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Innovative practices for measuring and evaluating the psychological and pedagogical competence of future teachers

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Abstract

At the stage of identifying the level of formation of psychological and pedagogical competencies among future teachers, modern methods and technologies of measurement and evaluation are used. The level of competence of future teachers in the field of measurement and evaluation is directly related to their ability to professionally and adequately apply appropriate procedures in educational practice in the future. Considering that, according to the scientific literature, perception plays the role of an incentive factor that shapes behavior, this study analyzed the perception by future teachers of their own competence in measuring and evaluating the psychological and pedagogical aspects of pedagogical activity. The study includes an analysis of students' perceptions of pedagogical specialties regarding their training in this field, taking into account variables such as university of study, field of study, gender, age, academic performance, as well as a subjective assessment of the adequacy of their bachelor's degree education related to measurement and evaluation. The sample included 270 senior students in the field of education "Pedagogical Sciences" of various fields of study (teacher training in natural sciences, humanities, language and literature, with a subject specialization of general development) from two universities of the Republic of Kazakhstan. A mixed method was used in the study. Quantitative data was collected using the "Scale of general perception of competence in the field of measurement and assessment for future teachers " developed by Nartgün [1] and qualitative data were collected through semi-structured interviews compiled by researchers. The scale consists of 24 points and is designed in the format of a five-point Likert scale. The internal reliability coefficient of the scale is .94. The quantitative and qualitative data obtained were compared and analyzed together. Based on the results of both levels of analysis, recommendations were formulated to improve innovative approaches to measuring and evaluating the psychological and pedagogical competencies of future teachers.

Keywords: Assessment, Innovative practices, Future teachers, Measurement in education, Mixed research methods, Perception of competence, Psychological and pedagogical competence.

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1. Introduction

The modern age is characterized by profound transformations not only in the field of information but also in the ways it is transmitted and used. In a rapidly changing society, there is a growing need for highly qualified specialists with the necessary knowledge, skills, and values that meet the requirements of the time. This, in turn, focuses the attention of states on the quality of training of future teachers and, in particular, on the level of formation of their psychological and pedagogical competence. In this regard, innovative approaches to measuring and evaluating the professional competencies of future teachers are becoming increasingly important as an integral part of modernizing the teacher education system.

The qualitative renewal of the education system, initially focused on changing the content of curricula, eventually covered all components of the educational process input data, the learning process itself, results, and feedback [2]. In accordance with this approach, the behaviorist approach prevailed in educational programs in Kazakhstan until the early 2000s, but in subsequent years, the transition to the principles of constructivist learning, focused on a personality-oriented and competence-based approach, began [3]. As part of these changes, the focus has shifted from a results-based model to an understanding of learning as a continuous process. In other words, knowledge is now viewed not as an end product but as the result of active interaction and reflection [4] a large number of uncontrolled input factors in the education system simultaneously increase the likelihood of errors and emphasize the importance of control mechanisms, while complicating the quality management process. In the context of the modernization of teacher education in Kazakhstan, this requires the introduction of innovative practices for evaluating not only the results but also the process of forming the psychological and pedagogical competence of future teachers. Such approaches provide a more accurate, holistic, and dynamic diagnosis of the level of professional readiness of teaching staff.

This study aims to identify the perceptions of future teachers who will work in elementary and secondary schools regarding their confidence and self-esteem in using measurement and evaluation tools in the learning process. In accordance with this goal, the following specific tasks were set and studied:

a. What is the level of perception of future teachers' own competence in certain aspects of the scale of general competence in the field of measurement and evaluation?

b. Does the perception of general competence in measurement and evaluation differ statistically significantly depending on the academic specialty?

c. Are there statistically significant differences in the perception of competence in measurement and evaluation depending on the gender of participants?

d. Does the perception of competence in measurement and evaluation depend on the age group of participants?

Are there statistically significant differences in self-assessment of competence depending on the educational institution where future teachers study?

f. Is there a link between academic performance and the perception of one's own competence in the field of measurement and evaluation?

g. Does the perception of competence have significant differences depending on how much participants consider the undergraduate education in the subject "Pedagogical measurements and evaluation of the quality of educational systems" sufficient?

h. To what extent do future teachers consider themselves experienced in using traditional (classical) measurement and assessment methods?

i. How do future teachers evaluate their experience with additional measurement and evaluation methods?

j. What measurement and evaluation methods do future teachers plan to use when working with students in their classrooms?

k. What are the three main characteristics that future teachers believe a good measurement and evaluation tool should have?

l. To what extent do future teachers consider themselves experienced at various stages of the measurement and evaluation process?

m. What are the views of future teachers on the goals of the measurement and evaluation process in education?

n. What suggestions do future teachers propose for more effective and reliable measurement and evaluation?

2. Literature Review

The development taking place in the education system has affected not only the content of curricula but also approaches to assessing how students achieve the stated educational results, that is, to assess their success. Measuring tools not only facilitate the assessment process itself but also determine the quality and reliability of the results obtained [5]. Modern approaches are replacing traditional assessment tools that are unable to fully take into account the individual characteristics of students and their activity in group and practice-oriented tasks. We are talking about authentic and alternative (complementary) assessment methods that are widely used in modern pedagogy [6]. The use of such innovative approaches in the process of training future teachers is especially relevant in the context of assessing their psychological and pedagogical competence. The assessment of professional training should include not only theoretical knowledge but also real practical skills that manifest themselves in the course of project, research, communicative, and reflective activities. It is these multidimensional tools that allow for a more accurate and objective diagnosis of future teachers' readiness for professional activity. As the author emphasizes [7] the importance of assessment in education lies not only in the development of a theoretical framework but also in providing informed and effective solutions in educational practice.

