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## CRITERIA AND FORMATION LEVELS OF PROFESSIONAL COMPETENCES OF SPECIALISTS OF THE NATURE PROTECTION BRANCH IN ECOLOGICAL MONITORING

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*Під час дослідження розроблено критерії та рівні оцінки ступеневої системи підготовки фахівців природоохоронної галузі до екологічного моніторингу: для майбутніх фахівців та професіоналів за рівнем сформованості професійних компетентностей з екологічного моніторингу; для фахівців природоохоронної галузі за рівнем готовності до професійної діяльності. Побудована критеріально-рівнева шкала для оцінки сформованості професійних компетентностей майбутніх фахівців включає в себе мотиваційний, теоретико-методологічний та аналітико-практичний критерії. Оцінювання здійснюється за репродуктивним, достатнім та високим рівнями. Для майбутніх професіоналів з екологічного моніторингу критеріально-рівнева шкала для оцінки сформованості професійних компетентностей включає в себе мотиваційно-ціннісний, діяльнісно-практичний, науково-дослідницький критерії та інтерпретуючий, конструктивний, дослідницький рівні. Для професійного розвитку фахівців природоохоронної галузі у системі післядипломної освіти критеріально-рівнева шкала розроблена для оцінки рівня готовності до професійної діяльності, яка включає в себе наступні критерії: мотиваційно-аксіологічний для оцінки сформованості мотивів професійної природоохоронної діяльності; компетентнісний для оцінки професійності; професійне ставлення для оцінки особистого відношення до професійної діяльності, зокрема самостійність у прийнятті рішень, у використанні різних підходів до вирішення складних екологічних ситуацій, у розробці і плануванні проектів щодо покращення якості довкілля. Відповідно до особливостей професійного розвитку здійснено визначення рівнів готовності, а саме базисний, інтегративно-проектний, творчо-креативний. Розроблені та обґрунтовані критерії, показники та рівні забезпечують здійснення оцінки ступеневої системи підготовки фахівців природоохоронної галузі до екологічного моніторингу через сформованість професійних компетентностей і готовність до професійної діяльності*  
**Ключові слова:** екологічний моніторинг, післядипломна освіта, критерії, рівні, професійні компетентності, професійний розвиток

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### 1. Introduction

In the modern world requirements to qualified workers, especially to specialists of the nature protection branch that realize monitoring of the condition and development of territories grow fast. That is why their training in the system of higher and postgraduate education, formation of professional competences in them is urgent.

For verifying the effectiveness of the multi-level training system of specialists of the nature protection branch for ecological monitoring, it is necessary to measure this process, its development and also to study the dynamics of changes in formation levels of professional competences and readiness to the professional activity. For realizing the studied problems, it is worth to use criteria, parameters and levels of formation that are the base of the measuring process and give a possibility to elaborate diagnostic instruments.

### 2. Literature review

As far as the measuring process is realized by determining the quantity ratio between a characteristic of an object and a certain value that is etalon [1], this etalon

is a criterion in pedagogical scientific studies. There are several meanings of the notion “criterion” – it is: a sign, by which something is estimated, determined or classified, estimation of a phenomenon or subject [2]; quality, property, sign of a studied object, based on which a condition, development and functioning level are determined [3]; compared objective parameters, stable during a certain period of time [4].

Any criterion is a higher development level of a phenomenon, an etalon for comparing with real phenomena. It is useful at determining a correspondence degree of a present competences formation level, including professional ones [5, 6]. Author [7] thinks, that at elaborating criteria, it is necessary to take into account their characteristics, especially they must be unambiguous, adequate, grounded, reliable, must represent all components of a phenomenon.

The problem of forming effective competences in ecological specialists is well formulated, but not completely solved. Thus, the National association of ecological professionals of the USA (NAEP) thinks that distinctly determined principles for ecological educational programs must be added by methods for controlling suc-

cesses of these programs in training students to the professional activity in the nature protection branch [8]. At the same time criteria that determine the effectiveness of competence formation are the base for the further transfer of specialists to work and from it to further education [9].

At analyzing achievements of specialists in the sphere of knowledge estimation, there was revealed an unessential number of works, devoted to criteria and methods for estimating narrow professional skills in the nature protection sphere, although there are original methods for estimating a formation level of general ecological competences [10]. So, there is a necessity in studying and elaborating diagnostic instruments, using which the effectiveness of a formation level of professional competences and readiness to the professional activity of specialists and professionals will be estimated.

### 3. Aim and tasks of the research

The aim of the research is to determine and to substantiate pedagogical instruments for estimating the

competences formation in ecological monitoring and readiness of specialists of the nature protection branch to the professional activity.

The following tasks were set for attaining this aim:

1) to elaborate formation criteria and levels of professional competences at the bachelor and master educational levels;

2) to elaborate criteria and levels of readiness to the professional activity of specialists of the nature protection branch in ecological monitoring.

### 4. Formation criteria, parameters and levels of professional competences in ecological monitoring

Having analyzed diverse approaches to the elaboration of criteria and levels and also peculiarities of training specialists at the bachelor and master educational levels, there was elaborated the criteria-level formation system of professional competences in ecological monitoring of future specialists (Table 1) and professionals (Table 2).

