Kazimierz Wenta
Poland

Fractality of Trust among General Educators and Methodologists Teaching Educational Subjects

Abstract

The issue of public trust in research and teaching arouses varied interest and is involved in multiple strands of conflict and environmental conditions. As theorists and academic teachers, general educators teaching an educational subject, e.g. for trainee teachers, often tend to have limited trust among methodologists, who are also the teachers of this subject. Fractality of limited mutual trust generally situates itself on many substantive levels and corresponds to the technology of education, which is revealed in the so-called reliability and geometry of trust concerning the evaluation of the quality of education.

Keywords: *general didactics, methodology of educational subject teaching, fractality of trust, theorists and practitioners of teaching*

Introduction

In addition to the theory of upbringing, the theory of social welfare and the history of education, general didactics is an important part of educational sciences. In general, it is the primary source of knowledge among dozens of pedagogical subjects, and it sets out procedures for the mastering of theoretical and practical teacher skills and the acquisition of social competence. Methodology of teaching educational subjects is carried out by methodologists (educators) for teachers specialized in teaching, e.g., mother tongue, foreign languages, mathematics, physics, and other subjects that are included in the list of university and school

classes, extracurricular activities and parallel out-of-school education. Limited trust in competence between general educators can be seen, especially those having limited experience in teaching, and methodologists teaching educational subjects. This is due to the dynamics of change in education, which tends to be the result of political decisions, and which is not always based on in-depth research. Methodologists teaching educational subjects generally declare that they actively participate in these educational changes, while claiming that general educators are focused on the old theories of teaching, as they do not keep up with changes that occur in universities, schools and teaching practice.

The cognitive objective of this study was to deepen the knowledge of fractal trust, which is based on the metaphorical use of the fractal theory based on algorithms for geometric constructions, typological constructions or function with jagged, fragmented self-similar shapes (Tempczyk, 1998, pp. 322–323). At the same time, this paper stresses that knowledge is not identified with information, data and news, but it is recognized as an internal, subjective model of the material and spiritual world. The rationale for choosing the topic of fractal and mutual, but limited, trust among general educators and methodologists teaching educational subjects is the author's concern resulting from the functioning of the multitude of opposing external and internal factors. And these factors are often the causes and consequences of students' educational failures, which are revealed in the form of the dominance of messages obtained during educational subjects which correspond to the curriculum. There can also be seen far-reaching absenteeism of students in gaining desired theoretical and practical skills and social competence.

In general, the content of the article is of theoretical nature with scientific statements related to the analyzed sources and the author's own teaching experience. Methodological assumptions are contextual; nevertheless this article refers to the signaling analysis of individual biographical cases (Pilch, Bauman, 2001, p. 78) obtained on the basis of selecting respondents from general educators and methodologists of educational subjects, who are well-known to the author. The substantive threads forming the thematic core of this article include i.a.: 1) the issue of the geometry of trust in terms of fractal theory; 2) the presentation of biographical profiles representing general educators and methodologists obtained from the available sources; and 3) areas of limited fractal trust between general educators and methodologists. Furthermore, the conclusion includes corrective actions to be taken in terms of changes in the training and further education of theorists and practitioners at further levels of professional development of academic teachers and methodologists teaching educational subjects concerning the

implementation of the framework qualifications for higher education institutions (Chmielecka, 2010), as well as primary and secondary schools.

The issue of the geometry of trust in terms of fractal theory

Trust of modern man living in the world of nature, culture and technopole (Postman, 1995) serves multiple functions due to deliberate actions resulting from satisfying diverse biological, social and selfish needs. In the first decades of the twenty-first century, mankind found itself in the grip of globalization, information networks and consumerism, and yet found it hard to barely approach the subjectivity of the individual. Therefore, people should trust: 1) those who represent them in the areas of politics, economics, technology, science, education, etc.; 2) pay attention to various elements of the contemporary world, which operate on the principles of interdependence; 3) because social life is marked by threats and dangers; 4) as the modern world offers many possibilities, e.g., consumption, education, work, leisure; 5) because there are more and more areas of contemporary social world which become opaque for its participants; 6) as there is growing anonymity of individuals; 7) because the contemporary world is filled with an increasing number of unknown individuals, which is associated with migration, tourism; and the stranger represents the unknown (Sztompka, 2007, pp. 45–49).

Adapting the geometry of trust to fractal theory is an attempt at interdisciplinary approach to determine the meaning and substance in the investigation of the truth, supposing that there is one science, although it is situated in the changing structures and divisions into separate fields and disciplines. Therefore, the analysis of information related to the metaphorical “geometry of trust” proposed by P. Sztompka (Ibid, pp. 229–259) focuses on: 1) the circles of reliability and trust in clear and ambiguous situations, and networks of personal contacts; 2) trust as an important component of social capital in places where it is not common, e.g., in Poland there is too heavy load of mistrust; 3) networks and chains of trust as platforms, inclusive and exclusive networks, and personalized and collective networks. While referring to the proposed scientific statements from the point of view of a sociologist, which is related to the view of a teacher and especially an educator, it can be noted that they reveal the diverse connections of situational conditions. They refer to the theory of chaos in procedures for analyzing content related to general didactics, methodology of teaching educational subjects, which in this article applies to fractality of mutual trust among academic teachers from different disciplines and protects the group of teachers from non-specialists.

Therefore, from the perspective of the analysis of didactics as educational theory and practice, deterministic chaos appears as a generic term in relation to fractal theory in several senses, e.g., in the functional and behavioral, humanistic and adaptive, constructivist, social and psychological, and critical and emancipatory paradigms. Moreover, its source can be traced to the so-called (pseudo)theoretical premises, which are the effect of educational and cultural inheritance as the agreement to doublethink, which lies at the basis of the command-and-quota system, i.a., in the form of *increasing inability to recognize the meaning and consequences of one's own actions* (Klus-Stańska, 2009, pp. 68–72).