If learning assessment activities provide information that allows both students and teachers to rethink and adjust the learning and teaching process, they can become a powerful tool to support educational achievement [8]. At this stage, the level of professional competence of the teacher directly affects the quality of the educational process being implemented, which makes it mandatory for him to possess modern methods and techniques of measurement and evaluation [9]. The practice of assessment plays a key role in both determining and improving the quality of education [8]. Competence in the field of measurement and evaluation directly affects the efforts of future teachers in achieving educational goals and shaping teaching strategies [10]. One of the most important factors for a teacher's success in the classroom is their pedagogical self-confidence, or a sense of their own professional effectiveness [11]. It is defined as a teacher's faith in their ability to effectively plan and conduct lessons, taking into account the specific context and educational task [12]. Such attitudes influence how strategically and optimistically teachers think, how they form goals, and how consistently they strive for them [13]. A high level of pedagogical self-confidence contributes to the development of a sense of pride, satisfaction, and a positive emotional background [14].

A number of studies show that future teachers have limited knowledge of modern approaches to assessment, including methods of augmented (authentic) assessment. Thus, in the author's research [15] It was found that students of pedagogical specialties have significantly less knowledge in the field of augmented assessment compared to their knowledge of traditional measurement methods. According to the results of the author's research [16] future teachers are more likely to choose methods such as portfolios, assignment assessment, concept maps, and observation, but their level of self-efficacy in using these approaches remains average. Similarly, the author's research [17] revealed that future teachers' perceptions of their own effectiveness vary according to a number of parameters (gender, motivation for choosing a profession, type of school where they studied, etc.). In the author's research [18] it was found that future teachers feel confident when working with portfolios and projects but do not feel sufficiently competent in the application of diagnostic trees and conceptual maps. The author's work [19] emphasizes that there is no statistically significant relationship between self-assessment of pedagogical competence and variables such as gender, course of study, and program. Other studies by the author [20] show that students of pedagogical specialties still prefer traditional assessment methods, despite the availability of alternatives. In addition, the analysis shows that the perception of one's own competence in the field of measurement and assessment varies at an average level and may depend on the type of school from which a student has graduated and the profile of their studies [21]. The author's research [22] also revealed a low level of motivation of future teachers to master the course

"Pedagogical measurements and evaluation of the quality of educational systems." In this context, a future teacher with competence in the field of measurement and assessment is able to consciously choose appropriate diagnostic tools, clearly understanding at what stage of the educational process and for what purpose to apply this or that method [23]. An analysis of the literature shows that research on self-esteem and professional confidence in the context of measurement and evaluation is mainly focused on future and current educators. This highlights the relevance of developing and implementing innovative practices aimed at developing measurement competencies as a key component of psychological and pedagogical training.

3. Materials and Methods

The study was conducted using a mixed method, combining both quantitative and qualitative methods of data collection and analysis. The mixed approach allows for a deeper understanding of the problem under study by leveraging the advantages of both methods, as opposed to using only one of them [24]. According to the author Bazeley [25] the main assumption of the mixed approach is that the combined use of qualitative and quantitative methods provides a more complete and accurate understanding of the issue under study than each of the methods separately. At the first stage of the study, quantitative data were collected and analyzed on the level of formation of psychological and pedagogical competencies among future teachers. At the second stage, a qualitative analysis was carried out aimed at identifying students' deeper understanding of the assessment process and their perception of innovative practices in measuring their professional readiness. The study's working group consisted of 274 senior students studying in pedagogical specialties at two state universities. The choice of senior students was due to the fact that by the time of the study they had already studied the mandatory, basic, and specialized disciplines related to the formation of psychological and pedagogical competence and had completed a course on measurement in pedagogy. After excluding 4 students from the sample, whose data was considered outliers, the study included data from 270 future teachers. The demographic characteristics of the working group members, on the basis of which the data were collected and analyzed, are presented in Table 1.

Table 1.
Demographic characteristics of the participants.

Indicator	N	%
University		
L.N. Gumilyov ENU University	140	51.9
KU named after Sh.Ualikhanov	130	48.1
Educational program		
Training of computer science teachers	140 (A=81, B=59)	51.9
Training of teachers of social disciplines (teacher training: in natural sciences, humanities, language and literature, with subject specialization in general development, etc.)	130 (A=59, B=71)	48.1
Paul		
Women	188	69.6
Men's	82	30.4
Age		
19-21 years old	229	84.8
22 years and older	41	15.2
Average Academic Achievement Score (GPA)		
0–3.00	127	47.0
3.01–4.00	143	53.0
Assessment of the adequacy of competency measurement and assessment courses		
Yes	74	27.4
Partly	136	50.4
No	70	25.9
Total	270	100

As shown in Table 1, 51.9% of the participants are senior students at L.N. Gumilyov ENU, and 48.1% are at Sh.Ualikhanov. Among the participants, 51.9% are enrolled in the educational program "Computer Science Teacher Training," while 48.1% are enrolled in other educational programs in the field of Pedagogical Sciences (teacher training in natural sciences, humanities, language, and literature, with a subject specialization of general development, etc.), which we have collectively referred to as "Training of teachers of social disciplines." When analyzing the gender composition, it was found that 69.6% are women, and 30.4% are men. In the age category, the majority of students (84.8%) are between 19 and 21 years old, while 15.2% are aged 22 and older. Regarding academic performance, 47.0% of the participants have an average score in the range from 0 to 3.00, while 53.0% have an average score in the range from 3.01 to 4.00. When asked about the assessment of the sufficiency of courses on measuring and evaluating psychological and pedagogical competencies completed within the framework of the bachelor's degree, 27.4% answered "Yes," 50.4% "Partially," and 25.9% , "No."

In this study, to collect quantitative data, a scale of self-assessment of the psychological and pedagogical competence of future teachers was used, adapted on the basis of the "Scale of perception of general skills in the field of measurement and evaluation of future teachers" developed by Nartgün [1]. The tool includes three subscales:

- Basic professional concepts (6 statements),
- Assessment techniques in teaching (9 statements),
- Data interpretation and reporting (9 statements).

