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Educational diagnostics for contemporary school systems : measuring and assessing growth of student human capital. Part I: main concepts and the scope

Colloquium nr 2, 123-144

2012

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej bazhum.muzhp.pl, gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

Tekst jest udostępniony do wykorzystania w ramach dozwolonego użytku.

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**EDUCATIONAL DIAGNOSTICS
FOR CONTEMPORARY SCHOOL SYSTEMS.
MEASURING AND ASSESSING GROWTH
OF STUDENT HUMAN CAPITAL
PART I: MAIN CONCEPTS AND THE SCOPE**

ABSTRACT

Educational diagnostics may be defined as the theory and practice of recognizing context, progress, and outcomes of learning. It is a relatively new branch of knowledge still searching for a cardinal scientific paradigm: informal or standardized, dealing with class disruptions or monitoring student development.

Labor market as the place for selling and buying jobs and vocational positions constitutes a far-reaching target for education. Graduates from schools and colleges bring there their human capital, containing competences, knowledge, experiences, skills and similar assets.

Taxonomies of educational goals – emotional, world-view, cognitive, and psychomotor – put the elements of human capital in the following order: (1) motivational domain, (2) moral domain, (3) experiential domain (4) physical domain. With this approach human capital becomes a learning task for students and their ability to learn gained in education becomes the most important manpower characteristics.

Keywords:

educational diagnostics, labor market, taxonomies of educational goals, human capital.

INTRODUCTION

The terms *human capital* and *social capital* wander educational projects and reports more like impressive metaphors than in a capacity of operationally defined constructs. It means that we can use them to refer to certain

functions of education and to emphasize their importance but not to assess a student's individual resources, neither to identify processes of their growth and decrease.

Teachers do not employ these two terms in their everyday work nor researchers apply them to their survey methodologies. *Capital* may appear in some final comments to students' cognitive achievement for its appreciation and far-reaching prognoses of future accomplishments. It has broadly-interpretative rather than specifically-diagnostic value in education.

Introducing measurement of human capital into educational diagnostics may redefine the branch. It will gain both a distant criterion of instructional efficacy and new directives for students' individual assessment.

My way to the ideas presented in this issue was long and complex. When I was working in a teacher-training high school I had an opportunity to consider the value of personal, environmental, and scholastic characteristic of young teacher candidates to further their professional training and career¹.

After few years I was promoted to the position of scientific worker in the Institute for Educational Research, where I was responsible for the Polish segment of international achievement study and I learned that cognitive domain failed capacity to embrace compound educational processes². As the consequence, I developed an original theory of *multilevel criterion-referenced measurement*³ based on the assumption that differentiation of achievement levels according to the letter-grade scale would solve diagnostic problems. Several postgraduate studies and hundreds of in-service teacher training courses have been conducted on this assumption with less than satisfactory progress toward finding a qualitative distinction between students' achievement levels and enriching letter grades with human characteristics of students.

For the last twenty years I have been solely professor of education in some higher-education schools including Naval Academy in Gdynia. Dealing mainly with students of socialization studies widened my focus from subject-matter teaching and cognitive achievement to up-bringing matters and developmental needs of young generations. Meanwhile, *behavioral psychology*, as

¹ B. Niemierko, *O powodzeniu nauczyciela w pracy dydaktyczno-wychowawczej* [On teacher's success in her educational work], PZWS, Warszawa 1969.

² L. W. Anderson, T. N. Postlethwaite, *What IEA studies say about teachers and teaching*, [in:] A. C. Purves (ed.) *International comparisons and educational reform*, ASCD, Washington 1989.

³ B. Niemierko, *Pomiar sprawdzający w dydaktyce. Teoria i zastosowania* [Criterion-referenced measurement in education. Theory and applications], PWN, Warszawa 1990.

yet leading in mental testing, has gradually waned and *constructivist theory* overwhelmed social sciences. In education it meant that a student's individual *mental schemas* gained more importance than her/his compliance to school curricula.

There were more newly emerging psychological theories to regard in the field of educational diagnostics. Howard Gardner announced his theory of *multiple intelligences*⁴, addressed mainly to educationists, and Samuel Messick deepened psychometric theory with the concept of *consequential validity*⁵. These theories made teachers accountable for recognizing their students' ability profiles and for achieving the most of possible in particular learning environment.

My interest in *systems approach* to learning and diagnostics was firmly reinforced when I met professor Stanisław Walukiewicz from the Institute for Systems Studies in Warsaw. His brilliant delineations of fundamental economic concepts and simple, clear models of capital conversions opened the door to research on educational resources of human well-being and progress. Abruptly, I got a chance to integrate nearly all my previous studies into one set of notions and measurement procedures to be applied to basic educational problems.

