

STUDENT TEACHERS' COMPETENCIES FOR INQUIRY-BASED TEACHING

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Abstract

The complex process of planning inquiry-based teaching requires the appropriate teachers' professional competencies. Only those teachers, who have sufficient theoretical knowledge of the characteristics and specific features of inquiry-based learning, pedagogical and methodical skills for its successful implementation, and positive conceptions on its application in teaching practice, will be able to carry it out competently, and thus achieve all its benefits. Previous research has shown that teachers often resort to traditional teaching strategies because of the lack of the competencies needed for the organization of inquiry-based learning. That is why it is important to develop these competencies during future teachers' formal education. This paper presents the results of the research with the aim of determining the level of student teachers' competencies in inquiry-based teaching in primary science classes, including their knowledge and beliefs about inquiry-based learning, their skills for its effective organization, and the relationship between these three variables. Also, the research aims to determine whether future teachers have any misconceptions about inquiry-based learning. The research was conducted using a sample of 180 students from the Faculty of Teacher Education, University of Zagreb. The obtained results show a high level of students' knowledge about the basic features of inquiry-based learning, and their positive beliefs about its application in primary science classes. However, students self-evaluated their skills in the organization of inquiry-based teaching as partially developed. The results also show the positive correlation between these three variables. Based on the results of this research, recommendations have been made for the development of future teachers' competencies in the organization and implementation of inquiry-based learning in primary science classes.

Keywords: beliefs, inquiry-based learning, knowledge, primary science education, skills.

1 INTRODUCTION

The way that future primary education teachers will teach greatly depends on the knowledge and competencies they acquire during their initial training. The acquisition of competencies of "21st-century teachers" is a permanent and complex process whereby teachers continuously, starting with formal education, professional development, and lifelong learning, improve their competencies in order to achieve and maintain a high quality of the profession in line with the changing requirements that they have to meet on a daily basis [1], [2]. Teachers' competence areas range from basic to very specific and professional ones and do not exist independently and separately. For teachers this means that their competencies must be reflected in their professional work, knowledge, skills, and attitudes that enable them to have a successful educational approach to students. However, a frequent opinion expressed by preservice teachers is that after completing their initial education and obtaining their diploma, they lack practical teaching skills and need better networking of theoretical and practical knowledge, particularly the knowledge related to contemporary teaching strategies methods [3]. Therefore, such connections should be carried out during their formal education at teaching studies. Traditional principles and teacher education models, based on declarative knowledge obtained during the five years of study, lose their dominant position concerning to new reflective models of higher education where students, instead of declarative knowledge, develop competencies which involve a combination of knowledge and experience [4].

Future teachers master the outcomes of the teacher education curriculum with great interest and expectations. However, the question that arises is what quality of knowledge and experience they have for professional teaching after completing their teacher training and what is the level of their competencies achieved for their future profession. By changing the role of teachers from mere realises to co-creators of the curriculum acting autonomously and competently as critical intellectuals in the best interest of their students and in line with the specific professional standards and ethical rules of the teaching profession, requirements for the possession of features and competencies that will enable them to achieve that role change as well. Based on an analysis of educational documents

Razdevšek – Pučko [5], concluded that one of the most desirable teachers' competencies in the contemporary education system is the competence to apply modern curricula that encourage students' active participation in the learning process, with a particular emphasis given to inquiry-based learning. Inquiry-based teaching approach and development of students' scientific competence are also key components of contemporary Science curricula in primary grade classes. They require teachers who will know how to realize them. For that, they need adequate education and competencies. The absence of a unique and unequivocal agreement by experts on what key competencies the teacher needs to be qualified for the quality and efficient organization of inquiry-based teaching [6], [7] implies some difficulties that have an impact on the training of future teachers for their implementation in everyday practice. Dostal [8], building on the research mentioned, divides teachers' competencies to be applied in inquiry-based teaching into key competencies, basic competencies, and the other competencies. However, to define the basic compilation of teachers' competencies needed for the organization of inquiry-based teaching, a larger number of scientists used the National Science Education Standards which have been used in the United States since 1996, [9], [10], [11].

