

Research Article

The low level of biology teacher candidate questioning skills



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ABSTRACT

Questioning skills is one of competencies required by teachers in dealing with the 21st-Century challenges. The purpose of this study was profiling biology teacher candidates' questioning skills in Pekanbaru. The subjects of the research were the students, in three institutions, who were taking Zoology course. The total number of the subjects were 278 students selected using purposive random sampling. The instrument used was test contained of five items which instructed students to make questions related to five objects. The results showed that the teacher candidates' question level in three institution were low-level question (more than 50% in C1-C3 level). The questions posed were dominance in the level of memorizing, understanding, applying, and analyzing. They were not accustomed to asking questions with the evaluating and creating levels. The systematic of question was dominated as a divergent question, while the question area asked was dominated in the physiology (32.93%) and morphology (32.14%) concept. The information gained from this study can be consideration point for further research.



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INTRODUCTION

Learning in the 21st-Century requires the development of students' critical thinking skills (Changwong, Sukkamart, & Sisan, 2018; Maryuningsih, Hidayat, Riandi, & Rustaman, 2019) and problem-solving (Binkley et al., 2014; Priemer et al., 2020). One way to do this is to ask questions in class to facilitate discussion and make students think (Albergaria-Almeida, 2011; Schoenberger-Orgad & Spiller, 2014). In this case the teacher must have good questioning skills (Albergaria-Almeida, 2011; Zolfaghari, Fathi, & Hashemi, 2011). The teacher uses questions to ensure that students are attentive and involved in the learning process and to assess student understanding (Yenmez, Erbas, Cakiroglu, Cetinkaya, & Alacaci, 2018). The ability to ask and answer questions is very important in learning. Therefore, questioning skills must also be possessed by teacher candidate students (Akkaya & Demirel, 2012).

Teacher candidate students need to prepare techniques for providing feedback (Daniel, Auhl, & Hastings, 2013), providing criticism as affirmative and formative actions. The importance of professional dialogue as part of their development as future teachers, and as part of professional practice, is also highlighted (Sahamid, 2016). In the learning process, a teacher must have techniques that tend to vary according to several factors including the subject content characteristics, class size, and physical conditions in the class (Sahamid, 2016; Seman, 2018). One technique that teachers must regularly use in class is questioning. A good questioning technique will bring up many creative answers and bring up other questions that are "extraordinary" from students (Zolfaghari et al., 2011). Besides, according to Santi, Soendjoto, and Winarti (2018), a good questioning is both a methodology and an art. It can make a significant contribution to improve teaching and learning. However, the good question is not always effective. Effective questioning techniques are very important mastered by teacher candidate students to control the learning process to achieve the learning goals. The technique of asking is as important as the technique of answering questions, but the essence of learning always starts from "wanting to know" then we get the answer from what we are looking for (Saputri, Sajidan, Rinanto, Afandi, & Prasetyanti, 2019). A structured feedback framework is provided to improve the critical nature of students (Pedrosa-de-Jesus, Moreira, Lopes, & Watts, 2014), focusing on the specifics of the skills being trained.

On the other hand, the use of questioning skills is essential to a systematic investigation in any subject area. In such an investigation: 1) one asks questions to identify the reason for the investigation, 2) questions are asked to direct searching for information and to synthesize what has been discovered, and 3) the conclusions resulting from investigations are evaluated via questions (Nappi, 2017). However, using questions to assist students' investigations is a relatively new technique in schools. In the past, teachers primarily questioned students to ascertain whether or not they were learning the book content and to see if students were paying attention in class (Lihui, Qun, Feng, & Qin Yuqing, 2015). Engaging in reflective processes enables educators to refine their practice, in response to the contextual circumstances of their work, and supports the continuous development of effective pedagogy, processes, and policies in schools in response to changing knowledge in the field. Engaging in critical reflection and dialogue contributes to the establishment of teaching as a community of practice and its ultimate recognition as a profession (Amin & Adiansyah, 2018). Through this study, it is thought that to determine teacher candidates' questioning skills in an effective teaching process can contribute to the research, educators and teachers education programs.

Some studies indicate that teachers also view questioning as a basic way to stimulate student thought and to guide the development of knowledge (Amin, Corebima, Zubaidah, & Mahanal, 2017; Arsal, 2015; Bahri & Idris, 2018) and encourage children to express themselves orally (Burton, 2010). In addition, teachers should consider questioning to motivate students to think (Daniel et al., 2013; de Boer, Janssen, van Driel, & Dam, 2019). Questioning skills can also be used to evaluate the learning of students (Carlson et al., 2014; DeWaeltsche, 2015). According to Dustova and Cotton (2014) asking questions can have a positive impact on student learning and most teachers are aware that verbal questioning can facilitate student learning. Researchers studying traditional face-to-face classroom discourses pointed out that teachers' questions can facilitate dialogic inquiry as stated by Etemadzadeh, Seifi, and Far (2013).

