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Methodology for improving the professional training of future biology teachers

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Abstract

The purpose of this research; The aim of this study is to get the opinions of prospective teachers about the methodologies for improving the professional education of future biology teachers . This research was designed in accordance with the qualitative research method. The study group of the research consists of 50 biology teacher candidates studying at universities in Kazakhstan. The data collection tool of the research is the semi-structured interview form developed by the

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researchers. Research data were analyzed by descriptive analysis method. In this direction, in this research; In this study, it was aimed to get the opinions of prospective teachers about the methodologies for improving the professional education of future biology teachers . As a result of the research; The majority of future biology teachers who participated in the research stated that they found their professional self-efficacy and educational development somewhat adequate. The vast majority of future biology teachers participating in the research; While they stated that they found their personal development sufficient, they also stated that they found their field-specific development somewhat sufficient.
Keywords: Biology, prospective teachers, methodology

1.Introduction

The three basic elements of the education system are teachers, students and education programs. The effectiveness of education and achieving its goals at the highest level depend on the harmony between these elements (Rosli and Suiv, 2020). This triple relationship between the student, the teacher and the education program must have certain qualifications. The fact that one of them lacks the desired qualifications directly affects the education process. However, the power of the teacher element, which is one of these three elements, to affect the other two elements, students and curricula, is more than the others (Yehya , 2020).

1.1. Theoretical and conceptual framework

The teacher performs the teaching activities in the lesson by using the curriculum (Ceyhan, 2022). Therefore, the relationship between the implementer teacher and the applied curriculum is extremely important in terms of the education system (Dandashly et al., 2019). Teachers' fulfillment of the competencies required by the teaching profession is closely related to their belief that they can fulfill their duties and responsibilities as well as receiving good education (Skaalvik and Skaalvik , 2007; Adi et al ., 2021). In education, teachers need to have competencies in some areas in order for students to reach the desired level (Carraro & Trinder, 2021).

The concept of teacher competence, which has been used frequently recently, is a concept adopted by most educators in terms of clearly demonstrating the skills of a teacher candidate who has completed his education in this field (Yildiz & Uzunboylu, 2018; Fuchsova & Korenova , 2019). For biology self-efficacy, it is important for pre-service teachers taking biology lessons to use their knowledge appropriately and to have self-confidence. Biology self-efficacy perception; It is the self-confidence of individuals in understanding biology better and using biological concepts and processes (Friedman & Kass , 2002).

Applications of biological science have become indispensable in daily life. Biology is of great importance for the understanding of the world of living things to which humans belong, as well as the knowledge for the improvement of human life (Sapriati et al ., 2020). Information on these issues that concern humanity can only be provided by biology education. Realization of the objectives expected from biology education; It will be possible with the best use of laboratory and course equipment in biology lessons (Mojavezi & Tamiz, 2012).

Innovations in science and technology in recent years make the development of biology teaching compulsory (Bezeljak et al., 2020). Developments in the field of biology cause the emergence of new information, and these developments enter our daily lives with new technologies. Especially since the information obtained in the field of biology directly affects human life, the need for education on these issues in the society is increasing and therefore biology education is gaining importance day by day (Nogerbek , et al., 2022). Written documents that determine why biology subjects are taught to learners (achievements), what to teach (content), how to teach (learning-teaching process) and how much is taught (evaluation) are called biology curriculum (Desa et al ., 2021).

According to the educational understanding of the new age, the most general goal of the renewed biology programs all over the world; To raise individuals who understand the nature of science and biology, realize the necessity of learning biology in order to recognize themselves and understand the events around them, have general biology knowledge, and can analyze the interaction between science-technology-society-environment regarding the past, present and future (Istiana et al., 2021). Moreover; To raise biologically literate individuals who are mentally and physically healthy, aware of their abilities, have various communication skills, attitudes, values and understandings, and have technological and psycho-motor skills related to biology (Diaz Eaton et al., 2020). In addition, this program emphasizes student-centered activities under the guidance of teachers through biology teaching; taking into account individual differences but not ignoring social skills; It contributes to the training of constructivist teachers who have adopted a process-oriented assessment approach as much as the product (Verhoeff et al., 2018).