The basic teachers' knowledge, necessary for the successful organization and implementation of inquiry-based teaching of Science, includes content knowledge of the main subject, adequate knowledge about the nature of science, implementation of authentic scientific research, basic pedagogical-psychological knowledge, and methodological knowledge for the organization and implementation of inquiry-based learning. In addition to the cognitive component, competencies for conducting inquiry-based teaching include developing adequate skills and abilities for its methodological design and implementation, as well as positive attitudes to learning and teaching a specific subject, and teachers' positive self-efficacy beliefs in this area. The implementation of inquiry-based teaching in the everyday teaching practice also depends on teachers' attitudes and beliefs about inquiry-based teaching and the curriculum recommendations for inquiry-based learning [12]. Teacher competencies for conducting inquiry-based teaching are key to increasing students' scientific literacy, consisting of a meaningful understanding of scientific facts and concepts, improving their scientific skills [13] and interest in science. Therefore, their development is a priority in the formal education of future teachers.

Previous research has shown that primary education teachers, especially preservice teachers, have significant difficulties in conducting inquiry-based science teaching [14]. The causes of such findings can be found in their lack of knowledge about authentic scientific research and how to implement inquiry-based learning into the teaching practice [15], [16].

Kirschner, Sweller and Clark [17], emphasizing the importance of teacher competencies for the effective application of inquiry-based teaching, draw attention to the fact that teachers do often not apply inquiry-based teaching because they think they are incompetent for its implementation. As experienced teachers often do not use inquiry-based teaching in their practice, the consequence is that preservice teachers, despite high expectations, have limited opportunities to observe inquiry-based learning in their mentors' classes in schools [18]. This creates a vicious circle that needs to be interrupted by developing adequate future teachers' knowledge, skills, and positive beliefs needed for the quality application of inquiry-based teaching.

Analysing teachers' knowledge of inquiry-based learning, Demir and Abell [19] identified the discrepancy and inconsistency of teachers' understanding of inquiry-based teaching with definitions presented by key educational documents and educational experts. Their finding is also confirmed by Leon [20] who pointed out that teachers understand inquiry-based learning in different ways, to the extent that some of them do not understand what inquiry-based learning actually is and what its basic features are. Therefore, he suggested a clearer definition of inquiry-based learning and teaching in the curriculum and acquiring adequate student teachers' knowledge about inquiry-based learning during their formal education.

It would certainly be pretentious to expect teachers to understand and implement inquiry-based teaching only on the basis of analysis of educational documents that define such teaching or by listening to lectures on research. Varma, Volkman and Hanuscin [10] emphasize the importance of multiple teachers' experience in implementing different inquiry-based learning levels to develop their understanding of inquiry-based teaching and considered the many benefits of inquiry-based learning in a constructivist environment. The empirical application of inquiry-based learning throughout the future teachers' education is of paramount importance for building an understanding of inquiry-based learning [21]. Lee and Shea [22] determined that preservice teachers had a simplified understanding of inquiry-based learning and that practical training for applying the scientific method significantly affects their better understanding of this teaching strategy and its application in the teaching practice.

Fazio, Melville, Bartley, and Jones [23] determined that the teachers' ability to practice inquiry-based teaching depends on their personal experience of inquiry-based learning and the ability to contemplate about the possibility of its implementation in their personal teaching activities. Many studies are dealing with the analysis of the implementation of inquiry-based teaching by teachers who had just completed a faculty of teacher education identify gaps in their understanding of inquiry-based teaching and the interconnectedness of their past educational experiences with the understanding of inquiry-based learning and the way of its organization [24], [25], [26], [27].

