TEACHING SKILLS IN TEST CONSTRUCTION AND ANALYSIS BASED ON PSYCHOMETRIC APPROACHES

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In the modern education system, the quality of assessment of knowledge and competencies is one of the key factors that determine the effectiveness, transparency, and fairness of the educational process. In particular, assessment through test-based examinations is recognized as one of the most widely used methods to evaluate students' knowledge level and intellectual potential. Therefore, the importance of scientifically grounded approaches-especially psychometric approaches-in test construction, analysis of test quality, and implementation in practice is steadily increasing. Psychometrics is a field of study focused on the quantitative assessment of human psychological traits (knowledge, ability, motivation, and other latent constructs). The main objective of this discipline is to develop methodological approaches that ensure the reliability, validity, and precision of assessment tools, particularly tests. Psychometric analysis allows for identifying statistical quality indicators of test items (such as discrimination index, difficulty level, and internal consistency) and conducting in-depth pedagogical analysis based on the test results. In recent years, the widespread use of test methods in secondary and higher education systems, as well as the reliance on test outcomes for decision-making, has increased the demand for high methodological and statistical literacy among test developers.

In the global literature (e.g., Benjamin D. Wright, Geoffrey N. Masters, Robert L. Linn, and others), extensive studies have been conducted on developing tests based on psychometric approaches, determining test item parameters, and modeling latent constructs. In particular, Classical Test Theory (CTT) and Item Response Theory (IRT) are among the most commonly used methods in test development and analysis. Although certain research has been carried out in Uzbekistan regarding test-based assessment (e.g., works by O'. Umrzoqov, M. Kholbotaboyeva, and others), these studies primarily focus on content and educational effectiveness analysis. However, issues such as analysis of psychometric quality indicators, parametric description of test items, statistical reliability criteria, modeling, and diagnostic analysis have not yet been sufficiently addressed (see A.A. Bodalev, S.A. Minaeva). Moreover, current research lacks practical methodological guidelines, instructional modules, or

educational technologies aimed at helping teachers develop diagnostic skills in test construction.

These circumstances indicate the presence of the following core problems:

-Psychometric indicators are not sufficiently considered during the test construction process;

-Teachers often lack the necessary skills to conduct quality analysis of tests;

-The practice of analyzing data obtained through tests from a psychometric perspective and revealing their diagnostic potential is not widespread;

-There is a lack of methodological resources aimed at teaching students and teachers how to develop tests based on psychometric approaches.

These identified issues demonstrate that developing psychometric skills for constructing and analyzing tests has become an essential pedagogical task within the educational process. Therefore, the main objective of this study is to develop a system of methodological recommendations aimed at forming the competencies of teachers and pedagogical students in constructing and analyzing tests based on psychometric approaches.

To achieve this goal, the following tasks should be carried out:

-Analyze the theoretical foundations of psychometric approaches (Classical Test Theory – CTT, Item Response Theory – IRT, factor analysis);

-Review the existing literature and methodological resources related to teaching test development and analysis;

-Develop practical algorithms for the psychometric analysis of test items;

-Create educational modules and training programs on psychometric test construction for teachers and students;

-Conduct an experimental trial to assess the effectiveness of the proposed methodological system.

In our view, giving sufficient attention to psychometric indicators during the process of test construction is a necessary condition to ensure the reliability and effectiveness of educational assessment. The following scientifically grounded approaches are recommended in this regard:

1. Determining the psychometric quality indicators of test items. After developing each test item, its key psychometric indicators - reliability, practicality, discrimination index, difficulty level, and sensitivity - must be identified using statistical methods. It is recommended that analysis be conducted based on Classical Test Theory or modern models such as Item Response Theory (IRT).

2. Introducing empirical trial and psychometric analysis as mandatory stages. Before implementation, test items should undergo empirical trials with small groups to determine their statistical characteristics. This makes it possible to identify normative indicators, probability of errors, and variations in individual responses.

3. Utilizing statistical software and analytical methods. Software tools such as SPSS, R, WINSTEPS, Iteman, TAP, and JMETRIK should be used to analyze test items and obtain accurate, objective information on their psychometric quality. This includes calculating indicators like average score and standard deviation.

4. Evaluating content and construct validity. To ensure that test items cover the intended learning competencies, expert-driven content validity and construct validity analyses should be carried out. This confirms the theoretical alignment of the test items.

5. Improving the qualifications of item writers and evaluators. Developing tests based on psychometric criteria requires special knowledge and skills from teachers and methodologists. Therefore, professional development courses in testology, psychometrics, and statistical analysis should be organized for professionals working with tests.

6. Systematic management of psychometric indicators in test banks. The psychometric indicators of each test item must be stored in a test bank and used as a basis for selection in future assessments. This ensures the quality assurance of tests and enables their reuse.

Based on the above principles, we present recommendations for constructing psychometrically sound tests for the subjects “Pedagogical Qualimetry” and “Pedagogical Mastery”:

A. Principles for Test Development:

-Construct validity: Each item should be based on a clear construct (e.g., theory of pedagogical assessment, didactic competence, analytical thinking).

-Content validity: Tasks should cover the essential knowledge, skills, and competencies from the curriculum.

-Construct alignment: The test must correspond to a theoretical model that reflects pedagogical competence.

-Discrimination: Each item should differentiate between high and low-performing students.

-Difficulty level: The test should include questions ranging from moderate difficulty to those requiring high-level analytical thinking.

-Reliability: The test should yield consistent results upon repeated administration.

-Practicality and Impact: Items should be based on scenarios applicable in real classroom settings.

Sample Test Items (Pedagogical Qualimetry):

1.Which of the following is a criterion used in qualimetric assessment?
A) Emotional climate B) Accuracy of scale descriptors

C) Students' social activity D) Subjective opinion of the evaluator

2.What is the main difference between normative and diagnostic assessment?

A) Only the teacher participates in normative assessment

B) Diagnostic assessment identifies the learner's initial status

C) Grades are not assigned in normative assessment

D) Diagnostic assessment is not based on testing

3.Which of the following is not a tool of qualimetry?

A) Rubric B) Essay C) Diagnostic table D) Test score statistics

Sample Test Items (Pedagogical Mastery):

1. What should be determined first when planning an effective lesson?

A) Learning objectives B) Assessment scales

C) Teaching style D) Parents' opinions

2. What is the essence of pedagogical reflection?

A) Recording students' results in the gradebook

B) Teacher's analysis of their own professional activity

C) Working on students' written assignments D) Conducting an active lesson

3. What is the main feature of a creative teacher?

A) Organizes subject Olympiads

B) Solves problem situations in a unique way

C) Follows the curriculum

D) Uses traditional methods

Organizing Psychometric Analysis (summary of content):

Test items are empirically piloted with a small group.Psychometric indicators such as discrimination index, difficulty level, and item-total correlation are identified.

Item parameters are calculated based on IRT models. Content validity is assessed through expert reviewers. An analytical passport is developed for each test item.

In conclusion, to ensure adequate attention is paid to psychometric indicators in the test development process, it is essential to:

-Design tests based on scientifically grounded models;

-Conduct statistical analyses;

-Involve subject-matter experts in item review;

-Implement iterative refinement through practical trials.

This approach ensures not only objectivity and fairness in assessment but also promotes a deep, analytical study of educational outcomes. Through this research, a contribution is made not only to the quality of test-based assessment but also to the development of psychometric literacy, which enhances the assessment culture of both teachers and learners.

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