Although it is recognized that the question plays an important role in the learning process, in Indonesia, the questions asked by teachers are questions at a low cognitive level (memorization and understanding) and ask more close-ended questions than open-ended questions (Cahyani, Nurjaya, & Sriasih, 2015; Saun, 2015; Zahra, Kusmayadi, & Usodo, 2016). The low-level question can't stimulate ongoing thinking and inquiry for students (Albergaria-Almeida, 2011; James, Morse, & Howarth, 2010; Martinho, Almeida, & Teixeira-Dias, 2014). The small number of teacher questions that are open and demand high-level thinking shows that learning science in schools still has not trained students to develop high-level thinking and reasoning and the results also indicate that an increase in the teacher's questioning ability is still needed. Based on the results of the research above, it was concluded that the development of critical questioning skills must be done as early as possible because it is very important in improving teacher candidate student competence.

Questioning skills are very closely related to science learning, such as biology learning, which emphasizes mastery of concepts, and in practice is more dominant on rote learning. Rote learning is not so long stored in the memory of students, this is because there are not many senses involved (Tan, 2014). By starting with a critical question, students will be able to think in their inquiry learning (Clark, Harbaugh, & Seider, 2019; Pedrosa-de-Jesus et al., 2014). Based on these explanations, indicated that inquiry learning can be initiate by teachers' questions at the beginning of the lesson. Questioning skills are related to critical thinking skills, which are the basis for someone in finding out something (Adams, 2015; Mayweg-Paus, Thiebach, & Jucks, 2016; Nappi, 2017; Pedrosa-de-Jesus et al., 2014). It means delving deeper and asking questions like: Why is that so? Where is the evidence? How good is that evidence? Is this a good argument? Is it biased? Is it verifiable? What are the alternative explanations? Critical thinking moves us beyond mere description and into the realms

of scientific inference and reasoning. For many scientists, critical thinking becomes (seemingly) intuitive, but like any skill set, critical thinking needs to be taught and cultivated. Unfortunately, teachers are unable to deposit these skills directly into their students' heads. Critical thinking itself needs to be experienced first-hand by practice their questioning skills. Therefore, questioning skills must be familiarized in each education unit. Based on the description above, critical questioning skills are very important to be studied more deeply. Therefore, this study tried to conduct profiling research related to questioning skills of biology teacher candidate students in Pekanbaru, Riau, Indonesia. By knowing the questioning skills profiles of biology teacher candidate students, especially in Riau, can be a foundation for sustainability in improving these skills. This is related to the importance of questioning skills that must be possessed by biology teachers to achieve learning success. Questioning skills are the basis for successful communication between teachers and students to construct meaningful learning.

METHOD

This descriptive study was using students in three institutions as the research subject. The chosen institution was the institute of teachers' education in Pekanbaru, Riau, Indonesia. The subjects use are students who were taking the Zoology course. The total number of the subjects were 278 students selected using purposive random sampling, as presented in Table 1. To obtain the relevant data, the instrument used was a test contained five items that instructed students to make questions related to five objects. Then, the questions proposed by respondents were analyzed to find their level question (low-level question and high-level question), so that it is expected to obtain a profile of biology teacher candidates' questioning skills. The low-level question, in this case, is low according to the cognitive level C1-C3. Meanwhile, the cognitive level C4-C6 is categorized as a high-level question. The data obtained were analyzed using quantitative and qualitative analysis. Quantitative analysis was done by categorizing the level of students' question as low-level question or high-level question (accompanied by looking for percentages), the systematic of question (divergent or convergent), and the direction of question (or question area asked). Meanwhile, the qualitative analysis was conduct by examining the level of students' questions and identify the result.

Table 1. Research sample

No	Institute of Teachers' education	Number of respondent (Students)
1	Universitas Riau	88
2	Universitas Lancang Kuning	76
3	Universitas Islam Riau	114
Total of respondent		278

RESULTS AND DISCUSSION

The distribution of the level and systematic of the question proposed by students is shown in Table 2. It can be explained that biology teacher candidates in Universitas Riau have the level of questions ranging from highest to lowest, respectively are C4 (30.55%), C2 (26.86%), C1 (25.08%), C3 (16.52%), C5 (0.86), and C6 (0.12%). In Universitas Lancang Kuning, the level of students' question are C2 (29.14%), C1 (27.09%), C4 (26.41%), C3 (17.23%), C5 (0.14), and C6 (0.00%). Meanwhile, in Universitas Islam Riau, the result showed that the level of students' question from highest to lowest are C4 (29.67%), C2 (28.54%), C1 (27.97%), C3 (12.97%), C5 (0.85), and C6 (0.00%). Based on this result, the question proposed by biology teacher candidates in the three institution were categorized as low-level question (more than 50% in C1-C3 level). However, the highest question's level reached by students at Universitas Riau and Universitas Islam Riau is at C4 level, in contrast with Universitas Lancang Kuning which has the highest level of questions proposed at C2 level.