1.2. Related research

When the researches in the field are examined; It is seen that there are many studies on the professional development and competencies of teachers and teacher candidates. Gökmen and Ekici (2018) in their study; They investigated the relationship between teacher self-efficacy perception levels of biology teacher candidates and their professional concerns. According to the results obtained as a result of the research, it was determined that the teacher candidates' self-efficacy perception levels were quite sufficient and their professional concerns were low. In addition, it was determined that there was a negative and moderate relationship between the teacher candidates' perceptions of teacher self-efficacy and their professional anxiety.

Poulou (2007), " Personal teaching In their study named efficacy and is sources : Student teachers ' perceptions ', they aim to determine the beliefs of teacher candidates about teacher self-efficacy and their teaching strategies, classroom management and behaviors that can affect students' participation. The study group of this research consisted of 4th grade students studying in two primary schools in Greece. As a result of this study, it was concluded that the factors contributing to teachers' self-efficacy are teacher competencies, learning motivation and personal characteristics.

Caprara et al. (2006), "Teachers' self- efficacy beliefs as determinants of job satisfaction and students' academic In their study named " achievement ", teachers' self-efficacy beliefs were examined as determinants of job satisfaction and students' academic success. This study was conducted with more than 2000 teachers in 75 Italian secondary schools. The average grades of the students were

collected in the following academic year. It was concluded that teachers' self-efficacy beliefs, structural equation modeling analyzes and job satisfaction affect students' academic success.

Sheridan 's (2016) " Examining changes Of In the study called Pre -Service Teachers' Beliefs Of Pedagogy ", the pedagogical belief scale developed by Sheridan was used to examine the pedagogical beliefs of 167 pre-service teachers during their 4-year education period, which change at the beginning and end of each year . According to the results of the research, there was a change in the pedagogical beliefs of teacher candidates at the end of each year.

Mihaela and Alina- Oana (2014) "(When) Teachers' Pedagogical beliefs are Changing ?" In this study, it was aimed to examine the change in the pedagogical beliefs of 100 prospective teachers, 10 experienced and 10 inexperienced teachers, based on factors such as community value beliefs and teachers' professional development. According to the results of the research, it was concluded that as the experience of the teachers increased, they had hopeless ideas about the future of education.

1.3. Purpose of the research

The purpose of this research; The aim of this study is to get the opinions of prospective teachers about the methodologies for improving the professional education of future biology teachers .

1. How do prospective biology teachers evaluate their professional self-efficacy?
2. How do future biology teachers evaluate their instructional development?
3. How do future biology teachers evaluate their personal development?
4. How do future biology teachers evaluate their field-specific development?

2. Methods and Materials

This section contains information about the research method, data collection tools, study group and data evaluation.

2.1. research method

This research was designed in accordance with the qualitative research method. Qualitative research is one of the forms of knowledge production developed by people to understand their own potential, to solve their secrets, and to explore the depths of the social structures and systems they have built with their efforts. There is an effort to reach a deep perception about the event or phenomenon examined in researches designed with qualitative method (Mallat , 2007). In this direction, the opinions of the biology teacher candidates participating in the research on their methodologies to improve their vocational education were discussed in accordance with the qualitative research method.

2.2. Participants

The study group of the research consists of biology teacher candidates studying at universities in Kazakhstan. The biology teachers of the future, constituting the study group of the research, were

selected from among the students who are actively continuing their education in the 2021-2022 academic year. Pre-service teachers agreed to participate in the research voluntarily. The study group of the research consists of 50 biology teacher candidates. 19 of the teacher candidates are girls and 31 of them are boys. Of the pre-service teachers, 14 are 1st grade students, 9 are 2nd grade students, 11 are 3rd grade students, and 16 are 4th grade students.

2.3. Data collection tools

The data collection tool of the study was developed by the researchers. First of all, a field study was conducted and research questions were formed as a result of the research. The research questions were presented to the opinion of 2 experts and they were asked to evaluate their suitability for the research. As a result of expert opinion, some changes were made on the questions. The clarity of the interview questions with 3 biology teacher candidates was evaluated. Biology teacher candidates participating in this part of the research were excluded from the study group of the research. The finalized interview questions were converted into a semi-structured interview form. The semi-structured interview form is given in Table 1.

