

Formation of professional competence of learners in teaching medicinal plants

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Abstract

Professional competence is a necessary component of a person's professionalism in any area. The aim of the research is the formation of the professional activity of a future competitive specialist in the educational process of universities for the system-structural organization of professional training of biology students. The analysis of a wide range of various works aimed at professional pedagogical training of future specialists leads to the conclusion that its structure, content and organization cannot withstand the current state of social development. Currently, the modernization of the target, content and technological structures of professional education is associated with a revision of its content, form and methods in accordance with the requirements of continuing education, the main goal of which is to ensure the full and complete development of the future specialist. In this article, the results of a pedagogical experiment were obtained, which revealed the effectiveness of a specially prepared educational and methodological manual for training medicinal plants in the training of biologists in universities for educational and training.

Keywords: Competence, professional competence, medicinal plants, *Elaeagnaceae*;

1. Introduction

Today, it is impossible to work in the old way (Karim & Gide, 2018; Montaner, 2020; Ozdemir, 2020). A teacher of a new formation is a person who has developed professional skills, has developed pedagogical skills, has a rich spiritual world, is passionate about novelty, creativity (Alake-Tuenter et al., 2012; Tondeur et al., 2017; Moore, 2012). But professional competence is formed not only from creative skills (Anderson et al., 2011; Labov, Reid, & Yamamoto, 2010). This competence is characterized by the following components (Ruhrig & Höttecke, 2015).

Indicators of professional competence:

- Fundamental knowledge
- Didactic and methodological skills
- Ability to manage psychological situations
- Ability to predict pedagogical situations
- Predict and anticipate conflicts
- Ability to organize relationships
- Have your own / independent goals and principles
- Ability to manage the process of active learning
- Reputation among professionals
- Be active in the joint creative space

Competence means comprehensive knowledge in a particular field (Michael Eraut (1998), Baumert & Kunter, 2006; Akerson, Cullen & Hanson, 2009). A competent person is a person who can make a conscious, authoritative decision on any issues (Hrica & Eiter, 2020; Mulder, 2014). Competence, depending on the content and purpose, is divided into communicative, informational, diagnostic, psychological, pedagogical, methodological, subject, professional-practical, subject-theoretical, legal-labor, social-reflexive competencies, as well as creative, design and implementation competencies, competence to identify and solve situations, competence to improve their knowledge, self-development, and practical self-expression (Smagulov, 2011; Tenekeci & Uzunboylyu, 2020; Hamdan, Isik & Jallad, 2019).

Pedagogical competence is the result of methodological professional experience and fundamental knowledge of the teacher in solving situations that occupy a place in life and in the educational process (Blömeke, Kaiser & Lehmann, 2010; Kleickmann et al., 2014; Kunter et al., 2011).

Obviously, professional development can be carried out in two directions (Thomas, 2002). The first is the systematic organization of the development of the didactic and methodological level of teachers. The second is to manage the professional development of teachers based on independent work. Through the implementation of the plan in this direction, it is possible to achieve a realistic result that will increase the prestige of educational work. In this regard, "Medicinal properties and research methods of *Elaeagnaceae* " (ISBN 978-601-346-004-8), specially prepared for the elective course "Medicinal plants and their resources" for undergraduates of the Kazakh State Women's Teacher Training University, specialty "7M01505-Biology" and "Botany" for the specialty "6B05101-Biology" (Figure 1) was introduced into the educational process.



a
Figure 1. a) Educational and methodical manual "Medicinal properties and research methods of *Elaeagnaceae* "
b) author's certificate

One of the tasks of students majoring in biology at the Faculty of Natural Sciences is to study the biological features of medicinal plants. The teaching of biology includes general knowledge, education, protection and conservation of the environment, scientific approach, methods of laboratory work and the ability to use the results obtained (Dyuskaliev et al., 2014; Aktas & Babadogan, 2018).