The aim of the elaboration is to lay down paths of searching for effective diagnostic research and applications. Every step forward along these paths would be favorable for students and teachers at many levels of contemporary school systems. Oncoming years will exhibit whether the paths are passable.

THE SUBJECT AND USE OF EDUCATIONAL DIAGNOSTICS

We consider *educational diagnostics* as the theory and practice of sound recognizing (1) context, (2) progress, and (3) outcomes of learning. The three targets of diagnostics are equally important. Research and applications may be focused on all or on any one of them: environment, process or product of learning, not only at schools but also outside, under any circumstances and to whoever benefit.

⁴ H. Gardner, M. Krechevsky, *Multiple intelligences: The theory in practice*, Basic Books, New York 1991; H. Gardner, *Frames of mind*, Basic Books, New York 1993.

⁵ S. Messick, *Test validity and the ethics of assessment*, „American Psychologist”, 1980, 35; S. Messick, *Validity*, [in:] R. L. Linn (ed.) *Educational measurement. Third edition*. American Council on Education – Macmillan, New York 1989.

Broadly comprehended educational diagnostics embraces many elements of (1) *medical diagnostics*, dealing with students' organic development, their health preservation and illness risks, (2) *psychological diagnosis*, covering abilities, emotional characteristics, attitudes and aspirations, (3) *sociological diagnosis*, inquiring into expected and performed students' social roles, and (4) *historic diagnosis*, pertaining to the students' biographies, their individual and generation-bound experiences.

Every *learning* beyond the stimulus-response level has two distinct facets: cognitive and emotional/motivational. Both are crucial to education and neglecting the latter, typical to the authoritarian up-bringing systems, makes education ineffective at the higher-level tasks demanding students' own initiative and advanced personal values.

There are many parts teachers play in the processes of school learning. L. Cohen, L. Manion and K. Morrison⁶ analyzed twelve of them: 1. manager, 2. observer, 3. diagnostician, 4. educator, 5. organizer, 6. decision maker, 7. presenter, 8. informant, 9. helper, 10. motivator, 11. adviser, 12. reviewer. These „roles and functions” may be sorted into four major categories: A. recognizing, B. stimulating, C. instructing, and D. governing. Table 1 presents the arrangement and composition of the categories.

Table 1. The wealth of teacher roles in education

Recognizing	Stimulating	Instructing	Governing
Observer Diagnostician Reviewer	Organizer Helper Motivator	Presenter Informant Adviser	Manager Educator Decision maker

It should come to our notice that two recognizing tasks, observation and diagnosis, open the list of teacher roles in Table 1 while originally they were preceded by general management function. The new order emphasizes exploratory approach to teaching in which governing decisions follows getting acquainted, invitations to learn and advance organizers.

According to Stefan Ziemiński⁷, every *full diagnosis* contains five segments:

⁶ L. Cohen, L. Manion, K. Morrison, *A guide to teaching practice*, Routledge, London 1996.

⁷ S. Ziemiński, *Problemy dobrej diagnozy [Problems of a valid diagnosis]*, Wiedza Powszechna, Warszawa 1972.

1. *Typological diagnosis*, categorizing individuals into subgroups of ability, achievement, home environment, culture, study skills, etc.

2. *Genetic diagnosis*, registering events connected to the present situations with alleged causal relationship. For example, a teacher may learn students' personalities going through their biographic documents.

3. *Meaning diagnosis* which consists in identifying previous events and present attitudes that could influence current learning processes. Unconscious anxiety, resentments and constraints may be harmful to learning new behaviors.

4. *Stage diagnosis*, applying a developmental model to student characteristics and behavior. The model may be very general, like the Piaget's model of mental development⁸ and the Kohlberg's model of moral development⁹, or may be quite specific, based on subject-matter didactics and teacher observations of learning.

5. *Prognostic diagnosis*, being in education a prediction of learning results under certain conditions. It often begins: „Assuming your further consisted attempts, you will probably achieve...”. It is important not to deform prognoses into effort-exempting prophecies.

HISTORIC CHANGES OF DIAGNOSTIC FOCUS IN EDUCATION

For centuries schools were *teacher-centered* and the main part of the common-sense diagnostics was aimed at identifying innate abilities in students and selecting the best candidates for various callings and professions. Only just the 20th century was proclaimed The Child's Century and emerging developmental psychology entered the school gates. Educational diagnostics became *learner-centered*, and nowadays this focus appears constant though systematically challenged by subject-matter analyses and information technology advances. However, neither programmed instruction nor audiovisual systems could exempt the learner from coping with weaknesses and doubts.

Evolution of psychological trends significantly influenced educational diagnostics. *Stimulus-response approach* resulted in fast development of *psychometrics*, the methodology of measuring individual differences with em-

⁸ J. Piaget, *Judgment and reasoning in the child*, Hartcourt, Brace & World, New York 1924.

