EC is complexly determined by a combination of cognitive, affective, and motivational. EC is a motivational driver of curiosity and experimentation that underlies intellectual development and scientific achievement (Koo & Choi, 2010).

Previous research studies conducted by (Eren, 2009) EC students mainly in curiosity as a form of feeling lacking, significantly correlated with the achievement of mastery goals and student performance approach goals. (Huck et al., 2020) EC is very important in the early phase of learning. The results of the study (Tang & Salmela-Aro, 2021) show that EC can improve academic achievement in terms of two types; type interest curiosity and type deprivation curiosity.

Another study conducted by Istiani and Hasanah showed different results. EC and cognitive have a weak correlation (Istiani et al., 2018). (Hasanah et al., 2021) Students with high and moderate epistemic curiosity tend to be unable to determine appropriate problem-solving strategies.

The research that has been done focuses on the study of epistemic curiosity with the achievement of goals and performance approaches. So far, studies examining the role of two types of epistemic curiosity in science process skills, and (Tang & Salmela-Aro, 2021) specific academic achievement are still lacking and limited. The lack of studies on the contribution of epistemic curiosity to Science Process Skills is one of the reasons why one basis for assessing the contribution of epistemic curiosity in developing and improving Science Process Skills.

Science process skills are thinking skills that are able to answer the demands of learning in accordance with the principles of constructivism (Asy'ari & Fitriani, 2017). Science process skills are one of the important skills to be developed in learning because they can help students learn science process skills or inquiry skills to solve problems (Verawati et al., 2014), foster concepts (Doyan et al., 2021), and make students active in experimenting, taking responsibility, and being confident (Asy'ari et al., 2019). (Feyzïoğlu, 2009) explains that PPP is the ability to apply the steps of the scientific method to understand, apply and discover knowledge scientifically.

Science process skills are classified into two, namely basic SPS and integrated SPS. Basic SPS is a skill in learning that forms concepts that include (Observing, Classifying, Inference, Measuring, Communicating, Predicting) (Aktamış & Yenice, 2010). Integrated SPS is a skill to solve problems, and skills to conduct experiments (Hunaepi et al., 2020; Rauf et al., 2013; Sheeba, 2013), this SPS includes; (Identify variables, formulate hypotheses, tabulate and describe data in graphs, define variables, design experiments, and conduct experiments) (Ongowo & Indoshi, 2013; Trnova & Trna, 2016).

Based on the description that has been presented, the purpose of this study is to describe the contribution of epistemic curiosity to its relevance to students' science process skills. SPS measured on the indicator; 1) Observation, 2) Formulating the problem, 3) Hypothesis, 4) Identification of variables, (SPS integration), 5) Defining variables (SPS Integration), and 6) Experimental design.

Method

This research is ex post facto research. This study uses a quantitative approach with a correlational design because the research tries to find out the relationship between the correlated variables.

The object of this research is the third-semester students of biology education, Faculty of Engineering and Applied Science, Mandalika University of Education, totaling 32 people who were taken by purposive sampling.

The instrument used in collecting epistemic curiosity data is the State Curiosity Scale (SCS) developed by (Leherissey, 1971). The alpha reliability coefficient for the 20 SCS items was found to be .82, with a mean of 48.80 and a standard deviation of 9.39. The instruments used to collect SPS data are Student

Worksheets and SPS Rubrics which are designed to measure basic and integrated science process skills.

Researchers collect quantitative data, statistically analyzed to show the trend of the responses given by the target population about the phenomena discussed (Creswell, 2014). The data analyzed were in the form of questionnaire results and data on the results of science process skills. After the data is obtained and tabulated and the data is processed using the SPSS application.

Result and Discussion

This study aims to describe the contribution of Epistemic Curiosity its relevance to Science Process Skills in a descriptive analysis using a simple linear regression test. The results of the prerequisite test using the Shapiro Wilk test showed that epistemic curiosity and science process skills were normally distributed (0.359 > 0.05) so that a simple regression test could be performed to determine the contribution of EC to SPS. Below, the results of the analysis of the relationship between EC and SPS are presented in Table 1.

Table 1. Correlation value between EC and SPS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.600[a]	.359	.338	1.902

The table above shows that the magnitude of the correlation value or R relationship is 0.600. From the output, the coefficient of determination (R Square) is 0.359, the contribution of EC to SPS is 35.9%.

Table 2. Results of simple regression analysis of EC and SPS

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig
	B	Std. Error	Beta		
Const	18.908	2.294		8.243	.000
EC	.174	.042	.600	4.103	.000

The table above shows the following simple regression equation Y = 18.908 =.174. This shows that the constant value is 18.908 and the coefficient value is X = 0.174. (if the constant value increases by one point, it will cause an increase in the SPS variable by 0.174. Thus, it can be said that EC has a positive contribution to SPS. The results of statistical testing using SPSS on variable X (EC) obtained the value of account = 4.103>1.697ttable and sig. = 0.000 < 5%, this means that the EC variable contributes significantly to the SPS variable.

This finding indicates that epistemic curiosity has a role in improving science process skills. The effective contribution of epistemic curiosity to science process skills is 0.174.

The results of this study are in line with the opinion outlined by (J. J. Jirout, 2020) that curiosity can encourage motivation to carry out scientific investigations through the process of scientific thinking. Scientific thinking is a knowledge-seeking activity that involves searching for information starting from asking questions, formulating hypotheses, making predictions, determining variables, making observations, collecting data, and making conclusions (Jirout & Zimmerman, 2015). The indicators presented in scientific thinking are part of the PPP indicators used in this study.

(Veronicatama et al., 2016) stated that students who have a high curiosity about biology will study the material seriously, are interested in scientific activities, such as (Hunaepi et al., 2020) making observations and observations to collect information, find facts related to learning materials. Having an interest in these activities will provide a meaningful experience (Abdullah et al., 2015).

The existence of epistemic curiosity does not only have an impact on the development of science process skills. However, being (Mussel, 2010; Tamdogon, 2006) becomes an important variable in various fields that facilitate cognitive development and the development of academic skills. (K.g. et al., 2020) stated that epistemic curiosity can function as a monitor to measure students' intellectual abilities.

Biology education students as prospective biology teachers have become imperative to have the character of curiosity and science process skills because this ability will make it easier for them to prepare themselves as teachers. (Trnova & Trna, 2016) stated that they not only need knowledge of conceptual understanding related to scientific activities and methods, they also need to acquire planning and teaching skills to accompany the use of scientific methods for student learning.

Conclusion

The research findings show that epistemic curiosity has a positive contribution to the science process skills of prospective biology teacher students. Although there are positive contributions. However, this study has not shown the contribution of epistemic curiosity to each science process skill. So to find out the epistemic curiosity contribution to each science process skill indicator, there needs to be a study that examines more deeply each indicator.

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