2. Materials and methods

In practical, laboratory classes, students can learn how to prepare, analyze and work with semi-permanent (micro) preparation to get acquainted with the anatomical structure of the leaves, stems and roots of medicinal plants. Future biologists must have a deep knowledge of the biological processes that take place in medicinal plants, the information, and skills necessary for their study. This is one of the main conditions for meeting the high requirements for the training of future teachers (Kaliyeva & Dyuskaliyeva, 2015; Moghadamizad, Mowlaie & Rahimi, 2020)

To improve the skills of students, a lecture was held using the educational and methodological manual "Medicinal properties and research methods of *Elaeagnaceae*" (ISBN 978-601-346-004-8). The

following requirements were considered when developing the structure and content of the educational and methodological manual:

- The research material should be designed in such a way that it connects the theoretical and methodological training of future biology teachers with their future professional pedagogical activity (Gotting, 2008.)
- training should be individual-oriented.
- the research material should ensure that the subjective experience of the future biologist teacher, including his previous experience in all subjects of the curriculum.
- the presentation of the material should be aimed not only at expanding, structuring, integrating the content of the topic, but also to change existing experience, actively motivate future biology teachers to self-education, self-expression, self-development in the acquisition of knowledge and skills.

This manual is developed in accordance with the work program. There are methods for practical and laboratory classes, covering certain topics of the course "Medicinal plants and their resources", "Plant Anatomy and Morphology". In addition, students can use the information provided in the course of independent work on the methods and practical significance of the use of *Elaeagnaceae* for medicinal purposes.

3. Results and discussions

Before developing the educational-methodological manual, we decided to analyze the content of the elective course "Medicinal plants and their resources." The main purpose of the elective course "Medicinal plants and their resources" taught at the university: The formation of theoretical knowledge, practical skills and ideas about the botanical characteristics and biological features of medicinal plants found in the territory of the Republic of Kazakhstan.

Objectives of the elective course "Medicinal plants and their resources":

- to give students a general idea of the flora of medicinal plants found in the territory of the Republic of Kazakhstan.
- development of practical, legal and communication skills of students on the basic rules of medicinal plants used in the territory of the Republic of Kazakhstan.
- acquaint students with the basic provisions of the Republic of Kazakhstan on medicinal plants.
- formation of a common understanding of the characteristics and main features of the families and medicinal plants belonging to the same family, found in the territory of Kazakhstan.
- acquaintance with modern advanced directions of use of medicinal plants.
- formation of the ability to independently understand the use of medicinal plants and their raw materials suitable for domestic medicine in the Republic of Kazakhstan.
- formation of communication skills of students in communication with each other and with the teacher, in discussions, discussion of topical issues, expression, justification of their views, etc.
- to acquaint students with legal issues related to their professional activities.

- promoting self-education of students, improving the knowledge and skills of specialists on medicinal plants.

During the elective course of the discipline "Medicinal plants and their resources" students can learn: the collection, labelling and drying of plants in the herbarium, comparative morphological approach to self-determination of the systematic affiliation of plants.

Thus, in the lesson "Medicinal plants and their resources", the lesson was carried out according to the following algorithm, using the educational and methodological manual "Medicinal properties and methods of research of *Elaeagnaceae*". Based on the prerequisites for the development of educational and methodological manual for the course "Medicinal plants and their resources", we offer the lessons as an interactive learning technology to build the professional competence of students.

Interactive learning technology is a way to organize the activities of teacher and student in the form of educational games, which can create a situation of mutual motivational, intellectual, emotional, and other success of students in the learning process, guaranteeing students a pedagogically effective cognitive relationship (Boribekova & Zhanatbekova, 2014; Celik & Yavuz, 2018; Chae, 2021).

1. Lecture. Introduction. Botanical characteristics and composition of the *Elaeagnaceae*.
2. Laboratory lesson. Anatomical structure of roots, stems and leaves of *Elaeagnus rhamnoides* L.
3. ISW. Practical significance of the *Elaeagnaceae*.