The scale consists of 24 statements in total.
The assessment is based on a 5-point Likert scale.:
1 = Completely incompetent (1.00–1.80),
2 = Incompetent (1.81–2.60),
3 = Average level of competence (2.61–3.40),
4 = Competent (3.41–4.20),
5 = High level of competence (4.21–5.00).
In the framework of this study, the Kronbach reliability coefficients were:

- For the subscale of basic concepts — $\alpha = .87$,
- For the subscale of assessment techniques — $\alpha = .90$,
- For the subscale of interpretation and reporting — $\alpha = .93$,
- For the entire scale as a whole — $\alpha = .94$, which indicates a high internal consistency.

To collect qualitative data, this study used a semi-structured interview form designed to identify future teachers' perceptions of their competence in measurement and evaluation. In the process of developing the questions, a detailed analysis of the scientific literature on this topic was carried out. The interview form consists of three sections:

1. The first section contains demographic data of the participants: it includes six questions regarding educational programs (field of study), gender, age, university, average academic score, and participants' opinions on the adequacy of measurement and assessment training during their bachelor's degree.

2. The second section contains a self-assessment scale for general competence in measurement and assessment, which enables quantification of future teachers' confidence in their knowledge and skills.

3. The third section includes 7 open-ended questions aimed at revealing students' views and practical experience in the field of assessment, as well as supporting quantitative data. The topics of the questions cover: the experience of using traditional and alternative assessment methods, three mandatory qualities that students believe a good assessment tool should have, the tools they plan to use in their professional activities, experience in participating in assessment activities, understanding the objectives of the assessment process, as well as suggestions for improving the assessment process.

The scale was supplemented with a form for collecting personal information and was applied to 274 future teachers included in the research sample. It took the participants approximately 20 minutes to complete all the points on the scale. Afterward, the subjects were asked to answer questions aimed at identifying their opinions and ideas about the measurement and evaluation process.

To determine whether the data conforms to a normal distribution, a normality check was performed based on the coefficients of skewness and kurtosis. In this context, the values of skewness and kurtosis were divided by the standard error, and based on the values obtained, it was determined whether the data conformed to a normal distribution. For the entire sample of future teachers, the coefficient of asymmetry was 1.26, and the excess was -0.71. For subgroups in the areas of training:

- Training of computer science teachers: asymmetry 1.03, excess -1.05;
- Social studies: skewness 0.90, kurtosis 0.01.

The coefficients of skewness and excess according to school scores obtained in each category of study variables are presented in Table 2.

Table 2.
Checking the normality of the distribution of variables.

Variable	**AS**	**KU**	**SES**	**SEE**
The direction of training				
Training of computer science teachers	1,042	-0,651	0,45	0,18
Training of teachers in social disciplines (teacher training: in natural sciences, humanities, language and literature, with subject specialization in general development, etc.).	0,78	-0,34	0,31	0,11
Paul				
Women	0,92	-0,58	0,39	0,17
Men's	1,11	-0,73	0,48	0,21
Age				
19–21 years old	1,03	-0,89	0,42	0,19
22 years and older	0,87	-0,45	0,36	0,15
University				
L.N. Gumilyov ENU University	0,64	-0,37	0,25	0,10
KU named after Sh.Ualikhanov	1,29	-0,69	0,51	0,22
Final score of psychological and pedagogical competence	0,88	-0,53	0,33	0,14

Symbols:

- AS — Asymmetry (parity of distribution)
- KU — Kurtosis (elongation of the distribution)
- SES — Standard error of skewness
- SEE — Standard Excess Error

The obtained values of skewness and kurtosis are within the confidence interval ±1.96 at a significance level of 95%, which allows us to consider the distribution as normal. The following statistical methods were used to analyze the data: descriptive statistics (mean, standard deviation, and percentage) were used to analyze the first subgoal; a t-test for independent samples was used to analyze the second, third, fourth, fifth, and sixth subgoals; and one-way analysis of variance (ANOVA) was used to analyze the seventh subgoal. Spearman's rank correlation coefficient.

Since the assumption of the uniformity of variances was respected, and the number of groups was significant, the Tukey test was applied for multiple comparisons. In addition, to determine the strength of significant differences between variables, the effect size index or the value of $\boldsymbol{\eta^2}$ was calculated. The values of the effect size were interpreted as follows:

- $d < 0.2$ — low effect,
- $0.2 < d < 0.8$ — medium effect,
- $d > 0.8$ — high effect.

Similarly, the value of η^2 was interpreted as:

- $\eta^2 = 0.01$ — small effect,
- $\eta^2 = 0.06$ — average effect,
- $\eta^2 = 0.14$ — high effect.

When analyzing the relationship between future teachers' general perception of their competence in the field of measurement and assessment and the degree of satisfaction with learning on this topic in undergraduate studies, the Spearman correlation coefficient was used, since the satisfaction variable had an ordinal scale, and the self-assessment of competence had an interval scale.

The Spearman correlation coefficient, like the Pearson correlation coefficient, takes values from -1 to +1. The magnitude of the connection is interpreted as follows:

- < 0.30 — weak connection,
- from 0.30 to 0.69 — average connection,
- ≥ 0.70 — is a strong bond.

The scale "General competence in the field of measurement and assessment" for future teachers, developed by Nartgün [1] includes three subscales. In this study, the total scores for all three subscales were used for analysis. The minimum possible score is 24, and the maximum is 120.

When analyzing the data obtained using the interview form, both content analysis and descriptive analysis were employed. As part of the descriptive analysis, the data was summarized and interpreted according to predefined themes. Additionally, some significant points identified during the analysis were supported by direct quotes from interviews. The purpose of content analysis is to identify concepts and connections that can explain the collected data. In this study, qualitative data was encoded and analyzed within predefined thematic categories.

The encodings of 23% of the qualitative data set were verified by the researcher together with experts in the field of teaching social studies and pedagogical measurements. The percentage of consistency between encoders for this dataset was 91.9%. When similarly checking another data set related to the answers to another open question, covering 23.9% of the sample, the percentage of agreement between coders was 88.0%. The average level of agreement between the two experts was 89.95%. Since this indicator exceeds the threshold of 70%, it can be assumed that the criterion of initial consistency between encoders has been met. In the process of presenting the opinions of the participants, the following coding system was used:

- The first letter stands for the university,
- The second is the training area,
- The third is the gender of the participant,
- The last one is an ordinal number.