⁹ L. Kohlberg, *Moral stage and moralization: The cognitive-developmental approach*, [in:] T. Lickona (ed.) *Moral development and behavior: theory, research, and social issues*, Holt, New York 1976.

phasis on diversity of mental aptitudes and cognitive achievement between humans. Paradoxically, the present *cognitive psychology*, which operates in framework of modern *constructivist theory*, broadened the focus of instructional diagnostics far beyond acquiring knowledge¹⁰. The question how to recognize contexts and experiential schemas of learning as well as emotional resources of learners became principal for educational diagnosticians. Motivation to learn gained equal importance as the student potentials to absorb and process available information.

In the last two decades educational diagnostics focused teachers' attention on helping students *learn how to learn*, i.e. how to manage their learning skills. The concept has been present in instructional theory for almost a century but it was not operationalized up until labor market developed and cognitive psychology was fully grown. In 1930, Polish distinguished educationalist Bogdan Nawroczyński wrote:

[The youth of today] do not know how to plan their work, are unable to consistently execute a plan, nor are fond of scientific literature, do not know how to search for books, do not know how to use them, are unable to make notes, cannot gather and put straight acquired knowledge, cannot write papers, in one word – do not know how to learn¹¹.

Modern research on cognitive processes displayed learning as a complex, self-regulated activity. *Self-regulation of learning* contains planning, monitoring, controlling, and evaluating somebody's own process of gaining experience¹². Unfortunately, the majority of students, even at the higher education level, do not manifest self-regulation of learning/studying what brings heavy charges against educational systems¹³.

¹⁰ P. Kroepe, *Konstruktive Pädagogische Diagnostik* [Constructive educational diagnostics], Waxmann, Münster 1996.

¹¹ B. Nawroczyński, *Zasady nauczania* [The principles of teaching], [in:] *Dziela wybrane*, Tom II [Selected works. Vol. II], WSiP, Warszawa 1987, p. 197, first edition: Książnica-Atlas, Lwów-Warszawa 1930.

¹² D. L. Butler, P. H. Winne, *Feedback and self-regulated learning. A theoretical synthesis. Review of Educational Research*, 1995, 65, p. 245-281; D. H. Schunk, B. J. Zimmerman (ed.), *Self-regulation of learning and performance*, Erlbaum, Hillsdale 1994; T. Bouffard, J. Boisvert, C. Vezeau, C. Larouche, *The impact of goal orientation on self-regulation and performance among college students*, „British Journal of Educational Psychology”, 1995, 66, p. 317-329.

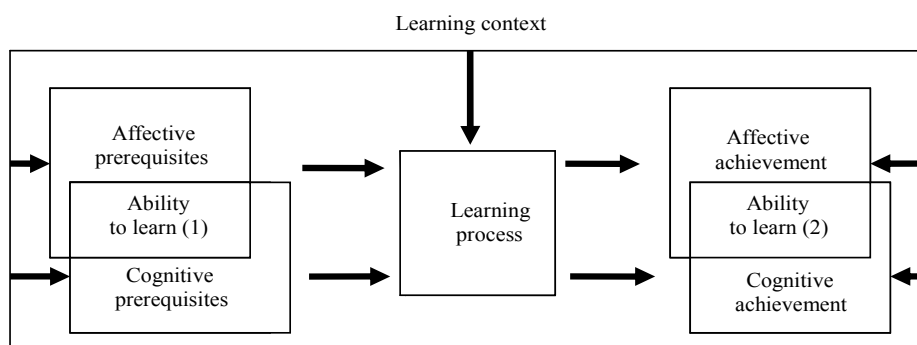
¹³ M. Ledzińska, E. Czerniawska, *Psychologia nauczania. Ujęcie poznawcze* [Psychology of teaching. Cognitive approach], PWN, Warszawa 2011, p. 112.

FOUR PARADIGMS OF EDUCATIONAL DIAGNOSTICS

After Thomas Kuhn¹⁴, we will employ the term *paradigm* to determine the way a discipline of science is structured and managed. Paradigms regulate the areas and methods of searching for principles and procedures which are aimed to increase appropriate cognitive activities. Several competitive paradigms may exist in a discipline of science and struggle for the best explanation and the most effective shaping the realities.

In educational diagnostics we start with the general model of school learning launched by Benjamin Bloom¹⁵. With some slight modifications it goes like in Figure 1.

Figure 1. A model of school learning



There are four kinds of variables in the model presented in Figure 1:

1. *Learning context* contains all the economic, environmental, cultural and legal circumstances that influence learning but are not influenced by its particular course. They constitute a framework for learning process. The larger the scope of diagnosis, the more evident the impact of context on the learning process.

