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Using Selected Methods of The *SDP-System* Device, as a Tool For Computer-Assisted Brief Pedagogical Diagnosis

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Abstract

The article presents, present, practical requirements towards educationists as diagnosticians. It is an attempt to answer constantly changing provisions in the matter of organizing and providing psychological and pedagogical help in public schools. The work includes description of specified test exercises, from Integrated Measurement of Psychological Variables System (*SDP-System*), which based on validation analysis so far were acclaimed as accurate and reliable. In *System*, test exercises are built inter alia based on test modules using graphic marks, presenting pictures and psychomotor exercises. These exercises may be successfully used by educationists and technical or vocational education teachers in order to determine predispositions, potential and students aptitudes.

Keywords: educational computer programs, pedagogy of work, *SDP-System*

Introduction

Computer assisted diagnosis allows educationists to objectively evaluate students, with relatively small time expenditure and effort spent on collecting and analyzing data. Educationists' decisions based on quantitative data are considered as fundamental in improving effectiveness and minimizing bias in their work (Van der Kleij, Feskens, Eggen, 2015).

School is an environment, in which order and support for students are provided in the first place. In Poland the change of laws was proposed, concerning psychological and pedagogical help in public educational institutions. Underlining challenges placed before educationists. According to new laws, school educationists should do examinations and diagnostic activities connected to recognizing inter alia. Needs, predispositions, interests and students problems. Addi-

tionally specialists in that area should attend in determining necessary learning conditions, specialized equipment, using inter alia. Information and communication technologies (Decree MEiN, 2022). That claim of competence is without a doubt a great organizational challenge for schools, and also specialists who work there.

Research concerning psychological and pedagogical diagnosis are considered as mostly rooted in modern education, as regards practical research. Currently described kind of diagnosis is an organized process of collecting and analyzing data, which is specified by cognitive activity. Diagnostic activity is a connection of so-called cold knowledge (scientific, theoretical) and the hot knowledge (experiences), (Wysocka, 2013). Pedagogical diagnosis used in the process of education is an activity having to describe a given state of affairs and explain the mechanisms that condition specific phenomena. Drawn conclusions are also classified to specific types, categories and characteristics (Skibska, Wojciechowska, 2014).

Unfortunately, psychodiagnostics conducted by educationists in schools, is often directed by coincidence and not based on psychometric tools, which we can see for example in psychological and pedagogical clinics. Use of modern methods and technologies, would contribute not only to deepening psychodiagnostic component, but also development of teacher's professional activity (Minakhmetova, Pyanova, 2016).

The subject matter of the study

Presented work is a voice in the discussion about uses of practical psychometric methods in schools, thereby improvement of the teachers diagnostic workshop. Palka (2010) has written that *reflection over pedagogical examinations methodology should be a continuous process*. Diagnostics should also be a field to search for new ways to practice the science in spaces rarely used to this time. The key contents in the voice taken, should concern inter alia how educationists can manage the challenges before him. With the help come technological solutions, specifically a possibility to use specific tests of integrated psychological and pedagogical systems, named *SDP-System*.

Research methodologies and tools. Practical requirements towards diagnostician, use of psychometric tests in pedagogical diagnosis

Strength of practical pedagogical diagnosis is its right use in the education process, such as determining a student's strengths and weaknesses, wording of learning plans, tracking his progress and relay the bright feedback. Essentially this process applies to three questions: *Where am I going?; How to get there?; Where next?* (Hattie, Timperley, 2007). Educationists, practical specialists can smoothly carry out a student's thought this way.

Wysocka (2013) gives the criteria that pedagogical diagnosis should meet in terms of practice, should be: practical; decisive; complete; valuing; permanent; descriptive-explanatory; dynamical; interdisciplinary and multifaceted. These types of requirements are met by the testing method, more specifically psychometric diagnosis. Should be emphasized, that as in psychology, as in pedagogy – the term of test is identical with a tool, which meets the terms of standardization, objectivity and normalization. Diagnosis using psychometric tools, which meets methodological criteria, minimizes the risk of abnormality while evaluating a child's capabilities. It enables an objective measure of examined traits for educationists (Stemplewska-Żakowicz, 2009).

Both traditional psychometric tools, as well as these implemented by computer technology, provide a possibility of organizing pedagogical diagnosis on a new level. Nowadays, school educationists not only don't have access to computer diagnosis systems, but have limited resources for traditional tests, or they may be not allowed to use some psychometric tests. In pedagogy the term of test is used wider than for example in psychology and concerns both normalized diagnosis, as well as informal. These tools may have the form of questionnaire, achievement tests, tests of unfinished sentences or inventory (Niemierko, 2009). Among them we can enumerate psychometric tools, to which educationists have full access. It's for example *Cognitive function diagnosis battery-PU1 LTE; Battery for methods of diagnosis psychometric development of children from age of five to six – BATTERY-5/6c* and others (PTPiP, 2022). Availability to the most of the tests is however restricted, or for the people with a psychology profession diploma, or necessity for paid training. Among such tools we can list: *Verbal Fluency Test* or *TMK – Raven Matrices Test in the color version*. Listed example methods concern cognitive functioning diagnosis and psychometric efficiency and are meant for individual examination of children and school youth.