During the lesson, students are divided into three groups by drawing lots. First, students are asked a question on the topic of brainstorming (Figure 1). For example: How many genera are there in the *Elaeagnaceae*? How many genus are there in Kazakhstan? What is a morphological description? What is an anatomical description?



Figure 2. During the lesson

Each group is given a part of the content of the lecture and given some time to get acquainted with the materials. Then one person from each group goes to the next group and explains their topic, and the student in that group explains their topic. Then all members of the group will master the full content of the lecture, that is, learning materials in the form of games will be accelerated, the student will feel the learning process, systematic work will be done for the development of all students and personal communication. The lesson plan is shown in the table below. Table 1. After mastering the topic, work with a microscope.

Table 1. Lesson plan "Botanical characteristics and anatomical structure of the *Elaeagnus*".

Theme of the lesson	Botanical characteristics and anatomical structure of the <i>Elaeagnus</i>
Aim	Introduction to the anatomical composition of the rhamnoides L. and the <i>Elaeagnus oxycarpa</i> Schltld.
Goals	<ul style="list-style-type: none"> - Introduction to the morphological structure of the leaves of <i>Elaeagnus rhamnoides</i> L. and <i>Elaeagnus oxycarpa</i> Schltld, using herbarium materials and drawings. - Getting acquainted with the anatomical structure of leaves, stems and roots using ready-made preparations of <i>Elaeagnus rhamnoides</i> L. and <i>Elaeagnus oxycarpa</i> Schltld. - Similarities and differences in the morphological and anatomical structure of the leaves of <i>Elaeagnus rhamnoides</i> L. and <i>Elaeagnus oxycarpa</i> Schltld. <p>The article "Biological features of the medicinal plant <i>elaieagnus rhamnoides</i>, found in the south-east of Kazakhstan" was used to perform these goals (Kassimbekova, 2020)</p>
Necessary equipment	Herbarium, microscopes, permanent preparations, fixed plant (root, stem, leaf) Petri dish, sliding glass, cover glass, knife, clamp.
Tasks	<p>Discussion of complex and controversial issues and problems.</p> <p>Brainstorming</p> <p>Decision tree</p> <p>Here are 4 tasks according to the educational and methodological manual (Kasimbekova & Kalieva. 2019)</p>
Form of organization	Role-playing games, spinning (carousel)
In results	<p>Students participated in the content of the lesson:</p> <p>Masters the botanical characteristics of the <i>Elaeagnus</i>, the preparation of fixation, preparation of a permanent preparation and the anatomical composition of the roots, stems and leaves of the <i>Elaeagnus rhamnoides</i> L. and the <i>Elaeagnus oxycarpa</i> Schltld.</p>

130 students took part in the experiment, 70 of them were in the experimental group and 60 in the control group.

The main purpose of the detection experiment:

- ✓ definition.
- ✓ formation.
- ✓ summarizing.

At the first stage of determination, the actual state of the educational process and the level of this training were determined.

During the second stage of formation, experimental work was organized, and a system of activities was implemented.

- The content of the experimental work was selected.
- The pedagogical system is defined.
- The effectiveness of the content of programs, forms of training, introduced into the educational process.
- The difficulties and shortcomings encountered in the experiment were identified and ways to overcome them were considered.

In the third stage of control:

- Analysis of the obtained experimental data.
- Comparative examination of the analyzed materials with the purpose, objectives, and hypotheses of the study.
- Mathematical processing of experimental results.
- describe the relationship between students.

The formative experiment, conducted to increase the professional competence of future biologists, went through 3 different stages of action. The first stage was held in the student semester on the disciplines "Medicinal plants and their resources", "Plant Anatomy and Morphology". The second stage was held at the end of the eighth semester, and the stage of formation of professional training of students was determined. The obtained results revealed the effectiveness of the proposed methodological system, pedagogical technologies. The third stage showed the state of the quantitative levels of methodological systems and technologies that we have identified. This includes generalization and comprehensive analysis of experimental work carried out at this stage.