Table 1
Semi-structured interview form

Demographic Information
Your gender: Girl ( ) Boy ( )
Class of Education: 1st Grade ( ) 2nd Grade ( ) 3rd Grade ( ) 4th Grade ( )
Questions
1. How do you evaluate your professional self-efficacy? Tick one of the options below. Give your opinion. Very sufficient ( ) Sufficient ( ) A little sufficient ( ) Insufficient ( ) Very insufficient ( ) Your opinion : …… …… ..
2. How do you evaluate your educational development? Tick one of the options below. Give your opinion. Very sufficient ( ) Sufficient ( ) A little sufficient ( ) Insufficient ( ) Very insufficient ( ) Your opinion : …… …… ..
3. How do you evaluate your personal development? Tick one of the options below. Give your opinion. Very sufficient ( ) Sufficient ( ) A little sufficient ( ) Insufficient ( ) Very insufficient ( )

Your opinion :
……
……
..

4. How do you evaluate your field-specific development? Tick one of the options below. Give your opinion.
Very sufficient ( ) Sufficient ( ) A little sufficient ( ) Insufficient ( ) Very insufficient ( )

Your opinion :
……
……
..

In Table 1, there is a semi-structured interview form prepared to collect the data of the research. The form includes 2 questions created to determine the demographic characteristics of the study group. These questions are related to pre-service teachers' gender and class information. There are 4 questions about the methodologies of future biology teachers to improve their professional education . Each of the questions consists of two parts, multiple choice and based on interpretation.

2.4. Data collection process

The semi-structured interview form created to collect the research data was applied face to face to the study group of the research. Interviews were held in a meeting room suitable for interviews within the university. In the interviews with the teacher candidates, they were asked to fill in the semi-structured interview forms. While answering the questions in the semi-structured interview forms, the pre-service teachers were asked to ask about the areas that were not understood. It took 25-45 minutes for the teacher candidates to fill out the interview forms. The process of completing the interviews with all teacher candidates took approximately 1 month.

2.5. Data collection analysis

Research data were analyzed by descriptive analysis method. The purpose of descriptive analysis is to bring together the data collected as a result of interviews and observations with the reader in an organized and interpreted way. In most descriptive analyzes, the data are classified according to predetermined themes, the findings related to the classified data are summarized, and the summaries are interpreted with the subjective knowledge of the researcher. In addition, the researcher establishes a cause-effect relationship between the findings and, if necessary, makes comparisons between the cases with structural difference analyzes (Kitzinger , 1995). The opinions of future biology teachers participating in the research on their methodologies for improving their vocational education were evaluated by descriptive analysis method and turned into findings.

3. Results

In this part of the research; The responses of future biology teachers to the semi-structured interview form were analyzed. Findings created with frequency and percentage tables were supported

by direct quotations from the answers of the pre-service teachers. The direct answers of the pre-service teachers were given by the coding method.

In Table 2, the opinions of future biology teachers participating in the research on their professional self-efficacy are given.

Table 2

Opinions of future biology teachers on their professional self-efficacy

Category	Theme	F	%
Very enough	B4: I believe that I have trained myself well as a teacher who will just start the profession. I have the necessary equipment.	6	12
	B41: Both the education I received from the faculty and my personal effort enabled me to be very competent professionally.		
Sufficient	B16: I find myself sufficient in many ways. There is no limit to knowledge, of course, but the important thing is to be open to development.	10	20
	B20: I think I have the knowledge that a pre-service biology teacher should have.		
A little is enough	B1: I find myself sufficient in terms of content knowledge, yet insufficient in terms of application.	22	44
	B13: I think I am sufficient in terms of course success. But I can not say that I have full competence in the field of biology.		
Insufficient	B28: It is not possible to say that I am proficient in the field yet. I think I am at the very beginning of my professional development.	9	18
	B50: For now, we are only in the phase of learning the information written in the books. When we implement this, we will be able to test where we really stand professionally.		
Very inadequate	B17: I think professional competence is an area to be measured after stepping into the profession. For now, I think I'm too understaffed.	3	6
	B46: I find my professional development very inadequate. I do not find the training we have received sufficient in terms of preparation for the profession.		
Total		50	100

In Table 2, the opinions of future biology teachers participating in the research on their professional self-efficacy are categorized. Of the biology teacher candidates, 12% answered very adequate, 20% sufficient, 44% somewhat sufficient, 18% insufficient and 6% very insufficient. From this point of view, it is possible to say that the majority of future biology teacher candidates find their professional self-efficacy a bit sufficient.