2. *Learning prerequisites* are twofold: *affective*, i.e. attitudes and motives, and *cognitive*, i.e. knowledge and skills. Synergy of the two student characteristics forms his/her *ability to learn*, the key factor of progress in acquiring new behaviors. In the fully grown form it develops into *self-regulated*, inde-

¹⁴ T. S. Kuhn, *The structure of scientific revolutions*, The University of Chicago Press, Chicago 1962.

¹⁵ B. J. Bloom, *Human characteristics and school learning*, McGraw-Hill, New York 1976.

pendent system but more frequently it must be prompted by contextual actions. All the prerequisites amount to student entries into the learning process.

3. *Learning process* is the basic and the most dynamic part of the model. Its rate depends on the overall context pressure, a student's prerequisites, the content to learn and the quality of instruction. The complex nature of school-organized learning make it difficult to follow and diagnoses but learning process is undoubtedly crucial for every sort of education.

4. *Learning achievement* consists of elements similar to the learning prerequisites: affective, cognitive and ability to learn. In contemporary quickly developing society, ability to learn is a vital precondition for gaining a position appropriate to the variable market offer. Therefore, *value added* assessment models concern mainly with this kind of learning outcomes¹⁶.

The first question to be asked about recognizing school learning is whether we are going (1) to perform it in a participant way, not disturbing and/or changing the usual course of teaching/learning process, or (2) to arrange quasi-experimental situations in which main context variables are controlled and ready-made measurement tools are applied. Accordingly, we may distinguish (1) the *informal*, teacher-performed educational diagnostics, and the (2) the *standardized*, professional educational diagnostics. Both are indispensable to competent managing contemporary educational systems.

The second question to educational diagnostics is whether it is designed (1) to deal with learning disabilities and disorders or (2) to advance regular learning in a normal situation. To treat illnesses or to establish healthcare? We will refer to the former in (1) *disorder diagnostics*, and to the latter in (2) *developmental diagnostics*. Generally, breakdowns need more specialized consultants than everyday monitoring of student growth but both diagnostic domains require theory and research.

Plotting the two divisions of diagnostic procedures we arrive to the classification presented in Table 2.

Table 2. Four paradigms of educational diagnostics

Method \ Aim	Informal Diagnostics	Standardized Diagnostics
Recognizing disorders	Informal intervening diagnostics	Standardized intervening diagnostics
Monitoring development	Informal developmental diagnostics	Standardized developmental diagnostics

¹⁶ L. Saunders, *A brief history of educational „value added“: How did we get to where we are?*, „School Effectiveness and School Improvement“, 1999, 2.

Informal intervening diagnostics is aimed at undisturbed class management. Its application is almost exclusively based on pre-service training and professional experience of teachers. According to Good and Brophy¹⁷, a teacher interacts every day as many as 1000 times with individual students and at least 90 times she evaluates a student's behavior. She has to make many managerial decisions not having enough time to gather sufficient information about the case of disturbance and the troublemakers. In Poland, informal intervening diagnostics was prospering in the early 60s of the last century¹⁸, when the rigid socialist educational system proved unable to promote large numbers of students. Diagnosis, therapy, and prevention of school backwardness was left to the teachers themselves with a little if any support from external institutions.

Standardized intervening diagnostics is focused on learning prerequisites. It is conducted either by school psychologists or by institutions of educational counseling where psychologists constitute the majority of staff. They use tests, questionnaires and observation techniques to detect a child's innate and acquired cognitive skills and to recommend teaching content and methods suitable for improving the child's school achievement. In most cases it means that performance standards should be temporally or definitively lowered¹⁹ and some remedial treatments provided for the learner. For instance, dyslexia, as disturbance in the ability to read, is one of the best organized services in the field of educational diagnostics in Poland²⁰. The first Polish textbook giving full instruction in standardized intervening diagnostics was published quite recently²¹.

¹⁷ T. L. Good, J. E. Brophy, *Looking in classroom*, Harper & Row, New York 1987.

¹⁸ J. Konopnicki, *Problem opóźnienia w nauce szkolnej* [The problem of retardation in school learning], Ossolineum, Wrocław 1961; Cz. Kupisiewicz, *Niepowodzenia dydaktyczne. Przyczyny i niektóre środki zaradcze* [School failures. The reasons and some remedial means], PWN, Warszawa 1964; M. Maciaszek, *Kształtowanie umiejętności dydaktycznych nauczyciela* [Shaping teacher's instructional skills], PWN, Warszawa 1965.

¹⁹ K. J. Klauer (ed.), *Handbuch der pädagogischen Diagnostik* [Textbook of educational diagnostics], Schwann, Düsseldorf 1978; K. Ingenkamp, *Pädagogische Diagnostik* [Educational diagnostics], Beltz, Weinheim/Basel 1975; A. C. Ornstein, F. P. Hunkins, *Curriculum: foundations, principles, and theory*, Allyn and Bacon, Boston 1992; G. Szyling, *Nauczycielskie praktyki oceniania poza standardami* [Teachers' practices of assessment out of standards], Impuls, Kraków 2011.