Qualitative indicators of the results of the pedagogical experiment using the method of mathematical statistics. We determined by the formula proposed by Bespalko.

$$P = \frac{\sum_{i=1}^n n_1}{nN}$$

Where: P is the coefficient of tasks

n is the number of tasks

n₁ - the number of tasks performed correctly by the first student

N - the number of students involved in the task

Σ n₁ - the number of tasks performed correctly by all students

The coefficient of success in the formation of professional knowledge of students in the educational process was determined by the formula proposed by A.V. Usova:

$$\beta = \frac{P_2}{P_1}$$

Here, P1- is the coefficient of completeness of tasks at the beginning of the training period, and P2 - is the coefficient of completeness of tasks at the end of the training period.

At the final stage of the study, students were re-interviewed in connection with the research problem. Their results showed a change in the level of students. This information is shown in the table below.

Table 2. Indicators of professional qualification of students

Level	Control group		Experimental group	
	Before the experiment	After the experiment	Before the experiment	After the experiment
High	9	12	8	15
medium	33	34	41	42
Low	18	14	21	13

If we convert the results of the research presented in the table above as a percentage, the post-experimental indicators in the control group are at a low level of 23.33%, and in the experimental group at 18.57%. The average level of control was 56.67 in the group and 60% in the experimental group. 20% in the control group at the highest level, 21.43% in the experimental group. There is reason to believe that the results obtained have fully confirmed our scientific hypothesis.