In order to achieve the vision of a scientific literate society, it is particularly necessary to build the desired level of teachers' competencies for the implementation of inquiry-based teaching and to harmonize their concepts, knowledge, and beliefs with the objectives and tasks of science education, which can be achieved at the level of their initial education at faculties.

2 METHODOLOGY

2.1 Research aim

This research aims to determine the level of student teachers' competencies in inquiry-based teaching in primary Science classes, including their knowledge and beliefs about inquiry-based learning, effective organization skills, and the relationship between these three variables. Furthermore, the research aims to determine whether future teachers have any misconceptions about inquiry-based learning.

2.2 Research problems

The following research problems have been formulated based on the general research aim:

- 1 What is the level of student teachers' knowledge about basic inquiry-based learning and teaching features?
- 2 What misconceptions about inquiry-based learning and teaching have been detected among teacher education students?
- 3 What are the student teachers' beliefs about inquiry-based learning and teaching? (positive, negative, or indeterminate)
- 4 How do student teachers self-assess the development of their personal competencies (knowledge and skills) to apply inquiry-based teaching in primary grade science classes?
- 5 Is there a statistically significant difference between the variables: knowledge, beliefs (about inquiry-based teaching and learning) and self-assessment of personal competencies for its organization?
- 6 Is there a correlation between the variables: knowledge, beliefs (about inquiry-based teaching and learning) and student self-assessment of personal competencies for its organization?

2.3 Research instruments

A special questionnaire was developed for the purpose of this research. The first part of the questionnaire collected demographic data on the respondents, their gender, year of study, completed secondary school, and average grade during their studies. The second part of the questionnaire contained 70 statements that determined future teachers' competencies (knowledge, skills, and attitudes) for applying inquiry-based teaching.

The claims were divided into three scales. The first scale (30 items) examined students' knowledge and misconceptions about inquiry-based learning and teaching. In the second scale (20 items), student teachers self-assessed their personal competencies (skills and knowledge) for the organization and application of inquiry-based learning and teaching, and the third scale (20 items) examined their beliefs and attitudes about the same. Respondents assessed the claims on a five-point Likert-type scale (from 1-strongly disagree to 5-completely agree, i.e., when assessing the development of their skills and knowledge - on a scale from 1-not fully developed to 5-fully developed).

2.4 Data processing methods

The study results have been processed and presented by standard scientific-statistical methods, supported by the IBM SPSS Statistics 20 program package. Descriptive statistics were calculated, i.e., the values of the arithmetic mean and standard deviation of the subjects' responses on individual scales and subscales. A one-way analysis of the variance was used to determine the differences in the subjects' replies to certain subscales of the questionnaire. For the determination of the relevant link between variables, the Pearson's correlation coefficient was calculated.

2.5 Research sample

The research was conducted through a survey, and the sample included student teachers attending the third, fourth, and fifth year of study (N = 179) at the Faculty of Teacher Education, University of Zagreb. Students of the fifth year of study were selected because they passed their methodological training and attended the course subject Methodical Approach to Teaching Science and Social Science. Students of the fourth year of study were selected because they attended the theoretical part of the lectures in the field of the same subject, and students of the third year of study because during their studies they passed general pedagogical-psychological courses during which they were able to learn the basic features of inquiry-based learning but did not have the opportunity to gain an insight into its methodological application in specific subjects.

The sample predominantly included female respondents (95%). Concerning the year of study, the respondents were divided into three groups: 20% were students of the third year, 47% were students of the fourth year, and 33% were students of the fifth year of teacher education.

3 RESULTS

To respond to the research problems, before statistical data processing, the total results on the scales and subscales of the questionnaire were calculated, descriptive statistics and the normality of distributions of dependent variables, as well as distribution curvature and kurtosis were checked. All distributions of individual items' results are statistically significantly different from the normal distribution, with a risk of 1%. However, the overall results on the scale and subscales of competencies and lack of knowledge follow a normal distribution. In further data processing, the focus will be on the overall results, so parametric statistical procedures are justified. This is justified even for items that do not follow a normal distribution and because the results of skewness and kurtosis of the distribution show that no variable has a serious distortion in the appearance of the distribution because skewness never exceeds 3, and kurtosis never exceeds 10 [28].