Example of notation: (X, SAT, W, 12).

The content of 270 participants' statements was used to analyze qualitative data.

4. Results and Discussion

Descriptive statistics on the general competence of future teachers in the field of measurement and assessment are presented in Table 3.

Table 3.
Descriptive statistics on the scale of general competence of future teachers in the field of measurement and assessment

Measurable aspects	n	$\bar{X}$	S	Minimum	Maximum
Basic concepts	270	3.54	4.25	1.83	5
Assessment methods and techniques	270	3.48	5.75	1.66	5
Statistical processing and interpretation	270	3.03	7.80	1.00	5
Total	270	3.33	15.24	1.62	5

The level of competence perception by future teachers in the first component of the scale of general competence in the field of measurement and assessment "basic concepts" (X = 3.54) was defined as "sufficient." In the second component, "assessment methods and techniques," participants also rated themselves at a sufficient level (X = 3.48). In the third component, "statistical analysis and presentation of results," the level of perception was described as "average" (X = 3.03). In general, according to the three components of the scale, the overall level of perception by future teachers of their competence in the field of measurement and assessment was defined as "average" (X = 3.33). The following table provides descriptive statistical data characterizing the level of perception of competence in each component of the scale among students studying in the areas of "Computer Science teacher training" and "Training of teachers of social disciplines."

Table 4.
Descriptive statistics on the levels of perception by future teachers of computer science and social sciences of general competence in the field of measurement and assessment.

The direction of training	n	Basic concepts	Assessment methods	Statistical analysis and reporting
Training of computer science teachers	140	3.63	3.60	3.22
Training of teachers of social disciplines	130	3.46	3.36	2.82

The level of perception of general competence in the field of measurement and assessment among future teachers studying in the field of computer science was determined as "sufficient" for the following components of the scale:

- "Basic concepts" (X = 3.63)
- "Assessment methods" (X = 3.60)

At the same time for the component "Statistical analysis and reporting" (X = 3.22), the level was described as "average".

With a similar analysis of data for future teachers in the field of "social disciplines", the following was found:

- According to the component "Basic concepts" (X = 3.46), perception is also at a "sufficient" level,

While, according to the components "Assessment methods" (X = 3.36) and "Statistical analysis and reporting" (X = 2.82), the level of perception of general competence was assessed as "average".

Table 5 shows the results of a t-test conducted to identify differences in the perception of the psychological and pedagogical competence of future teachers, depending on the educational program used (innovative or traditional), based on the application of modern measurement and evaluation practices.

Table 5.
The results of the t-test on the perception of psychological and pedagogical competence by future teachers, depending on the training program.

Training program	n	$\bar{X}$	S	df	t	p	Cohen *d*
A program with innovative practices	140	83.25	14.90	268	3.76	.000	0.46
The traditional program	130	76.43	14.86				

It was found that the scores of future teachers in terms of psychological and pedagogical competence vary significantly depending on the educational program used [t(268) = 3.757, p < .05]. Participants enrolled in the program with the introduction of innovative practices (M = 83.25) demonstrated a higher level of competence compared to participants in the traditional program (M = 76.43). The difference between the groups has an average effect size (Cohen's d = 0.46), which accounts for approximately 22% of the total variance.

Table 6 shows the results of a t-test conducted to identify differences in the perception of future teachers' psychological and pedagogical competence, depending on their gender.

Table 6.
Results of the t-test on the perception of psychological and pedagogical competence by future teachers, depending on gender.

Paul	n	$\bar{X}$	S	df	t	p	Cohen's *d*
Women	188	79.38	14.97	268	0.95	.343	0.12
Men's	82	81.30	15.86				

Differences in the perception of future teachers' psychological and pedagogical competence by gender were found to be statistically insignificant [t(268) = 0.95, p > .05]. Although men (M = 81.30) exhibited slightly higher averages than women (M = 79.38), this difference is considered small in effect size (Cohen's d = 0.12) and is not practically significant. This suggests that gender does not play a determining role in assessing the level of psychological and pedagogical competence when employing innovative measurement and evaluation practices.

Table 7 shows the results of a t-test conducted to identify differences in the perception of the psychological and pedagogical competence of future teachers, depending on their age.

Table 7.
Results of the t-test on the perception of psychological and pedagogical competence by future teachers, depending on age

Age	n	$\bar{X}$	S	df	t	p	Cohen's *d*
19–21 years old	229	79.91	15.25	268	0.14	.892	0.02
22 years and older	41	80.26	15.37				

Based on the t-test, it was found that the age of future teachers does not significantly affect their perception of psychological and pedagogical competence [t(268) = 0.14, p > .05]. The average values for participants aged 22 years and older (M = 80.26) and those in the 19-21 years age group (M = 79.91) are nearly identical. The effect size is minimal (Cohen's d = 0.02), indicating no significant age difference in assessing competence levels when using innovative measurement and evaluation approaches.

Table 8 shows the results of a t-test conducted to identify differences in the perception of the psychological and pedagogical competence of future teachers, depending on the university in which they study.

Table 8.
Results of the t-test on the perception of psychological and pedagogical competence by future teachers, depending on the university of study.

University	n	$\bar{X}$	S	df	t	p	Cohen's *d*
L.N. Gumilyov ENU University	140	77.12	15.00	268	3.23	.001	0.39
KU named after Sh.Ualikhanov	130	83.03	14.95				

The results of the analysis indicated that the psychological and pedagogical competence of future teachers varies significantly depending on the university attended [t(268) = 3.23, p < .05]. Students at KU named after Sh. Ualikhanov (M = 83.03) demonstrated a higher perception of their competence compared to students at L.N. Gumilyov ENU University (M = 77.12). The observed difference has a medium effect size (Cohen's d = 0.39), suggesting that educational strategies, including innovative measurement and evaluation practices, may influence the development of professional competencies.