In Table 3, the opinions of future biology teachers participating in the research on their educational development are given.

Table 3

Opinions of future biology teachers on their educational development

Category	Theme	F	%
Very enough	B15: I feel very competent in preparing a suitable learning environment.	6	12
	B45: I find myself very creative in designing materials in biology education. My progress in this field is very sufficient.		
Sufficient	B8: I think I have the competence to teach biology.	7	14
	B44: I find my progress in giving education good. I am also open to development.		
A little is enough	B12: Although I think that I have enough theoretical knowledge in biology education, I do not fully trust myself in teaching.	25	50
	B18: My development in terms of education is somewhat sufficient. Because I think that this development will be achieved mostly in the classroom environment.		
Insufficient	B3: I don't have any teaching experience yet. In terms of education, my development still consists of providing knowledge.	8	16
	B31: I find myself inadequate in combining technology with biology in educational development.		
Very inadequate	B35: I find myself inadequate in using different methods and techniques. I will teach next year and this shows that my development is very poor.	4	8
	B39: I am very inadequate in measurement and evaluation, except for classical methods.		
Total		50	100

In Table 3, the views of future biology teachers participating in the research on their educational development are categorized. 12% of future biology teachers gave the answer very adequate, 14% sufficient, 50% somewhat sufficient, 16% insufficient and 8% very insufficient. From this point of view, it is possible to say that the majority of biology teachers who participated in the research found their educational development somewhat adequate.

In Table 4, the opinions of future biology teachers participating in the research on their personal development are given.

Table 4

Opinions of future biology teachers on their personal development

Category	Theme	F	%
Very enough	B11: I devote most of my free time to self-development.	10	20
	B14: I try to improve myself in every field. I think my personal development is very sufficient within the possibilities I have.		

Sufficient	B5: I think I have personal equipment in addition to professional knowledge.	21	42
	B9: If we evaluate personal development in terms of both field knowledge and private life, I am a person who is open to development and self-development in every aspect.		
A little is enough	B6: I have some difficulties in terms of time management in developing my missing aspects. So I will give a somewhat adequate answer.	8	16
	B29: I try to improve myself as much as I can. I devote time to my interests, but still, it cannot be said that I am very good.		
Insufficient	B30: I cannot spare time for my personal development. I don't have time to add new information to the knowledge I learned at school.	8	16
	B33: Although I strive for my personal development, there are many areas where I need to improve myself. Unfortunately, I find myself inadequate.		
Very inadequate	B7: I am very inadequate. I am an introverted person, I would love to improve myself in the social field.	3	6
	Unfortunately, I do not have the necessary opportunities for personal development. I don't have the budget and time to spare for the courses I want to attend.		
Total		50	100

In Table 4, the views of future biology teachers participating in the research on their personal development are categorized. 20% of future biology teachers gave the answer very adequate, 42% sufficient, 16% somewhat sufficient, 16% insufficient and 6% very insufficient. From this point of view, it is possible to say that the majority of future biology teachers find their personal development sufficient.

In Table 5, the opinions of future biology teachers participating in the research on their field-specific developments are evaluated.

Table 5

Views of future biology teachers on their field-specific development

Category	Theme	F	%
Very enough	B2: I am constantly improving myself in my field. I follow the innovations in my field.	5	10
	B45: I find my personal studies to support my biology education very sufficient.		
Sufficient	B38: I try to follow the developments in my field closely. I am interested in my field.	9	18
	B10: I am trying to improve myself. I am constantly reading new publications related to my extracurricular area.		