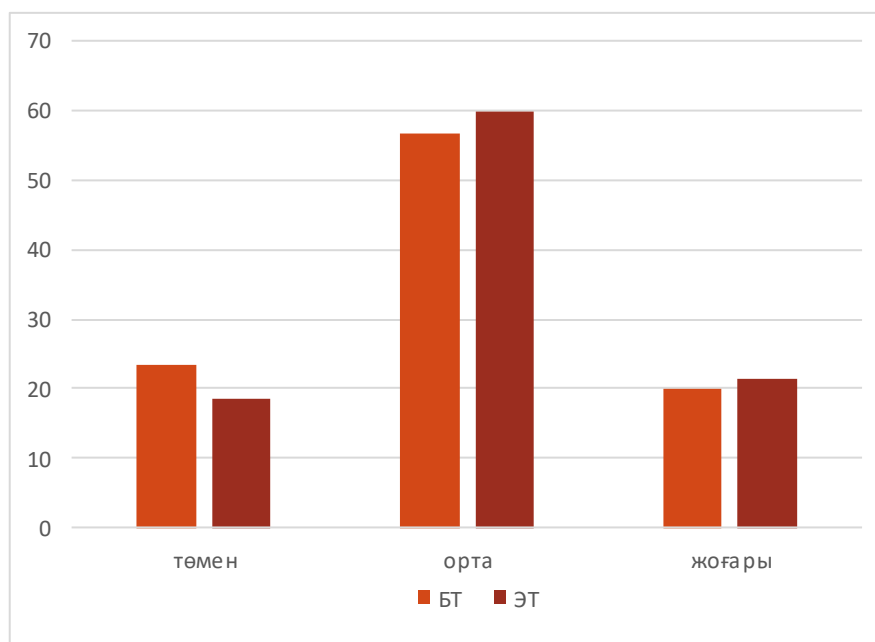
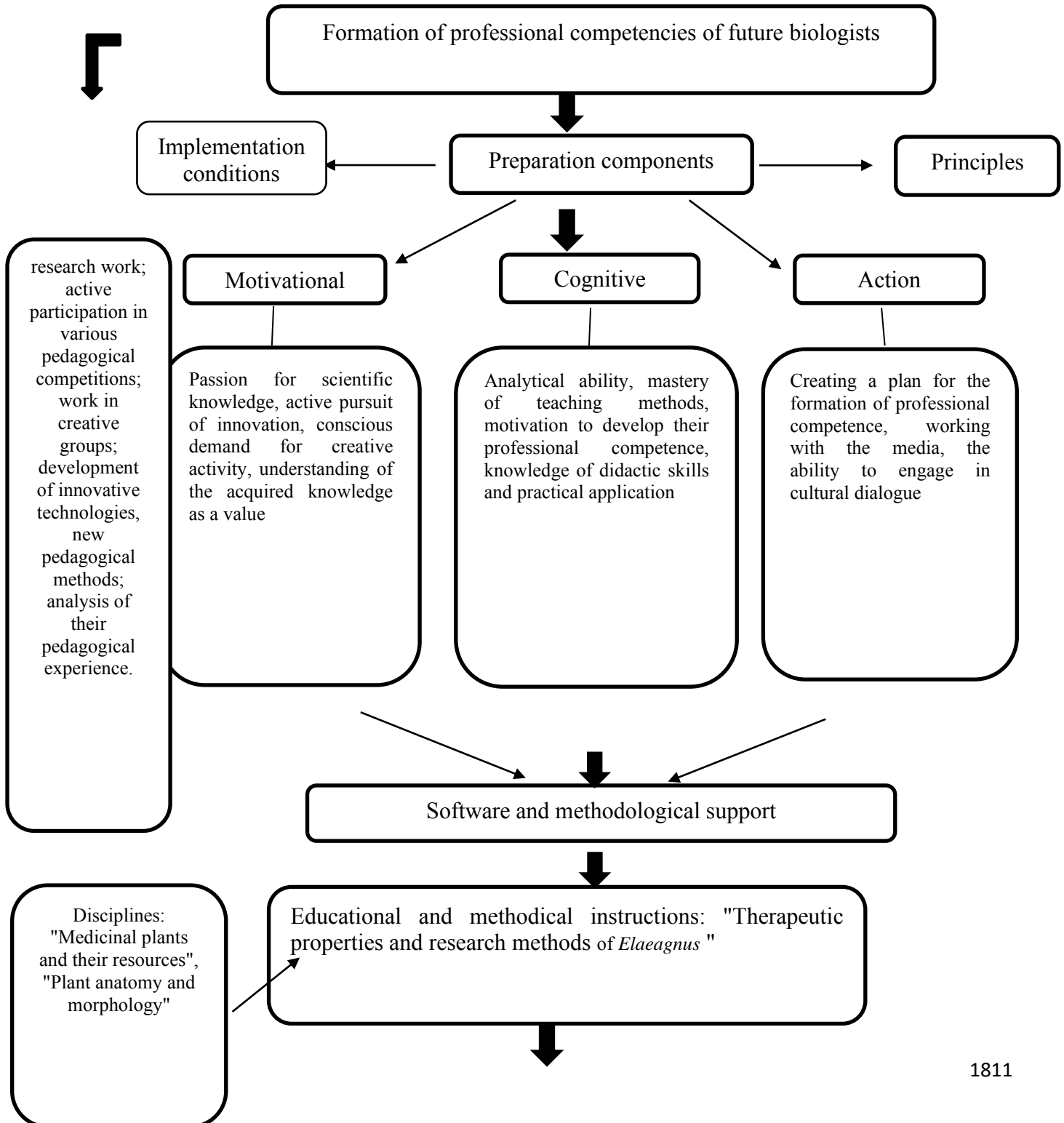


Figure 3. Percentage of professional qualification of students

In the descriptive experiment, the coefficient of complete knowledge was determined by calculation, in the control group this figure was 0.02, and in the experimental group was 0.09. The educational and methodological manual "Medicinal properties and methods of research of the *Elaeagnus*" (ISBN 978-601-346-004-8) in the training of biologists (Figure 1) showed an indicator of the

effectiveness of its implementation in the educational process - 4.5, which indicates the effectiveness of the implementation of the methodology proposed by us.

Based on the above-mentioned literature, the following figure shows a model for the formation of professional competencies of 4 future specialists-biologists.