Table 9 shows the results of a t-test conducted to identify differences in the perception of the psychological and pedagogical competence of future teachers, depending on their average academic success (GPA).

Table 9.
Results of the t-test on the perception of psychological and pedagogical competence by future teachers, depending on their academic performance.

Academic performance (GPA)	N	$\bar{X}$	S	df	t	p	Cohen's *d*
1.00–3.00	127	79.55	14.78	268	0.43	.671	0.05
3.01–4.00	143	80.34	15.68				

The results of the t-test indicated that the level of academic achievement among future teachers does not significantly influence their perception of psychological and pedagogical competence [$t(268) = 0.43$, $p > .05$]. Although students with higher GPAs ($M = 80.34$) scored slightly higher than those with lower GPAs ($M = 79.55$), this difference was statistically insignificant and demonstrated an extremely weak effect size (Cohen's $d = 0.05$). This suggests that the development of psychological and pedagogical competence may be more related to the application of innovative approaches during training rather than academic performance itself.

Table 10 shows the results of an analysis of variance (ANOVA) aimed at identifying differences in the perception of psychological and pedagogical competence by future teachers, depending on their assessment of the adequacy of undergraduate education in the field of measurement and evaluation.

Table 10.
The results of the analysis of variance (ANOVA) of differences in the perception of psychological and pedagogical competence depending on the assessment of the adequacy of education received in measurement and evaluation.

The source of the variation	Sum of squares	df	The average square	F	p	Significant difference	η^2
Intergroup	7482.47	2	3741.24	18.16	.00	Yes – No	0.12
Intra-group	55021.29	267	206.07			Yes – Partly	
General	62503.76	269					

Note: *$p < 0.05$.

According to the results of the Levene test, since the value of $p > 0.05$ ($p = 0.387$), the null hypothesis was accepted that there were no statistically significant differences in variances between the groups [26]. The results of the analysis of variance (ANOVA) indicated a statistically significant difference in the perception of the overall level of psychological and pedagogical competence, depending on how much future teachers consider the measurement and assessment courses received during their bachelor's degree to be sufficient [$F(2, 267) = 18.155$, $p < 0.05$]. According to the results of the post-hoc analysis (Tukey test), the perception of psychological and pedagogical competence was higher among participants who marked "Yes" ($M = 88.07$) compared to those who chose "No" ($M = 73.14$) and "Partially" ($M = 79.66$). In other words, teachers who consider their undergraduate education in measurement and evaluation sufficient demonstrate higher confidence in their overall competencies in this area. It was found that the observed difference has an average effect size ($n2 = 0.12$) and explains about 11% of the total variance. Additionally, the Spearman correlation coefficient was used to identify the relationship between the perception of the sufficiency of university education and the overall level of competence in measurement and evaluation. The results showed a positive and statistically significant relationship between the two variables ($r = 0.35$, $p < 0.00$). This indicates that as future teachers' confidence in the adequacy of their education increases, so does their subjective assessment of their competence in the field of psychological and pedagogical measurements.

Table 11 presents the qualitative opinions of the participants who chose the options "Yes", "Partially" and "No" about their perception of the sufficiency of training in the field of measurement and evaluation.

Table 11.
Opinions of students of pedagogical fields (specialties) about teaching assessment and measurement in the process of professional training.

Category	Yes (f. %)	Partly (f. %)	No (f. %)
Competent teachers	24. 8.8		
An effective educational environment	20. 7.4		
Sufficient subject base	20. 7.4		
Support (courses, etc.)	2. 0.7		
Insufficient organization of the course content		35. 12.9	
Lack of practice		27. 10	
Insufficient number and time of classes		15. 5.5	
Low stability of knowledge		12. 4.4	
Student-level discrepancy		11. 4.07	
Orientation towards exams (e.g., UNT. USE)		10. 3.7	
Mechanical memorization		10. 3.7	
Students' passivity		3. 1.1	
Assimilation of the course content			50. 18.5
Teacher's factor (behavior. bias. etc.)			20. 7.4
Lack of watches			5. 1.8
Problems in the learning process			2. 0.7
The coverage of topics is too broad			1. 0.3
Lack of interest in the subject			1. 0.3
Lack of educational materials			1. 0.3
Misunderstanding of key concepts			1. 0.3

When analyzing Table 11, it can be observed that among future teachers who consider their bachelor's degree in measurement and assessment to be sufficient (the answer is "Yes"), the most frequently mentioned category is "qualified teacher" (f=24). One participant expressed this as follows: "Our teacher knew this subject well and was able to explain it well to us." Among respondents who selected the "Partially" option, the most common explanation is "insufficient organization of the course content" (f=35). Within this category, disadvantages such as the lack of numerical examples, exclusive use of a lecture format, and the content's ineffectiveness were highlighted. Some participants shared their thoughts: "I absolutely do not think that these classes at the university were sufficient. Everything was too theoretical"; "The digital aspect was overlooked. Probably because our subject is more focused on the humanities." Simultaneously, among respondents who chose the "No" option, the most common category is "inability to fully grasp the content of the course" (f=50). Subcategories within this include excessive theory, low efficiency, lack of practice, fragility of acquired knowledge, focus solely on exams, and superficial presentation. Participants described their experiences as follows: "They explained everything to us only theoretically, without showing us how to actually conduct an assessment. Everything was in the format of a simple lecture, which is not enough. Teach us how to do it in practice"; "It wasn't enough. It's just that lectures on slides don't give lasting results."

Within the framework of this section, the eighth auxiliary question was analyzed, concerning the level of experience of future teachers in the application of traditional/classical assessment methods, as well as the ninth auxiliary question aimed at identifying their level of training in the field of alternative (complementary) assessment and measurement methods. In this regard, the opinions of future teachers were collected regarding which methods and tools of assessment and measurement they feel most competent and experienced in. The results are presented in Table 12.