3.1 Student teachers' knowledge about inquiry-based learning

The results for the research question "What is the level of students' knowledge about the basic features of inquiry-based learning and teaching?" are shown in Table 1.

Table 1. Mean result on variables relating to knowledge, lack of knowledge, and misconception about inquiry-based learning and teaching

<i>Knowledge scale - subscales</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>df</i>	<i>p</i>
Knowledge	4.1	0.36	682.9	2	<0.01
Lack of knowledge	2.7	0.46			
Misconceptions	2.5	0.56			

The results of arithmetic mean for the knowledge variables is $M = 4.1$, $SD = 0.36$, while the mean result on the lack of knowledge variables is $M = 2.7$, $SD = 0.46$, and misconceptions $M = 2.5$, $SD = 0.56$. From the results, we can conclude that students' knowledge is higher than lack of knowledge ignorance and misconceptions. The analysis of variance for repeated measurements shows that this difference is statistically significant ($F = 682.9$; $df = 2$; $p < 0.01$) and that the differences are significant between all measurement pairs. In other words, knowledge is on the highest level, followed by ignorance, and finally misconception.

These results show a high level of students' knowledge about inquiry-based learning, which is the basic precondition for its quality implementation in teaching practice. This knowledge refers to the epistemological definition of inquiry-based learning and knowledge of its basic levels, including knowledge of how to raise students' interest in research, how to use their previous knowledge, how to encourage them to participate in certain levels of inquiry, and include them in self-assessment of inquiry-based learning [29]. The lack of teacher's knowledge about inquiry-based teaching can indirectly affect the creation of feelings of incompetence and lead to loss of self-confidence for the organization of inquiry-based teaching [30]. This component is crucial for the successful implementation of inquiry-based learning in the teaching practice. Methodological knowledge about inquiry-based teaching should be developed gradually. It begins with teachers' initial education within methodology courses of individual faculty subjects, especially in workshops that enable students to apply inquiry-based teaching in practice. Methodological knowledge needs to be continuously developed and updated with contemporary knowledge in educational sciences and changes in the educational system. The subscales' correlation showed that misconceptions were positive and medium-high associated with lack of knowledge ($r = 0.62$; $p < 0.01$). Knowledge is negative and low-related to lack of knowledge ($r = - 0.28$; $p < 0.01$) and misconceptions ($r = - 0.35$; $p < 0.01$). In other words, as the results on the subscale of misconception increase, so does the result on the subscale of ignorance, and as the results on the subscale of knowledge increase, so do the results on the subscales of ignorance and misconception. This finding was expected, given that the basic cause of misconceptions about a phenomenon or process is precisely lack of knowledge ignorance about that phenomenon or process.

Regarding the answer to the research question "Which misconceptions about inquiry-based learning were detected among students of teacher education?" it was found that the most pronounced misconception is that inquiry-based learning is time-consuming ($M = 3.7$, $SD = 0.82$), and this is the only item in the category of answers *I mostly agree with* ($M > 3.5$). In the category of misconceptions with an arithmetic mean between $2.5 < M < 3.5$, misconceptions were also detected. The misconceptions that every practical work is also inquiry-based learning ($M = 3.3$, $SD = 1.11$), that inquiry-based learning cannot be conducted if students do not have any knowledge of the content that will be learned in this way ($M = 2.7$, $SD = 1.12$), and that inquiry-based learning is more appropriate for higher grade students ($M = 2.7$, $SD = 1.28$) belong to that category. Wendel's [31] research of misconceptions about inquiry-based teaching showed that these misconceptions could be negatively linked to the use of inquiry-based teaching and therefore needed to be detected and corrected on time so that the application of inquiry-based learning was of a high quality, successful and consistent with its basic determinants.