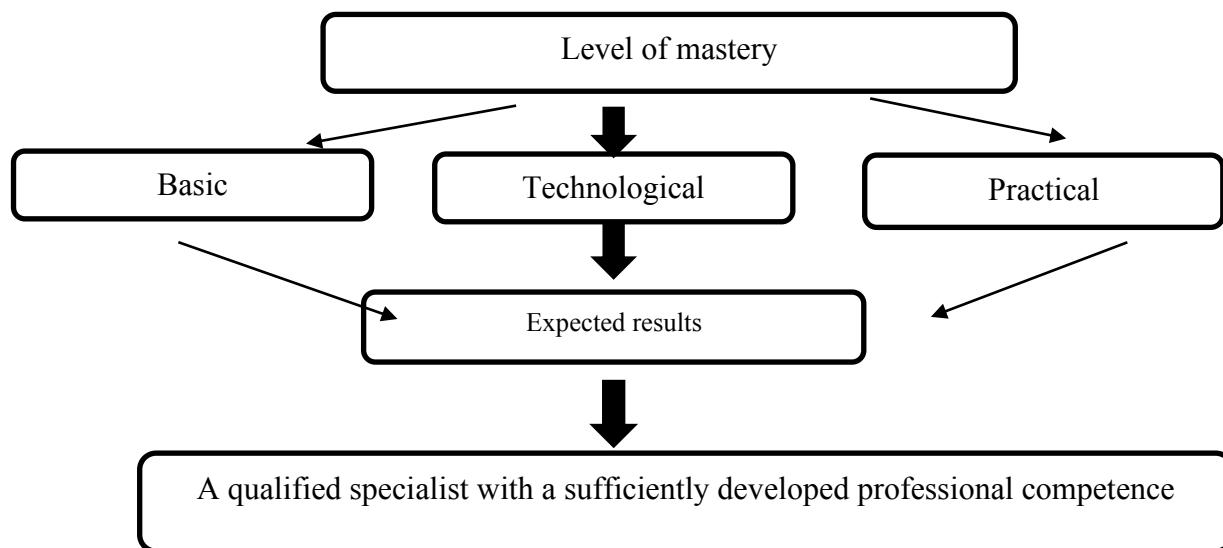


Figure 4. Model of formation of professional competence of future biologists

In the process of formation of professional competence, the following skills of biologist students should be formed in the field of teaching medicinal plants:

1. Knowledge: structural analysis of information, as well as the ability to convey the information to students (Akoul, 2021).
2. Scientific research: mastering the rules of collection and storage of medicinal plants, the ability to conduct anatomical and morphological experiments, to determine the phytochemistry of medicinal plants.
3. Informational: mastering the skills of searching for information; mastering the methods of storing, copying, and translating information in electronic form; mastering general methods of editing text and graphic information (Agha & ELDaou, 2018).
4. Analytical: analysis of Internet resources, considering the basic didactic, ergonomic, and technical requirements; assessment of the educational potential of e-learning resources and educational software products.
5. Prognostic: forecasting the effectiveness of the use of educational software and Internet resources in the educational process; be able to predict learning outcomes using specific resources, anticipate possible deviations and negative consequences.
6. Organizational: checking and monitoring the level of knowledge of students using computer testing programs; increase the motivation of students through active research, design activities using CT.
7. Communication: mastering the skills of network interaction to solve educational and professional problems (Agha & ELDaou, 2018).

Thus, the above skills are indicators of the professional competence of today's professionals.

4. Conclusion

If the systematic experimental work carried out through the training of medicinal plants in the formation of professional competence of future biologists demonstrates the effectiveness of the proposed scientific methods, then the educational process has achieved a positive result. The following tasks have been fulfilled in the formation of professional competence of future biologists:

- developed and practiced educational and methodological manual.
- The effectiveness of educational and methodological manual in the formation of professional competence of future biologists was tested.
- During pedagogical practice, students' theoretical knowledge, combined with practical research work, formed their research skills.

The solution of the tasks set was obtained in the research, as well as the study of the theoretical, methodological, pedagogical, and scientific-biological materials, which are widely used.

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