The results showed that the questioning skills of biology teacher candidate students at three institution were still relatively low. This is also reinforced by the results of question's systematic which is dominate by divergent questions (shown in Table 2). The data showed that from Universitas Riau, Universitas Lancang Kuning and Universitas Islam Riau, percentages of the divergent question were 87.63%, 89.71%, and 91.18% respectively. Different questions are questions that are in line with different mindsets. This is very good for a scientist (Sahamid, 2016). However, the factor that further determines the level of one's questioning skills is the level of questions made (Coutinho & Almeida, 2014). The question proposed by students are only dominant at the level of memorizing, understanding, applying, and analyzing. They are not accustomed to asking questions with the category evaluating and creating level. This can be occurred because teacher candidate students are not accustomed to formulating high-level questions. Ramadhan, Mahanal, and Zubaidah (2017) state that the

ability to ask questions is a reflection of students' level of thinking. The more often students ask questions, the more often the lecturer gives feedback. Then students can give their answers or opinions, so the interaction between them becomes more meaningful (Hu, Chiu, & Chiou, 2019; Pedrosa-de-Jesus et al., 2014; Ramadhan et al., 2017; Santosa, 2012).

A teacher cannot just stand up while saying "Any questions? Are there anything want to be asked? Don't you understood?" It certainly makes students feel ashamed to ask questions, lack of confidence, and afraid to ask. Therefore it cannot encourage students to ask. A teacher should give questions that are responsive to students to develop students' way of thinking (Grant & Smith, 2018). One alternative to improving students' thinking skills is to promote various questions that stimulate students' thinking processes. Questions are sparks that trigger students' thought processes and one of the most important uses of questions is to spur higher thinking skills (Whiley, Witt, Colvin, Sapiains Arrue, & Kotir, 2017). According to Mayweg-Paus et al. (2016), the implementation of learning is a relevant experience for the continuous learning of teacher candidate students in developing new knowledge about the subject matter, pedagogical aspects, and learner cognition. This knowledge plays a role in the improvement of subsequent learning.

Table 2. Distribution of the level and systematic of question proposed by students

No.	Institute of teachers' education	Object	Level of questions (%)						The systematic of question (%)	
			C1	C2	C3	C4	C5	C6	Divergent	Convergent
1	Universitas Riau (88 students)	SP 1	5.59	3.63	4.75	6.18	0.21	0.00	22.04	4.19
		SP 2	3.92	5.29	3.42	8.20	0.12	0.03	17.63	2.58
		SP 3	6.27	5.74	2.73	8.35	0.42	0.09	16.45	1.94
		SP 4	3.71	5.85	3.06	4.67	0.03	0.00	15.48	1.94
		SP 5	5.59	6.36	2.56	3.15	0.09	0.00	16.02	1.72
	Total	25.08	26.86	16.52	30.55	0.86	0.12	87.63	12.37	
2	Universitas Lancang Kuning (76 students)	SP 1	5.56	6.38	3.86	6.00	0.00	0.00	20.11	3.09
		SP 2	3.92	4.81	4.61	7.85	0.10	0.00	20.80	2.74
		SP 3	8.46	3.65	3.21	5.22	0.00	0.00	16.91	2.06
		SP 4	5.36	6.35	2.87	3.92	0.03	0.00	16.11	1.71
		SP 5	3.79	7.95	2.70	3.41	0.00	0.00	15.77	0.69
	Total	27.09	29.14	17.23	26.41	0.14	0.00	89.71	10.29	
3	Universitas Islam Riau (114 students)	SP 1	5.92	6.82	4.19	8.98	0.15	0.00	20.12	2.48
		SP 2	7.27	7.67	5.87	6.04	0.38	0.00	19.95	2.14
		SP 3	6.45	6.82	2.16	6.70	0.33	0.00	18.32	1.46
		SP 4	4.99	3.21	0.43	5.24	0.00	0.00	16.87	1.71
		SP 5	3.34	4.01	0.33	2.71	0.00	0.00	15.92	1.03
	Total	27.97	28.54	12.97	29.67	0.85	0.00	91.18	8.82	