3.2 Student teachers' beliefs about inquiry-based learning and teaching

The results for the research question "What are students' beliefs about inquiry-based learning and teaching?" are shown in Table 2.

Table 2. Mean result on variables relating to student teachers' beliefs about inquiry-based learning and teaching [IBLT]

<i>Belief scale - subscales</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>df</i>	<i>p</i>
Beliefs about the influence of IBLT on the development of students' skills and attitudes	4.5	0.56	231.2	2	<0.01
Beliefs about the influence of IBLT on the students' acquisition of knowledge	4.1	0.55			
Beliefs about the benefits of IBLT	3.9	0.45			
Beliefs - total	4.2	0.46			

The arithmetic mean values on the Beliefs scale ($M = 4.2$; $SD = 0.46$) show that students' beliefs about inquiry-based teaching were positively oriented. The positive orientation was most pronounced on the subscale Beliefs about the impact of inquiry-based teaching on the development of students' skills and attitudes ($M = 4.5$, $SD = 0.56$), then on the subscale Beliefs about the impact of inquiry-based teaching on students' acquisition of knowledge ($M = 4.1$; $SD = 0.55$), while on the subscale Beliefs about the advantages of organizing inquiry-based teaching the mean value was slightly lower ($M = 3.9$; $SD = 0.45$). The variance analysis for repeated measurements shows that this difference is statistically significant ($F = 231.2$; $df = 2$; $p < 0.01$) and that the differences are significant between all measurement pairs. The most positive beliefs were about the impact of inquiry-based teaching on the

development of students' skills and attitudes, followed by beliefs about the impact of inquiry-based teaching on students' knowledge and beliefs about the benefits of organizing inquiry-based teaching. The importance of positive beliefs about inquiry-based teaching is also shown by Andersen's research [32] where it was emphasized that most of the difficulties encountered in applying inquiry-based teaching had their source in the teacher's system of values and beliefs about students, teaching, the purpose of education. Windschitl [33] confirmed that teachers' beliefs about the inquiry process in teaching could determine their pedagogical approach and influence the frequency of application of the inquiry-based approach in teaching practice. In their research, Supovitz and Turner [34] concluded that adequate initial education of future teachers in inquiry-based learning and teaching led to a statistically significant increase in teachers' positive beliefs about inquiry-based teaching and its more frequent use. Therefore, it is obvious that already at the level of initial teacher education intervention through the initial teacher education programmes can be made to develop positive beliefs and attitudes to inquiry-based teaching, which can later positively support its implementation in teaching practice.

The correlation between subscales on the scale Beliefs is positive and quite high. A high correlation was found between the subscale Beliefs about the impact of inquiry-based teaching on students' knowledge acquisition and Beliefs about the advantages of organizing inquiry-based teaching ($r = 0.73$; $p < 0.01$), Beliefs about the impact of inquiry-based teaching on students' knowledge acquisition and Beliefs about the impact of inquiry-based teaching on the development of students' skills and attitudes ($r = 0.76$; $p < 0.01$) and the Beliefs about the advantages of organizing inquiry-based teaching and the Beliefs about the impact of inquiry-based teaching on the development of students' skills and attitudes ($r = 0.67$; $p < 0.01$), i.e. with the increase of results on one type of beliefs, the other two types of student beliefs also grew. This finding was expected given the positive orientation of teachers' beliefs most often covered all areas of inquiry-based learning.

3.3 Student teachers' self-assessment of competencies (knowledge and skills) for the organization and implementation of inquiry-based teaching

The research question results about student teachers' self-assessment of their personal competence (knowledge and skills) for the organization of inquiry-based teaching are shown in Table 3.