Table 1

Formation criteria of professional competences in ecological monitoring of future specialists of the nature protection branch

Levels	Estimation of formation criteria of professional competences in ecological monitoring		
	Motivational	Theoretical-methodological	Analytic-prognostic
Reproductive	Motivational-personal qualities for professional improvement and study of monitoring research peculiarities are absent	Knowledge of theoretical bases in ecological monitoring are formed not deeply, ability to realize practical tasks by the given scheme	Absence of abilities for analyzing ecological information, presence of fragment knowledge and skills as to processing and systematizing monitoring research results
Sufficient	Realization of own preparedness for the professional activity, striving for acquiring certain successes	Ability to use acquired knowledge and skills in the professional activity at solving standard situations	Ability to solving local ecological problems, especially as to analyzing information, estimating it
high	Realization of a necessity to improve oneself professionally during the whole life, to use practically and to acquire new professional skills in ecomonitoring	Ability to generate new ideas, hypotheses. Presence of a methodology of organizing monitoring studies of environment components, ability to solve non-standard ecological situations	Ability to solve complicated ecological problems, to develop plans and programs of ecological monitoring, including by separate environment components, to realize analysis and synthesis of information, to prognosticate a condition of the environment

For future specialists (EL Bachelor) it is typical to determine the following criteria: motivational, theoretical-methodological, analytic-prognostic. Each criterion is characterized by reproductive, sufficient and high levels.

For future professionals (EL Master) there were separated motivation-value, activity-practical, scientific-research criteria. For estimating formation, the following levels were separated: interpreting, constructive, research ones.

Table 2

Formation criteria of professional competences in ecological monitoring of future professionals of the nature protection branch

levels	Estimation criteria of professional competences in ecological monitoring		
	Motivation-value	Activity-practical	Scientific-research
Interpreting	Presence of motivation only to reproduction of formed competences in ecological monitoring in the practical nature protective activity	Ability to use fundamental-scientific knowledge on ecological monitoring in the practical professional activity by the typical algorithm	Scientific-research activity is characterized by the ability to search and analyze scientific literature independently
Constructive	Professional motivation to ecological monitoring, stimulation of students to acquiring personal professional qualities	Presence of professional-practical competences in ecological monitoring, ability to organize and conduct ecological monitoring independently	Ability to independent organization of scientific research in the nature protection sphere, to search of optimal research methods and means
Research	formation of motivation-value, personal-oriented research qualities, striving for self-development and self-realization	Ability for using productive, practical-research approaches to solving complicated ecological problems in the professional activity, using monitoring research programs	Ability to analysis and synthesis of scientific tasks, presence of practical experience as to using scientific-research methods of ecological monitoring

## 5. Results and discussion

Based on studying peculiarities of training bachelors and masters in ecological monitoring, diagnosing the effectiveness of their competences formation, there were elaborated criteria and levels of readiness of specialists of the nature protection branch to the professional activity in the system of postgraduate education.

There were separated three criteria of readiness to the professional activity in ecological monitoring:

– Motivational-axiological – gives a possibility to estimate the formation of motives of the professional nature protective activity in ecological monitoring, ability to self-education, self-development and self-organization;

– competence – discovers their professionalism, especially components, manifested in their activity: ability to processing, systematization, estimation and analysis of environment components, ability to elaborate models, prognoses, scenarios of the development of ecological situations; use of nature protection innovations;

– professional attitude – estimation of a personal attitude to the professional activity, especially independence in making decisions, in using different approaches to solving complicated ecological situations, in elaborating and planning projects for improving the environment quality.

For these criteria, there were determined the quality characteristics of levels of readiness to the professional activity of specialists of the nature protection branch in ecological monitoring: basic, integrative-projective, creative.

*The basic level* of readiness to the professional activity is typical for specialists, who have no satisfaction from the professional activity in the nature protection branch, no desire to self-development, self-realization, realize professional duties by the standard checked scheme, absence of the organization competence as to elaborating the system of ecological monitoring and supporting it.

*Integrative-projective level* of readiness to the professional activity is typical for specialists, who understand mutual dependencies between own abilities, professional possibilities and realization of ecological-managerial, system-practical, scientific-research tasks in ecological monitoring, a specialist solves ecological tasks using complicated algorithms, taking into account ecological risks and dangers, elaborates programs and projects in ecological monitoring, provides their realization, plans development directions as to improving the condition of environment components and their preservation.

*The creative level* of readiness to the professional activity is typical for specialists, who have a need in constant professional development, self-realization, self-improvement during the whole life, the professional activity in ecological monitoring is connected with creation of models, prognoses, scenarios and their realization at solving complicated ecological problems, elaboration and implementation of innovations as to providing stability of the environment, they are effective in realizing the analytic-prognostic activity in ecological monitoring, able to realize the initiative and creative approach in own professional nature protective activity.

## 6. Conclusions

1. There were elaborated and substantiated criteria, parameters and levels that provide the estimation of the multi-level training system of specialists and professionals of the nature protection branch for ecological monitoring through the formation of professional competences, taking into account peculiarities of training bachelors and masters.

2. There was constructed the criteria-level scale that takes into account peculiarities of the professional development of specialists of the nature protection branch in ecological monitoring by the basic, integrative-projective levels that is effective in pedagogical diagnostics.

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