The answer for current legal requirements, methodical, put before an educationist working in education may be the use of computer technology, based on an integrated test system, available for every specialist. Creation of multi-scale computer systems for screening diagnosis may be involved with technological challenges and organization. Technology must be able to serve a wide range of systems, devices, and school browsers. One of the examples of use compatible systems in schools was software *Expert 3.0*, including automatic pedagogical tests. Automatic diagnosis technology is a testing strategy oriented for pedagogical diagnosis, integrated with the school grading system. Software *Expert 5.05* is a Ukrainian product, based on inter alia mathematical tests. Advantage of this IT system is its modular design, which allows the test position author to create and add data. The system's database is based on test subject base, so it refers inter alia to monitoring student's achievements. After the examination, the diagnostician gets statistical data about every knowledge element. Data is presented with

the help of a graph in a spreadsheet. It also includes information about student's strengths and weaknesses and possible recommendations about further diagnosis (Bilousova et al., 2020).

Development (analysis of research results). Uses of specific tools *SDP-System* in pedagogical diagnosis

Objective, suitable, exact, consistent and free from prejudices – these requirements should be fulfilled by computer systems including psychometric tests. These requirements are possible by the Polish invention: *SDP-System*. It's an Integrated Measurement of Psychological Variables System. It consists of three elements: Test Apparatus, consisting of exhibition monitor and keyboard; Computer and Professional software. Serves inter alia to measure cognitive and psychometric functions and it's a proposition for all specialists, for whom overall assessment of human function is necessary. Main goal of *SDP-System* is to create a possibility of projecting and making tasks for testing mental, cognitive and motor capabilities of a human, in relation with evaluation of his capabilities in different areas of activity and diagnosis of possible deficits. Adopted psychometric tests, of which advantage of authoring tools – may successfully, without any license restrictions, be adopted in school educationist or technical education teacher's practice. Below a couple of example tools are included in *SDP-System* are presented, which based on validation research among adults, confirmed high reliability and accuracy (Horoszkiewicz, Korchut, 2020), confirming at the same time the requirements related to so called goodness of psychometric test (Brzeziński, 2002).

Number location test

This test evaluates efficiency of operating memory and observation. Tool consists of two boards separated into square fields, in which two-digit numbers are placed. Task requires us to memorize numbers from the first board, after which we search for them on the second board. In order to do the task, the diagnosed person moves the displayed frame using the keyboard. Software registers the execution time and the amount of repeated reactions in order to improve erroneous reactions. In order to evaluate reliability of the test, the system uses a method of repeated measurement. Homogeneity of test positions was also specified by calculating Cronbach's reliability coefficient. Based on the executed Kolmogorow-Smirnow test, the average reaction time in the Number location test was specified; it is also characterized by appropriate relevance.

The line test

The line test may be used as a way to measure the reliability of the visual receptor. A significant variable measured by this test is shifting and concentra-

tion of attention. It lets us evaluate the observation capabilities of the examined person by concentrating on a “detail” of the presented picture. During the test, there are 9 boards exposed, differing from each other by the amount of horizontal, thin and black lines placed on a white background. The task requires us to count the lines and to write down their amount using the keyboard. To evaluate accuracy of the test, the *test-retest* was used. The homogeneity of the test positions was specified by calculating Cronbach’s reliability coefficient. In the context of accuracy the results got by statistics analysis encourage a careful approach to the results in this test task.

Simple Coordination Test

It is a modified method of visual-motor examination and precision of moves. Numbers are shown successively on the monitor, on which we have to react by pushing the keyboard button with the exposed number. In the task two examination modes can be used: imposed, where pace of exposition is stable and forced mode, where the next exposition has its place after the right reaction of the examined person. To evaluate reliability of the test, method *test-retest* was used. The homogeneity of the test positions was specified by estimation of the Cronbach’s reliability coefficient. Based on the execution of the Kolmogorow-Smirnow test it was also specified that average reaction time in *Simple Coordination Test* is an accurate indicator.

Complex Coordination Test

It’s a method of psychometric efficiency measurement extended by the element of thinking. Exposed stimulus is based on simple mathematical tasks, based on adding and subtracting single numbers. Task of the examined person is a specific reaction by pushing a button with expected result. Method demonstrates the thinking time component in psychometric reactions. To evaluate the reliability of the test, *test-retest* was used. Homogeneity of the test positions was specified by the estimation of the Cronbach’s reliability coefficient. Based on the execution of the Kolmogorow-Smirnow test, it was also specified that the average reaction time in the *Simple Coordination Test* is an accurate indicator.

Precision and Thinking Indicator (PiM)

Is an amount of correct reactions in test tasks concerning simple and complex coordination at a forced pace. Results are showing a general level of visual-motor coordination efficiency that requires precision and fast thinking. To evaluate reliability of the test, *the test-retest* method was used. Homogeneity of test positions was specified by estimation of a Cronbach’s reliability coefficient. Based on the execution of the Kolmogorow-Smirnow test it was also specified that *PiM* variable is an accurate indicator differentiating the results in the scope of this variable.

Conclusions

In education institutions there is a constant need for information about students. Concerning their abilities, potential, changes, constraints, predispositions or capabilities. Diagnosis was always a daily educational element. School educationists, in order to assess the student, often prepared and used their own, intuitive diagnostic tools (McMillan, 2003). Criteria of that opinion's objectivism was often unfulfilled. In a situation with lack of diagnostic tools, educationists led students for preliminary diagnosis to the closest Psychological and Pedagogical Clinic. Currently introduced provisions in terms of organization and providing psychological and pedagogical help in public schools, are a big challenge for education employees.

Pedagogical diagnosis in schools should be based inter alia on test tools, and thus quantitative diagnosis, guaranteeing objectivism, reliability and result accuracy. Additionally, this type of tests shouldn't be time consuming, which would prompt educationists and teachers to use them more often.

Since the answer for current and methodical provisions put before educationists working in education may be use of computer technology – proposition of use of integrated psychometric tests seems to be reasonable. Use of specified tests tools like *SDP-System*, should be preceded by numerous validation examinations amid polish students, in order to confirm their psychometric goodness according to this age group.

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