Table 3. Mean score on variables related to student teachers' self-assessment of personal competencies for the implementation of inquiry-based teaching

Self-assessment of competencies (knowledge and skills) scale - subscales	M	SD	F	df	p
Self-assessment of knowledge	3.55	0.63	4.3	1/179	<0.05
Self-assessment of skills	3.46	0.80			
Self-assessment of competencies (knowledge and skills) - total	3.5	0.67			

The arithmetic means on a scale of student teachers' self-assessment of personal competencies ($M = 3.5$; $SD = 0.67$) show how student teachers self-assessed their competence for the organization and implementation of inquiry-based teaching only partially developed. The arithmetic mean of the respondents' answers on the scale of self-assessment of knowledge is $M = 3.55$, $SD = 0.63$, and on the scale of self-assessment of skills is $M = 3.46$; $SD = 0.80$. The analysis of variance for repeated measurements also confirms the existence of a statistically significant difference in these mean values ($F = 4.3$; $df = 1/179$; $p < 0.05$). It was found that student teachers self-assessed their competencies related to knowledge about inquiry-based teaching better than those related to skills for its successful organization.

In addition to the cognitive component, teachers' competencies for the effective and quality organization of inquiry-based teaching include developing adequate skills and abilities for its methodological design and implementation. Therefore, self-assessment of competencies related to knowledge and skills for implementing inquiry-based teaching is an important component of this research. The obtained results show that teacher education students self-assessed their competencies (knowledge and skills) to apply inquiry-based teaching as only partially developed. Unfortunately, this level is not sufficient for the quality application of inquiry-based teaching and the realization of learning outcomes that arise from such learning. Therefore, it is necessary to design such activities in the teacher's education that will enable them to acquire a higher level of such skills.

Matson and Pearsons [35] believed that teachers who had never experienced inquiry-based teaching will not teach science using an adequate and successful inquiry-based approach.

The correlation between self-assessment on the subscales of competencies related to knowledge and skills is positive and quite high ($r = 0.73$; $p < 0.01$). The increase of self-assessment results for knowledge-related competencies increases self-assessment results for competencies related to skills for its successful organization. Such a finding is logical since self-confidence in one's own knowledge is often associated with self-confidence in the skills to perform well concepts of teaching which we know well.

3.4 Differences and correlation between student teachers' knowledge, beliefs, and self-assessment of personal competencies

Further analysis of the obtained results revealed differences and correlations between the key variables in the research. Regarding the difference in mean values between knowledge ($M = 4.1$; $SD = 0.36$), beliefs ($M = 4.2$; $SD = 0.46$), and student self-assessment of competencies ($M = 3.5$; $SD = 0.67$), there was a statistically significant difference between those variables ($F = 132.1$; $df = 2$; $p < 0.01$), while differences by individual groups show that self-assessment of competencies for the organization of inquiry-based teaching was statistically significantly lower than students' knowledge and beliefs about research teaching and learning. This finding leads us to the importance of taking further steps to acquire an adequate level of abilities and skills of future teachers to apply inquiry-based teaching since students have assessed such skills as underdeveloped.

The correlation between the three basic variables and their parts is shown in Table 4.

Table 4. Results of the Pearson's correlation coefficient - the relationship between variables of knowledge, beliefs, and self-assessment of competencies for inquiry-based teaching

Dependent variable	K	LK	M	SK	SS	S (total)	BK	BS	BO	B (total)
K	1	-.28**	-.35**	.33**	.28**	.32**	.53**	.51**	.57**	.59**
LK		1	.62**	.03	.01	.01	-.35**	-.29**	-.26**	-.33**
M			1	-.10	-.13	-.13	-.51**	-.46**	-.37**	-.50**
SK				1	.73**	.91**	.20**	.21**	.29**	.26**
SS					1	.95**	.22**	.21**	.28**	.26**
S (total)						1	.23**	.23**	.30**	.28**
BK							1	.73**	.76**	.92**
BS								1	.67**	.89**
BO									1	.90**
B (total)										1