²⁰ M. Bogdanowicz, *Ryzyko dysleksji. Problem i diagnozowanie* [Risk of dyslexia. The problem and diagnosis], Harmonia, Gdańsk 2002.

²¹ E. Jarosz, E. Wysocka, *Diagnoza psychopedagogiczna. Podstawowe problemy i rozwiązania* [Psycho-pedagogic diagnosis. Basic problems and solutions], Żak, Warszawa 2006.

Informal developmental diagnostics emphasizes systematic monitoring achievement progress of both the slower learners and the faster learners. The rate of learning and the students' attitudes toward the school subjects in which they attain some achievement criteria are the focuses of attention in this paradigm. Entries, processes, and outcomes of learning are equally important in this approach. The title of T. Good and J. Brophy's book „Looking in classroom” clearly points to continuous observation as the main method of informal developmental diagnostics. Looking at, and in consequence seeing variations in student motivation and effort appears to be the key factor of educational success. It was well understood by Andrzej Janowski²² who should be recognized the father-founder of informal developmental diagnostics in Poland.

Standardized developmental diagnostics is intended for learning support by providing students and teachers with precise information on learning outcomes. It needs professional measurement tools but may be performed at the classroom level what leads some theorists to the idea of ‘classometry’ as a separate domain of psychometric methods²³. Achievement test series are commonly used in the United States and in some other countries in a mandatory district-wide surveys but the teachers' response to the actions is rather reluctant because of the harmful *backwash effect*, narrowing curricula and scope of education²⁴. The solution to the problem of teacher acceptance of the standardized testing may be found in designing tests which in a „seamless” way match common instruction²⁵. Also in Poland some measures are taken to improve education by standardized diagnostics²⁶.

²² A. Janowski, *Poznawanie uczniów. Zdobywanie informacji w pracy wychowawczej*. [Recognizing students. Gaining information in upbringing work], WSiP, Warszawa 1975, New edition: Fraszka Edukacyjna, Warszawa 2002.

²³ J. Benson, *Editorial*, „Educational Measurement: Issues and Practice”. Special Issue: Changing the way measurement theorists think about classroom assessment, 2003, 4; M. Daszkiewicz, *Pierwsze kroki klasometrii* [The first steps of classometry], [in:] B. Niemierko, H. Szaleniec red. *Diagnostyka edukacyjna. Standardy wymagań i normy testowe w diagnostyce edukacyjnej*, PTDE, Kraków 2004.

²⁴ D. A. Goslin, *Teachers and testing*. Russell Sage Foundation, New York 1967; B. S. Plake, J. C. Impara, J. J. Fager, *Assessment competencies of teachers. A national survey*, „Educational Measurement: Issues and Practice”, 1993, 4.

²⁵ A. J. Nitko, *Designing tests that are integrated with instruction*, [in:] R. L. Linn (ed.) *Educational measurement. Third edition*, American Council on Education, New York 1989.

²⁶ B. Niemierko, *Diagnostyka edukacyjna. Podręcznik akademicki* [Educational diagnostics. A textbook], PWN, Warszawa 2009.

The four paradigms of educational diagnostics coexist and cooperate nowadays but standardized developmental diagnostics, better and better equipped, will probably overshadow the intervening and informal paradigms in the anticipatable future.

LABOR MARKET AS A TARGET FOR EDUCATION

Wide accessibility of information and multitude of its possible applications turned over common interest to the benefits of acquiring carefully selected knowledge and skills.

Learning „all by the all”, recommended by Enlightenment Epoch philosophers²⁷, is neither reasonable nor possible any more. One needs reliable rules of selection *learning experiences* both at the school curricula level²⁸ and at the student level.

Labor market, the place for selling and buying jobs and vocational positions, constitutes the most visible and fundamental target for education. For this purpose, the concept of *market* turns fully comprehensive. It covers every situation in which an employment is anticipated and negotiated, since „the place” is used here as a conventional epithet. Such market spans the whole life of individuals, first as a set of perspectives, then as the real position, and finally as the recognition of attainment.

Young people are not openly oriented to their future. Common experience and research prove the opposite: adult people and particularly teachers think more about awaiting demands and responsibilities than those who will shortly start their careers²⁹. Nonetheless, an image of future social role exists and firmly influences the students' learning behaviors.

The future social roles of young generations are by no means limited to employment matters and many other factors shape their careers. However, from among all the existence, family, well-being, self-development, and spir-

²⁷ J. A. Comenius, *Opera didactica omnia*, Amsterdam 1657, [phototyped: Praha, 1957].

²⁸ R. Tyler, *Basic principles of curriculum and instruction*, The University of Chicago Press, Chicago 1949.