Table 12.
The results are presented.

Traditional assessment methods	Not at all	Badly	Medium	Well	Great
Answer selection tests	2	10	74	114	70
True/false tests	3	7	54	144	62
Compliance questions	3	9	64	125	69
Short-answer tests	3	10	81	119	57
Oral interview	13	27	100	93	37
Written survey	6	19	78	117	50
Alternative assessment methods	Not at all	Badly	Medium	Well	Great
Mutual evaluation	15	25	103	98	29
Categories (assessment scales)	17	38	116	75	24
Concept maps	7	20	92	108	43
Control sheets	13	30	108	92	27
Portfolio / E-portfolio	13	36	109	75	37
Self-assessment	5	15	88	120	42
Tasks to complete (performance tasks)	12	17	94	111	36
Projects	11	23	107	95	34
Diagnostic decision trees	16	33	91	96	34
Structured lattices (structural tables)	19	46	75	75	39

When reviewing Table 12, it was found that among the traditional/classical assessment methods, future teachers most often indicated a high level of experience in using the following tools: right-wrong tests (53.3%), compliance questions (46.3%), short-answer tests (44.1%), written surveys (43.3%), and tests with a choice of answers (42.2%) at the "good" level.

In a similar analysis of data on alternative assessment methods, it was found that future teachers consider themselves the most experienced in applying self-assessment (44.4%), performance tasks (41.1%), and conceptual maps (40.0%) at the "good" level; and assessment scales (rubric) at the "average" level (43.0%).

A simple linear correlation analysis was conducted to determine the relationship between individuals' perception of their own competence in the field of assessment and the assessment methods/tools employed.

The results of the analysis showed that there is a positive and statistically significant relationship between the perception of competence and traditional assessment methods. In particular, there was a weak positive correlation with answer selection tests ($r=0.29$, $p<0.00$) and "true/false" tests ($r=0.26$, $p<0.00$); and a moderate positive correlation with compliance questions ($r=0.31$, $p<0.00$), tests with short response ($r=0.31$, $p<0.00$), oral ($r=0.38$, $p<0.00$) and written surveys ($r=0.32$, $p<0.00$).

It was also found that there is a positive and significant correlation between the perception of competence and the use of alternative assessment methods. In particular, a moderate positive correlation with:

- Mutual assessment ($r=0.45$, $p<0.00$),
- Assessment scales (rubric) ($r=0.51$, $p<0.00$),
- Conceptual maps ($r=0.43$, $p<0.00$),
- Control sheets ($r=0.47$, $p<0.00$),
- Portfolio/electronic portfolio ($r=0.39$, $p<0.00$),
- Self-assessment ($r=0.43$, $p<0.00$),
- Completion tasks ($r=0.39$, $p<0.00$),
- Projects ($r=0.42$, $p<0.00$),
- Diagnostic decision trees ($r=0.46$, $p<0.00$),
- Structured lattices ($r=0.46$, $p<0.00$).

For example, it has been found that future teachers often use grading scales when evaluating student portfolios.

In general, it can be concluded that the level of perception of one's own competence among future teachers has a higher correlation with alternative assessment methods than with traditional or classical tools.

As part of the tenth research question, participants were asked to answer the following open-ended question:

What assessment tools and methods do you plan to use to evaluate your students when you start working as a teacher?

The responses received from prospective teachers were categorized based on their specializations: training computer science teachers and training teachers of social disciplines. The results of the analysis are presented in Table 13, which reflects students' preferences regarding traditional and additional assessment methods.

Table 13.
Opinions of future teachers on the use of assessment tools.

Type of assessment	Computer science teacher training (%)	Training of computer science teachers (f)	Training of teachers of social disciplines (%)	Training of teachers of social disciplines (f)
Traditional assessment methods				
Multiple choice tests	13.8	59	23.6	77
True-false statements	6.3	27	6.1	20
Comparative tasks	7.0	30	3.6	12
Written surveys	8.4	36	15.0	49
Short answers	3.9	17	7.0	23
Open questions	5.3	23	4.6	15
Oral interviews	5.6	24	4.6	15
Additional assessment methods				
Student portfolio	8.4	36	5.2	17
Projects	4.9	21	2.4	8
Self-assessment	3.9	17	1.8	6
Engagement Analysis	2.1	9	2.7	9
Decision tree	3.0	13	0.9	3
Concept map	3.0	13	1.8	6
Other				
Use of all types	3.7	16	1.5	5
Combined tasks	0.7	3	3.1	10
Games and drama	0	0	0.6	2
Other	1.6	7	3.3	11
Not specified	1.6	7	2.4	8

Analyzing the data in Table 13 it can be noted that future computer science teachers (f=427) use more diverse assessment methods and tools compared to students of the Social Studies department (f=326). Both groups demonstrate similar preferences in choosing the methods most often planned for use: these are multiple-choice tests, written tests, true/false tests, comparison tasks, short-answer questions, as well as portfolios (products of students' activities).
Future teachers explain their choice as follows:

- "I will choose multiple choice tests because they are economical and have high substantive validity."
- "Since the exam system in our country is focused on such tests, I will try to make the most of this type of assignment."
- "I use multiple choice tests because the assessment is more objective."
- "I prefer multiple choice tests, because these are the kinds of tasks used in government exams."
- Among the alternative (complementary) assessment methods, the greatest preference was given to the portfolio, which involves analyzing the products of students' activities. Some participants commented on this as follows:
- "I would choose a portfolio so as not to stress the children from exams and to be able to see their development in the complex."
- "In addition to multiple choice tests, I want to use a portfolio to track progress during the semester."
- Future primary school teachers note that there are no written exams in the first grades of elementary school, so they plan to rely on intra-classroom activity and student participation as the main means of assessment. In turn, future social studies teachers tend to use mixed methods combinations of various techniques in order to compensate for the weaknesses of each method.
- "I'm going to combine different methods so that the disadvantages of one are compensated by the advantages of the other."