** Correlation is significant at the 0.01 level; $p > 0.01$; * Correlation is significant at the 0.05 level; $p > 0.05$

LEGEND: K - knowledge about inquiry teaching; LK- lack of knowledge about inquiry-based teaching; M – misconceptions; SK - self-assessment of competencies related to knowledge for the organization of inquiry-based teaching; SS - self-assessment of competencies related to skills for the organization of inquiry-based teaching; S - self-assessment of competencies (total); BK- beliefs about the effect of inquiry-based teaching on the acquisition of students' knowledge; BC - beliefs about the effect of inquiry-based teaching on the development of student skills; BO - beliefs about the advantages of organizing inquiry-based teaching; B-beliefs (total)

The results in Table 4 show that the overall result on the subscale of knowledge about inquiry-based teaching is positively related to all variables, somewhat less with student self-assessment of competencies for organizing inquiry-based teaching ($r = 0.32$; $p < 0.01$), and more with beliefs about inquiry-based teaching (0.59 ; $p < 0.01$). This means that with the increase in the scale of knowledge, the results on the scale of self-assessment of competencies increase a little, but they increase more on the scale of beliefs. From such a finding, it can be concluded that the formation of a high level of knowledge of teacher education students about inquiry-based teaching can indirectly influence the development of their positive beliefs about this teaching strategy and the development of their skills for its implementation in teaching practice. Lack of knowledge and misconceptions were not related to student self-assessment of competencies for the organization of inquiry-based classes, but they

showed a negative relationship with beliefs (from $r = -0.26$ to $r = -0.51$), i.e., with a higher score on the subscales of lack of knowledge and misconception there was a drop in scores on beliefs subscales. This means that misconceptions and ignorance can lead to negative beliefs and therefore need to be eradicated in time. It was also shown that student self-assessment of competencies was positively related to their beliefs ($r = 0.20 - 0.30$). As the results on the sub-scale of beliefs increased, so did the results in the students' self-assessment of competencies related to knowledge and skills for inquiry-based teaching. This indicates the need to form positive student teachers' beliefs about inquiry-based learning in the initial teacher education.

4 CONCLUSIONS

Based on the research results, it can be concluded that future teachers have a higher level of knowledge about the basic features of inquiry-based learning and teaching, and more positive beliefs about their organization and effects on the acquisition of knowledge and the development of student skills. However, the existence of misconceptions about inquiry-based learning still points to the need to eliminate them. To make that possible, it is necessary to detect, on time, misconceptions that student teachers have. This will help to develop future teachers' understanding of the concept of this teaching strategy correctly. This is an important prerequisite for quality and adequate inquiry-based learning and teaching in the teachers' teaching practice. Positive beliefs regarding inquiry-based teaching and learning show student teachers' awareness of the benefits that this teaching strategy brings compared to traditional teaching methods. This is an important component for investing further efforts to replace traditional forms of learning and teaching in today's schools with contemporary ones. However, despite the high level of student teachers' knowledge about inquiry-based learning and their positive beliefs about its effectiveness, students self-assessed their competencies (knowledge and skills) to apply inquiry-based teaching only partially. Therefore, in further procedures of teacher education innovation, it is necessary to take appropriate steps to enable student teachers to acquire the appropriate abilities and skills. Students can gain valuable experience by participating in authentic research activities in science courses during teacher education, practicing inquiry-based learning in classroom simulations, and applying an inquiry approach in teaching during workshops within methodology courses.

Inquiry-based science teaching allows students in primary grades to develop scientific skills, and to understand the topics and nature of science [6]. It encourages the development of the curious and creative individuals who learn "how to learn" and develop the ability to analyse and synthesise and who can apply the knowledge they have in everyday life. This is the foundation of the creation of a future science-literate society. Based on this, it can be concluded that the necessity of training future teachers for implementing inquiry-based teaching is fundamental. The quality of their future work in the education system could be highly dependent on it. Such training is possible only in well-organized teacher education programmes, which will determine the development of future teachers' skills to efficiently organize and implement inquiry-based teaching and learning as one of the most important learning goals and outcomes.

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