²⁹ P. Zimbardo, *The Stanford Time Perspective Inventory*, Stanford University Press, Stanford 1990; K. Rybicka, *Dydaktyczne tendencje polskich nauczycieli mierzone w psychologicznej perspektywie postrzegania czasu* [Polish teachers' instructional tendencies measured in psychological perspective of time perception], [in:] B. Niemięko, M. K. Szmięgel red. *Badania zagraniczne i wzory międzynarodowe w diagnostyce edukacyjnej*. PTDE, Kraków 2009.

itual quality parameters the *job adjustment* should be considered of the greatest importance. Someone's vocational position is basic to satisfy his/her needs both at the biological level and at the higher order levels. It must not be underestimated by educational diagnosticians. The simple question „What is your expected job position?” or „What sort of job do you want to do when you grow up?” may open the door on understanding the student's selection of learning experiences and his/her level of self-regulated efforts.

HUMAN CAPITAL

Capital is an asset which brings or may bring *profit*, a surplus of income over expense. The „may” in this statement is essential for education since learning benefits will be obtained in the fullness of time and there is no guarantee that favorable circumstances allow to exploit a particular element of qualifications. Educators work for uncertain and hardly anticipatable future³⁰. Uncertainty in education is greater than in economy but it should not prevent us from estimating its magnitude.

According to a comprehensive economic theory proposed by Stanisław Walukiewicz³¹, there are four disjoint forms of capital:

1. *Financial capital*, made up of cash, savings, loans, retained earnings and similar tangible assets. Its value can be calculated for any moment of past and present and converted into a target currency. This is the simplest form of capital.

2. *Physical capital* in the form of buildings, infrastructure, equipment, and software in the shape of license documents. This is also tangible in the sense of physical handling and its value can be reliably calculated.

3. *Human capital* contains competences, knowledge, experiences, skills and similar intangible assets of humans considered as discrete individuals. As „explanatory examples” of this form of capital Walukiewicz³² gives:

- A. Competence and experience
- B. Knowledge and abilities

³⁰ B. Suchodolski, *Wychowanie dla przyszłości* [Education for future], PWN, Warszawa 1947.

³¹ S. Walukiewicz, *The dimensionality of capital and proximity*, Working Paper WP-3-2007, Systems Research Institute, Warszawa 2007.

³² S. Walukiewicz, *Kapitał ludzki* [Human capital], Instytut Badań Systemowych, Warszawa 2010. p. 25-26.

- C. Health and physical capacity
- D. Attitude toward the world outside
- E. Prerequisites for social capital

The above mentioned characteristics are usually taken into account while candidates to a specific job position in a company are selected.

4. *Social capital*, which is composed of formal and informal relations among persons, teams, and organizational units, such as families, schools, factories, shops, peer groups, neighborhoods, clubs, associations. Four forms of *proximity* make dimensions of this most intangible kind of capital: spatial, organizational, technological, and emotive.

The first step toward building educational diagnostics based on the concept of human capital is transforming its components into learning goals. We will perform it by means of educational taxonomies.

EDUCATIONAL TAXONOMIES

Taxonomies of educational goals, initiated in cognitive domain in the middle of 20th century, still challenge learning and teaching practices at all levels of education. Benjamin Bloom's *Taxonomy of educational objectives*³³ was the first fully efficient educational tool to support curriculum development, instruction, item writing, and achievement evaluation. Everybody who has read the introduction to this book remembers that Bloom's small editorial committee was desperately saving from collapse the five-year work of a large group of philosophers, psychologists and educators who were unable to make agree their views on educational processes. Since then, Bloom's taxonomy has remained under constant academic criticism, especially for its behavioral origins³⁴, and in glory of almost universal use.

My four-category revision of Bloom's cognitive taxonomy was first published in a booklet on educational measurement³⁵, then as a part of gener-

³³ B. J. Bloom (ed.), *Taxonomy of educational objectives. The classification of educational goals*, MacKay, New York 1956.

³⁴ E. J. Furst, *Bloom's taxonomy of educational objectives for the cognitive domain: Philosophical and educational issues*, „Review of Educational Research”, 1981, p. 441-453.