The eleventh subtask question of the study presents the distribution of opinions of future teachers regarding three mandatory characteristics that, in their opinion, an effective tool for assessing and measuring student academic achievement should have. These data are shown in Table 14.

Table 14.
The opinion of future teachers on the mandatory characteristics of effective assessment and measurement tools.

Characteristic	Frequency (f)	Percent (%)
Reliability (objectivity and stability of results)	92	34,1
Validity (compliance with the assessment objective)	76	28,1
Practicality (ease of use)	73	27,0
Other	29	10,8
Total	270	100

When analyzing the responses of future primary school teachers regarding the three mandatory characteristics of effective assessment tools, reliability was identified as the most important (34.1%). Validity was considered the second most important characteristic (28.1%), and practicality ranked third (27.0%). This suggests that participants regard the ability of an assessment tool to produce consistent and objective results as the most critical condition for its effectiveness. As confirmed in the scientific literature, reliability is a key characteristic of a high-quality measuring instrument. This section presents the distribution of opinions among future primary school teachers concerning their experiences during the assessment stages, which relates to the twelfth subproblem of the study. The data is shown in Table 15.

Table 15.
Distribution of opinions of future teachers on the availability of experience at the assessment stages.

Assessment stages	Not at all (f)	Bad (f)	Average (f)	Good (f)	Very good (f)
Student Study	5	9	75	142	39
Student supervision	3	8	50	137	72
Tool development	8	30	108	105	19
Application of the tool	5	14	85	126	40
Tool evaluation	5	19	75	130	41
Preparing the report	8	29	87	112	34

When interviewing future teachers about their own experiences at the assessment and measurement stages, the majority of participants indicated that they had a good level of experience in the following areas:

- Student learning – 52.6% (f=142) consider their experience to be good,
- Student supervision – 50.7% (f=137),
- The measurement tool score is 48.1% (f=130),
- Tool usage – 46.6% (f=126),
- Preparation of financial statements – 41.4% (f=112).

The only stage where the majority of participants rated their experience as average was the development of a measurement tool, 40.0% (f=108).

To determine whether there is a link between the perception of one's own competence in the field of assessment and actual experience, a simple linear correlation analysis was performed. The analysis showed a positive and statistically significant correlation between self-assessment of competence and assessment stages.

- Student learning: $r=0.39$, $p<0.00$
- Student observation: $r=0.31$, $p<0.00$
- Tool development: $r=0.47$, $p<0.00$
- Tool usage: $r=0.42$, $p<0.00$
- Instrument rating: $r=0.44$, $p<0.00$
- Report preparation: $r=0.39$, $p<0.00$

This section examines the thirteenth sub-topic of the study, which concerns the opinions of future primary school teachers about the goals of the assessment and measurement process. Table 16 provides detailed data reflecting the goals that participants consider most important. The approaches of future teachers to the assessment process allow us to judge the degree of their orientation towards such goals as studying students, tracking their development, and correcting the educational process.

Table 16.
Opinions of future teachers on the goals of innovative practices for measuring and evaluating psychological and pedagogical competence.

Category	f	%	Category	f	%
Identification of psychological and pedagogical characteristics and needs of students through assessment	189	40.1	Planning innovative methods to correct previous errors and distortions in knowledge	10	2.1
Individualization of the educational process through the assessment of educational needs	61	12.9	Ensuring sustainable assimilation of key pedagogical concepts	8	1.6
Using alternative and innovative assessment methods	41	8.7	Assessment of the final result of professional development	7	1.4
The use of valid and reliable tools for the diagnosis of pedagogical competencies	36	7.6	Critical reflection and rethinking the role of assessment (anxiety reduction, focus on development)	7	1.4
Improving the effectiveness of the pedagogical process through the assessment of cognitive, affective and motor spheres	32	6.7	Step-by-step tracking of the dynamics of students' competence development	5	1.06
Monitor readiness levels and track student progress	24	5.1	Development of individualized educational trajectories based on assessment results	5	1.06
Orientation towards the identification and development of pedagogical abilities	17	3.6	Improving the overall quality of teacher education	4	0.8
Building future teachers' confidence in their own professional capabilities	12	2.5	Motivation of students through participation in assessment procedures	1	0.2
No response	12	2.5			
Total	459	100			

When analyzing the participants' opinions on the main goals of measurement and assessment in education, it was found that the most frequently repeated justification is "to identify the condition of students as a result of the assessment process (feedback, internalization, etc.)" (f=189). In other words, it concerns determining how well the studied materials are assimilated by the students.

The second most common goal is "identifying and meeting students' educational needs through assessment" (f=61), and the third is "using alternative assessment methods that differ from traditional ones" (f=41).
The least mentioned goal was "student motivation through assessment procedures" (f=1).
In this context, direct quotes from the data are presented:

- "Check what the student has learned and what has not been learned in the learning process. Depending on the result, assistance is provided on undeveloped topics."
- "Get feedback on the desired behavior that is expected to form in the student."
- "Get feedback on how well the students have learned the material, and based on this, determine teaching methods."
- "Assess how much the student has learned and internalized knowledge and whether he will be able to apply it in the future."
- "Identify what the student has learned or not learned, and adjust the planning of the following topics to reflect these gaps."
- "Check the student's prior knowledge and direct the training based on their needs. Determine how successfully the goals were achieved after completing the topic."

Within the framework of this section, Table 17 presents suggestions from future teachers to improve or enhance the existing assessment system, which corresponds to the fourteenth subtask of the study.

These proposals are classified in the following areas:

- Proposals related to the evaluation process,
- Proposals related to the development and application of measuring instruments,
- Suggestions focused on the teacher's role in the assessment process

Table 17.
Innovative proposals for future teachers to improve the assessment system.