A little is enough	B37: I think that making progress in the field can be achieved with some experience. There is much that I have not yet experienced in my field.	29	48
	B43: Although I am competent in conveying information, I do not have experience in communicating with students.		
Insufficient	B22: I would love to be able to participate in national or international projects. I am inadequate in this respect.	3	6
	B27: I don't follow up-to-date scientific researches in my field. This is my major shortcoming.		
Very inadequate	B19: The field of biology is a very broad field. As I am still a first year student, I find myself very inadequate.	4	8
	B21: I do not do any work to support the knowledge I learned at school. I know it's necessary, but unfortunately I have no such motivation .		
Total		50	100

In Table 5, the opinions of future biology teachers participating in the research on the field-specific developments are categorized. 10% of future biology teachers gave the answer very adequate, 18% sufficient, 48% somewhat sufficient, 6% insufficient and 8% very insufficient. From this point of view, it is possible to say that the majority of future biology teachers find their field-specific development somewhat sufficient.

4. Discussions

The majority of future biology teachers who participated in the research stated that they found their professional self-efficacy a bit sufficient. In the research of Kösterelioğlu and Kösterelioğlu (2008); examined the perceptions of trainee teachers about the level of gaining their professional competencies. As a result of the research, it was revealed that the trainee teachers generally found themselves to be highly sufficient for the profession. Dilci and Yildiz (2012) in their study; revealed that pre-service teachers evaluate themselves as “quite competent” regarding their professional efficacy beliefs. The vast majority of future biology teachers participating in the research; stated that they found their educational development somewhat adequate. In their study, Menon and Sadler (2016) examined the change in science self-efficacy beliefs and science curriculum knowledge of pre-service teachers and the relationship between these two variables. As a result, a semantically positive relationship was found in the science self-efficacy beliefs and conceptual understandings of science teacher candidates.

The vast majority of future biology teachers participating in the research; stated that they found their personal development sufficient. Jovanova -Mitkovska and Hristovska (2011) “Contemporary teacher and core competencies for lifelong In the study named “ learning ”, it was aimed to reveal the perceptions of the fourth grade students of the Faculty of Education, novice teachers and kindergarten teachers about the competencies of teachers, lifelong learning competencies and professional development in the context of academic competencies . As a result of the research, candidate teachers; meta-cognitive skills, self-confidence, problem solving, current information and communication technologies, information, mathematics and linguistics literacy practices and

experimental research skill competencies have been determined as prominent lifelong learning abilities.

The vast majority of future biology teachers participating in the research; stated that they found their field-specific development somewhat sufficient. In Lee and Tsai (2010) research; They examined pre-service teachers' self-efficacy perceptions in terms of technological pedagogical content knowledge. In this study conducted with secondary and high school teachers, researchers revealed that older and more experienced teachers had lower self-efficacy perceptions regarding their content knowledge.

5. Conclusion

The teaching profession is a profession that requires many skills in an increasingly complex and rapidly changing information society. Today, for teachers to be successful, high They must have professional standards. In the information age, continuous development of teachers and students is necessary to create an information society. As expectations from students increase, so do expectations from teachers. In order to raise better students, teachers must constantly learn and improve themselves. In the history of education, the primary purpose of providing professional development opportunities to teachers has been to achieve student success. In this direction, in this research; In this study, it was aimed to get the opinions of prospective teachers about the methodologies for improving the professional education of future biology teachers . As a result of the research; The majority of future biology teachers who participated in the research stated that they found their professional self-efficacy and educational development somewhat sufficient. The vast majority of future biology teachers participating in the research; While they stated that they found their personal development sufficient, they also stated that they found their field-specific development somewhat sufficient.

6. Recommendations

Methodologies for improving the professional education of future biology teachers participating in the research were evaluated, it was found appropriate to develop the following suggestions.

1. Educational seminars should be organized at universities in order to increase the professional self-efficacy of future biology teachers and to support their educational development.

2. Personal development courses should be added to the curriculum of the universities in order to support the personal development of future biology teachers.

3. In order to ensure the field-specific development of future biology teachers, the curriculum applied should be revised. It is of great importance that education curricula are arranged according to student needs.

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