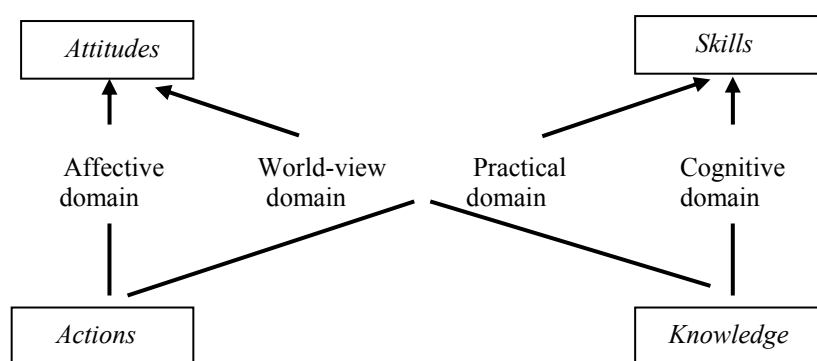
³⁵ B. Niemierko (ed.), *ABC testów osiągnięć szkolnych* [A primer of school achievement tests], WSiP, Warszawa 1975.

alized four-domain model³⁶, finally in a couple of my later books on measurement, instruction, and educational diagnostics³⁷. For making it as easy as possible to acquire by Polish teachers and school administrators I resigned from some original Bloom's wordings and adapted, widely known in our country, terms and definitions from the most popular textbook on teaching³⁸.

The fundamental assumption about learning is its double-sided nature: *affective* and *cognitive* (see Figure 1). These two aspects of learning are ubiquitous, indispensable to make any progress, and inseparable. Every educational system must reflect connection between affective and cognitive domains.

Simplifying, affective domain comprises of certain *actions* of an individual and *attitudes* arising from his/her actions, and cognitive domain contains somebody's *knowledge* and *skills*. The four components make possible to construct the model presented in Figure 2.

Figure 2. Four domains of educational goals



³⁶ B. Niemierko, *Pomiar sprawdzający w dydaktyce. Teoria i zastosowania* [Criterion-referenced measurement in education. Theory and applications], PWN, Warszawa 1990.

³⁷ B. Niemierko, *Między oceną szkolną a dydaktyką* [Between achievement grading and instruction]: WSiP, Warszawa 1991; B. Niemierko, *Pomiar wyników kształcenia* [The measurement of teaching outcomes], WSiP, Warszawa 1999; B. Niemierko, (2002) *Ocenianie szkolne bez tajemnic* [Grading without mystery], WSiP, Warszawa 2002; B. Niemierko, *Kształcenie szkolne. Podręcznik skutecznej dydaktyki*. [School instruction. Handbook of efficient didactics], WSiP, Warszawa 2007; B. Niemierko, *Diagnostyka edukacyjna. Podręcznik akademicki* (Educational diagnostics. A textbook), PWN, Warszawa 2009.

³⁸ W. Okoń, *Zarys dydaktyki ogólnej* [An outline of general didactics], WSiP, Warszawa 1963.

We can see in Figure 2 that:

- attitudes are assumed to emerge from actions and make together *affective domain*;
- when attitudes are based on a solid knowledge, *world-view domain* comes into being;
- skills derived from theoretical knowledge constitute *cognitive domain*;
- skills mastered in actions and based on practice make *practical domain*.

Now the four taxonomies, affective, world-view, cognitive, and practical, will be specified and some examples from teacher training colleges³⁹ will be given.

1. The four categories of *affective* achievement are based on classical educational literature⁴⁰ and adjusted to common classroom environment.

A. *Participation in action*. Example: a student listens attentively to the professor and carries out dictated tasks in a university class on educational theory.

B. *Undertaking actions*. Example: a student reports his/her own experience on learning or teaching at school or outside and suggests an original solution to a problem.

C. *Preference for action*. Example: a student shows his/her interest in education, reads individually selected literature and asks questions surpassing the level of introductory course.

D. *Action system*. Example: a student shows constant motivation to study education and full consistency of views on learning and teaching processes.

2. The *world-view* domain, though recently disgraced in Poland and in other socialist countries as the „scientific (read: Marxist) outlook on the world, opposed to idealism”, seems to regain its importance in social sciences, ecology, religion.

A. *Belief in truth of knowledge*. Example: a student is convinced that children grow in their individual, genetically and socially determined rates.

³⁹ B. Niemierko, *Taxonomies of educational goals as a lead into creative teacher training*, „Polish Journal of Social Science”, 2009, p. 93-106.

⁴⁰ D. R. Krathwohl, B. S. Bloom, B. Masia, (1964) *Taxonomy of educational objectives. Handbook II: Affective domain*, McKay, New York 1964.

B. *Belief in usefulness of knowledge*. Example: a student is convinced that school system can accommodate to the children right to individual progress.

C. *Inclination to apply knowledge*. Example: a student searches for educational systems adjusted to the children right to individual progress.

D. *Knowledge application system*. Example: a student has created her/his own consistent image of a child-adapted teaching and upbringing system to be implemented in educational practice.

3. In *cognitive* domain six-level Bloom's taxonomy was condensed by combining three highest levels („analysis”, „synthesis”, and „evaluation”) into one *problem solving* category of thinking processes. Besides, the definition of a skill as *knowledge applied to situations* was introduced.

A. *Memorizing knowledge*. Example: a student can name the four Herbart's formal steps of learning/teaching and show understanding of their meaning.