Furthermore, Table 3 shows the recapitulation of the direction of question proposed by students in three institution. The direction of the questions proposed by students was dominated by concepts of physiology (32.93%) and morphology (32.14%). The high of these two concepts is due to two causes, the first students do not know the concept, and secondly, the students' questioning skills are lack development. Therefore the direction of questions is only limited to what they know. For example, if students see the shape of *Chiton* sp. which does not have legs, they will ask about the shape of the feet. The other example, if students see *Portunus* sp. mating, then they immediately ask how the mating crab process. The two causes are interrelated, but it is fundamentally concluded that someone who already has a high level of questioning skills will propose questions is not only limited to the concepts of physiology and morphology. Thus the pattern of critical questions of biology teacher candidate students at three universities is to ask questions according to what they remember, know, and see. It is shows that their critical thinking are not well developed. In general, critical questioning skills can be developed by way of practice. This means that each student is accustomed to always ask questions related to biological concepts. Not only should that, but the questions they ask also be proven so that responsibility and curiosity arise when they ask questions and find their answers. Mutakinati, Anwari, and Yoshisuke (2018) argue that to be an effective questioner is not is something inborn talent and few teachers who can master it, but it is something that can be improved skills through exercises. The critical questioning skills are high-level questioning skills that bring a person to find advanced questions to find a complete answer, thus causing his critical thinking skills to develop (Hu et al., 2019; Mayweg-Paus et al., 2016; Nappi, 2017; Pedrosa-de-Jesus et al., 2014).

Asking questions encourages students to think critically. It is also important in problem-solving and decision making (Adams, 2015; Torabizadeh, Homayuni, & Moattari, 2018). From this case, it can be seen that students' willingness to ask questions is still relatively low because the question level categorizes as the low-level questions. Asking questions is a key activity in carrying out active and meaningful learning. The questioning

skills become indicators of students' thinking abilities that are known through quantity and quality (Mutakinati et al., 2018). Critical thinking has meaning, namely the power of thinking that must be built on students so that it becomes a character or personality that is engraved in a student's life to solve all his life problems. Critical thinking skills are very important for students because with these skills students are able to be rational and choose the best alternative for themselves. Students who have critical thinking skills will always ask themselves in facing all their problems to determine the best for themselves. They have the ability to identify the relationship of several statements of questions, concepts, descriptions, and various models used to reflect thoughts, views, beliefs, decisions, reasons, information and opinions. Students have critical thinking skills if always involved with exercises and habits that can stimulate them to think critically (Toy & Ok, 2012). Critical thinking is also a way of thinking that brings up various reasons in your mind (Nappi, 2017). The reasoning skill that arises will lead to the emergence of critical questioning skills. Questioning skills especially critical questioning skills of biology teacher candidate students must be developed as early as possible.

Table 3. Recapitulation of the direction of question proposed by students

No	Institute of teachers' education	Direction of question (%)					
		Morphology	Anatomy	Physiology	Ecology	Lack (-)	Excess (+)
1	Universitas Riau	9.14	9.11	12.57	1.70	0.07	0.13
2	Universitas Lancang Kuning	10.64	8.73	7.47	1.25	0.23	0.18
3	Universitas Islam Riau	12.36	10.58	12.89	2.64	0.16	0.16
Total		32.14	28.43	32.93	5.59	0.46	0.47

In addition, critical thinking can improve one's intelligence that will not arise without motivation in a person (Wartono, Hudha, & Batlolona, 2018; Zhou, Yan, Zhao, Liu, & Xing, 2012). Effective questioning skills can provide quality learning that is more meaningful and enjoyable, resulting in direct teacher-student interaction (Mergler & Spooner-Lane, 2012; Widiyowati, 2015). Therefore, we need a way to be able to bring up and increase student motivation. The motivation for learning is integrated into the right learning strategy, such as inquiry, problem-based learning, etc. The students' questioning skills is very important possessed by biology teacher candidate because it will greatly help them to prepare 21st-century challenge in the learning process.

CONCLUSION

The profile of questioning skills of biology teacher candidate students' in three institutions was categorized as a low-level question (more than 50% in C1-C3 level). The questions posed were dominance in the level of memorizing, understanding, applying, and analyzing. They were not accustomed to asking questions with the evaluating and creating levels. The systematic question was dominated as a divergent question, while the question area asked was dominated in the physiology (32.93%) and morphology (32.14%) concept. The study finds that the low level of students' questioning skills due to the lack of critical thinking. It can be improved using habituation in the learning process which accommodates students' questioning skills.

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