Subcategory	**f**	**%**
The assessment should be fair and objective.	73	13.5
Using innovative and alternative methods and techniques together with traditional ones	32	5.9
Transition to process-oriented assessment	25	4.6
Assessment should be focused on the learning process, not just the outcome.	16	3.0
Avoid motivation solely through marking (evaluation should not be the only motivation)	13	2.4
Provide high-quality teacher assessment training	9	1.7
Systematically eliminate gaps in students' knowledge based on assessment	7	1.3
Using more objective approaches instead of subjective methods	6	1.1
The use of modern technologies in the assessment process	4	0.8
Using valid and reliable tools	53	9.8
Compliance with the content, structure and objectives of the training program	41	7.6
Compliance with individual characteristics of students	36	6.7
The breadth and completeness of the content of the tasks	35	6.5
Minimizing the influence of external factors (noise, light, safety, physical environment, etc.)	35	6.5
Reducing the number of errors in assignments (grammatical, semantic, etc.)	19	3.5
Compliance with standards when creating assignments	18	3.3
Matching the level of difficulty to the level of students' training	11	2.0
Applying tests that meet the goals	8	1.5
Diagnosis of high-level skills (analysis, synthesis, etc.)	7	1.3
Reducing the number of memorization tasks	6	1.1
Clarity and clarity of wording	5	0.9
Providing feedback	5	0.9
The aesthetic structure of tasks	5	0.9
Do not use only questions with a single correct answer.	5	0.9
The possibility of students' self-expression	3	0.6
Logical and coherent tasks	2	0.4
Transparency of criteria and their compliance with set goals	2	0.4
Improving the competence of teachers in the field of innovative assessment	20	3.7
Improving the professional status of a teacher	2	0.4
There are no offers	f = 2	% = 0.4
The overall result	541	100

A general analysis of Table 17 found that the largest number of suggestions made by future teachers related to the development and use of measuring instruments (f = 328), which accounted for 60.6% of the total data sample.

The second place is occupied by proposals focused on the assessment process (f = 180, 33.3%), and the third place is occupied by proposals related to the professional role of the teacher in the assessment system (f = 20, 3.7%).

Thus, these three areas cover 97.6% of all offers. The remaining 2.4% belong to the "No supply" and "Empty" categories.

If we take a closer look at the proposals regarding the assessment process, respondents most often mention the need for a fair and objective assessment (f = 73). This subcategory is equally common among students of computer science training and students of social sciences training. Examples from the data include the following statements:

"Students should be treated more objectively and fairly.".

"The most important thing is objectivity. The assessment should be impartial and transparent.

An analysis of the subcategories in the section "Development and application of measuring tools" shows that the most frequently repeated sentences are evenly distributed between the two subcategories.

- Use of valid and reliable measuring instruments (f = 53),
- Taking into account the characteristics of the target audience to which the assessment is directed (f = 53).

Relevant examples from the data:

"Assessment should be fair; tests should be developed taking into account the level of students' education. It is important to avoid repetitive tasks and to pay attention to the criteria of reliability and validity."

"One should be objective. It is necessary to understand the assessment methods thoroughly. The main thing is to consider the individual characteristics of the students."

As for the category "Teacher-related suggestions", the most frequently mentioned here is the need for a sufficient level of knowledge in the field of assessment and measurement (f = 15). Examples of respondents' statements:

"The teacher performing the assessment should have sufficient knowledge in this area.";

"The assessment should be conducted by well-trained specialists. The assessment course should be of particular importance in teaching teachers.";

"The person conducting the assessment should have relevant knowledge and experience.".

5. Discussion and Conclusion

The study revealed that future teachers generally rate their psychological and pedagogical competence at an average level. At the same time, according to the "basic psychological and pedagogical knowledge" subscale, many participants rated themselves as sufficiently competent. However, in the components related to the analysis and interpretation of psychological and pedagogical data, the majority of respondents indicated an average level of their training.

The revealed difference between students of different educational programs warrants particular attention. For example, future computer science teachers demonstrated higher scores on the scale of "methods of assessment and interpretation of pedagogical information" than students studying in the field of "social sciences." This may indicate differences in the content of the training courses, as well as the quality of teaching at different faculties.

It was also found that graduates of one of the ENU universities demonstrated higher levels of psychological and pedagogical competence compared to students of Shokhan Ualikhanov University. The effect was statistically significant and was assessed as moderate in magnitude. This may indicate the need to review and modernize the content of courses in psychology and pedagogy, as well as the importance of training teachers in these disciplines.

The results of the study indicated that variables such as gender and age do not significantly influence the level of psychological and pedagogical competence, which is consistent with previous research. However, students who perceive the disciplines of psychology and pedagogy acquired during their studies as sufficient tend to have a higher self-assessment of their competence. Although the effect was small, it remained consistent.

Future teachers most often choose traditional diagnostic and assessment tools (tests, questionnaires, observations) for professional use. Nevertheless, among the innovative approaches, methods such as "portfolio," "assessment sheets," and self-assessment attract attention. Participants pointed out that such forms allow for a comprehensive assessment not only of knowledge but also of the personal and professional qualities of students. This is confirmed by other studies that emphasize the value of the portfolio as a tool for integrative assessment of competence.

As part of the qualitative analysis of the respondents' responses, special importance was attached to the training of teachers who teach courses in psychological and pedagogical training. Future teachers who positively assessed the quality of these courses most often pointed to the "competence of the teacher" as a key factor.

In addition, the study participants emphasized the importance of integrating the assessment of psychological and pedagogical competence into professional practices and training internships. This, in their opinion, allows not only for theoretical mastery but also for the practical application of methods of diagnosis, observation, analysis, and interpretation of student behavior.

Among the recommendations formulated based on the results of the study:

- It is necessary to expand the number of courses aimed at developing psychological and pedagogical competence within the bachelor's and master's degrees.
- Inclusion of innovative forms and methods of assessment (for example, digital portfolio, digital case analysis, structured observation, competence-based tasks, criterion-based assessment, etc.).
- Practical exercises in the disciplines of psychology and pedagogy should focus on the use of real assessment and diagnostic tools in the educational process.
- Professional development of teachers leading such disciplines in the field of innovative assessment methods is also a key area of development.

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