B. *Knowledge comprehension*. Example: a student can recognize Herbartian formal step structure in a lesson record and comment on its functions.

C. *Applying knowledge in typical situations*. Example: a student can plan a lesson according to the Herbart's learning/teaching model.

D. *Applying knowledge in problem situations*. Example: a student can identify flaws and mistakes in a lesson conducted according to the Herbart's learning/teaching model.

4. The taxonomy of *practical* domain is based on the psychomotor goal classifications⁴¹ but extended to every kind of action which brings about observable changes in their objects and is based on individual training rather than on theoretical knowledge.

A. *Imitating action*. Example: a student can construct a multiple-choice items observing educational measurement rigors and the patterns of standardized tests.

B. *Performing action*. Example: a student can write an original multiple-choice items exceeding the memorizing knowledge level according to provided test outline.

C. *Skillful action in stable circumstances*. Example: a student can plan and write a set of multiple-choice items, and correctly interpret their scores.

⁴¹ E. J. Simpson, *The classification of educational goals. Psychomotor domain*. University of Illinois Press, Urbana 1966.

D. *Skillful action in changing circumstances*. Example: a student can predict changes in test reliability and validity when some items or some students are omitted on testing.

This four-domain taxonomy will be transmitted to the human capital theory in the hope of making relationship between economy and education closer, more efficient and easier to manage.

HUMAN CAPITAL AS A LEARNING TARGET

Educational taxonomies describe student behaviors to be mastered in the course of curriculum-driven learning organized by appropriate institutions. In order to specify the human characteristics meaningful on the labor market we have to adopt a broader perspective in which inborn talents and individual interests take significant part. Studious work in the school environment would still play a leading role in a student self-development but its outcomes should be verified by the labor market. In particular, *ability to learn* new duties to perform appears to be more important than any kind of school-oriented attitudes and skills.

Four domains of educational taxonomies adapted to the aims of human capital development take the following shape:

1. *Motivational domain*. A person reacts to external stimuli in a reasonable and effective way, displays cognitive interest and wish for learning, appropriate resources of energy and perseverance. The domain comprises attitudes gained from successful actions and roughly matches Walukiewicz's part D of examples (*attitude toward the world outside*).

2. *Moral domain*. This domain covers self-confidence and assertiveness as well as overall socialization and ideological maturity to act generously for the good of nature, society, and culture. These attitudes, derived from social knowledge, Walukiewicz points out in parts D (*attitude toward the world outside*) and E (*prerequisites for social capital*) of his examples.

3. *Experiential domain*. It involves multiple intelligences (Gardner, 1993), formal education level, and all skills gained by seeing and doing things in school, out of school, and in employment. Qualifications of this kind, based on specific knowledge, Walukiewicz mentions in parts A (*competence and experience*) and B (*knowledge and abilities*) of his examples.

4. *Physical domain*. It consists of organic prerequisites, health and motional agility, psychomotor coordination in everyday activity, sport, and

artistic accomplishment. These characteristics lead from actions to skills and match group C (*health and physical capacity*) of the Walukiewicz's examples.

The four domains of human capital constitute four criteria of manpower assessment and four dimensions of possible educational diagnostics.

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**DIAGNOSTYKA EDUKACYJNA WE
WSPÓŁCZESNYM SYSTEMIE SZKOLNYM.
POMIAR I OCENIANIE WZROSTU
KAPITAŁU LUDZKIEGO UCZNIÓW
CZEŚĆ I: GŁÓWNE POJĘCIA I POLE
DZIAŁANIA**

STRESZCZENIE

Diagnostyka edukacyjna jest teorią i praktyką rozpoznawania warunków, przebiegu i wyników uczenia się. Ta stosunkowo nowa dziedzina wiedzy szuka jeszcze swego zasadniczego paradygmatu: nieformalnego czy unormowanego, interwencyjnego czy rozwojowego.

Rynek pracy jako miejsce, w którym oferuje się i nabywa zatrudnienie i pozycję zawodową, tworzy dalekosiężny cel kształcenia. Absolwenci szkół wnoszą tam swój kapitał ludzki, obejmujący kompetencje, wiedzę, doświadczenie, umiejętności i podobne wartości.

Taksonomie celów kształcenia – emocjonalna, światopoglądowa, poznawcza i praktyczna – porządkują składniki kapitału ludzkiego następująco: 1. dziedzina motywacyjna, 2. dziedzina etyczna, 3. dziedzina doświadczalna, 4. dziedzina fizyczna. Przy takim podejściu kapitał ludzki staje się zadaniem dla uczniów, a umiejętność uczenia się staje się najważniejszą właściwością kandydatów do pracy.

Słowa kluczowe:

diagnostyka edukacyjna, rynek pracy, taksonomie celów kształcenia, kapitał ludzki.