Especially in the second decade of the twenty-first century - not only in Poland or Europe - didactics had been drifting between common and scientific knowledge, the latter of which found itself on a dangerous edge of intensive eruption of theory. And it does not reach the educational practice nor has the form of eclectic mosaic of different authors often based on contradictory theoretical premises. These premises do not apply to new technologies of information and network education or they are used by teachers without pedagogical talent or operational knowledge, which would enable them to apply innovative and creative approaches. And educational chaos usually appears with a background metaphor (Ibid, pp. 193–373).

While searching for the semantic relationship between sociological geometry of trust and fractal theory, it is worth noting that the so-called applied pedagogy is often addressed to specific education (Śliwerski, 2009, pp. 80–109). And this specific education should be something more than just a theory, technology and the arts of education related to safe, innovative but also creative teaching and learning processes and preparation for lifelong self-education in the network society focused on research and educational interdisciplinarity (Wenta, 2011, p. 181).

The chaos theory reveals the statement that *the scope of the principle of causality is, on the one hand, limited by the uncertainty principle, and on the other, by the properties of instability, which is typical of nature* (Peitgen, Jurgens, Saupe, 1996, p. 18). In fact, in nature fractals are the result of the growth process, while in the dialectics of the fractal language there is a need to develop a special program to describe the natural processes of growth (through analogy with the processes of physical, mental, social and moral growth from infancy to advanced age). However, the need for studying growth rate in the fractal theory has been postulated already in the late seventeenth century, when there were no computers, although it should be considered as an essential factor for studying the shape (education – note KW) ... *as the shape is limited - using a mathematical term - by a function of time. Therefore ... we can treat the shape of the organism as an event in phase*

space (space-time), and not only as a spatial configuration. In fact, in the theory and practice of continuous improvement of fractals L-systems have been developed as a language modeling the growth of plants. However, much has been done for the solutions of systems of feedback rewriting sequences of characters in the center of the field dealing with formal languages and formal grammars in computer science (Ibid, pp. 23–25). Therefore, the question may be posed: Why do general didactics and specific didactics show far-reaching absence of taking any attempt to apply chaos theory, including fractals in pedagogy?

Biographical profiles of selected general and special educators

The group of general educators includes authors of books and numerous scientific publications, who generally deal with the textbook dissemination of knowledge for trainee teachers. Many general educators refer to Wincenty Okoń, who writes about the subject matter and methods of didactic research and the development of education systems, highlights main concepts of teaching, and characterizes the education system consisting of: objectives, contents, principles, methods, forms, didactic aids, and procedures on monitoring and evaluation (Bass, 2003). In the first part of his book, Czesław Kupisiewicz gives textbook examples of the concepts and subjects of didactics. In the second part he acquaints students or university graduates, who apply for teacher qualifications, with the educational process. In the third part, he highlights the components of this process, and in the fourth part he informs of didactic problems of modern education, e.g., by paying attention to school failure and teaching according to the curriculum, and he proposes an educational balance of the twentieth century (Kupisiewicz, 2000). On the other hand, Franciszek Bereźnicki, with Janina Świrko-Pilipczuk as a co-author of the second and third chapters, writes about the subjects and tasks of general education didactics, values, objectives and content of education, as well as the process of education and multilateral training. He also refers to the process of self-education, the principles, methods, forms and means of general education, planning and organization of teaching, school failure, control and evaluation of achievements, as well as the issue of educational innovation, working with gifted students, educational subjectivity, development of creative abilities and learning in the light of educational reports (Bereźnicki, 2007). An example that is of great interest among educators and methodologists, but also criticism among other educational publications is the book by Gordon Dryden and Jeannette Vos (2003), which announces a revolution in teaching. In this book, the authors write about

the future, about what is best while creating a society of learning people, and about understanding one's own mind, self-education and thinking in order to find great ideas for success in learning, etc.

While characterizing the profiles of some authors based on the books on general didactics, it is impossible not to be concerned about teaching and didactic processes in the second decade of the twenty-first century. An extensive work of Józef Pólturzycki (2014) is filled with multiple substantive ideas and cogent statements of concern over general didactics. The author also examines the standards developed by the Main Council of Science, the Delors Commission Report, axiological issues in the theory of education, issues of modernization of education, and also refers to the proposed educational solutions of selected Polish general educators in terms of new approaches and continuation of actions.

In popular science simplification, fractality of mutual trust between theorists of general didactics and special educators is seen as the operation of bit computers, and it is based on such properties of fractals which relate to the definition by Mandelbrot, because: 1) *they are not the formula, but recursive dependency*; 2) *they have the characteristics of self-similarity (a part is similar to the total)*; 3) their dimension is not integer (Kudrewicz, 2007, p. 19). On the other hand, according to the topological dimension of Hausdorff, they are always integers, and a fractal is any set the dimension of which is not an integer (Ibid, p. 61).

The application of the properties of fractals, which occur in nature, science and art, is revealed in the projection of human behavior, i.e., in the fractality of trust; although this will happen when the bit computers will be replaced with quantum computers that are at the stage of experimental testing, and when subquantum computers will stop to be the realm of theoretical projects providing new research and application opportunities (Gnitecki, 2005, pp. 86–91). Therefore, it is worth waiting for a self-similar fractal approach to different varieties of trust, its limitations or their lack in the form of numerical algorithms and computer programs for drawing “fractals” that often have nothing to do with the definition of Mandelbrot (Ibid, p. 21).

Special educators (teaching educational subjects), who educate trainee teachers of a given specialty, are traditionally called methodologists. They are usually high school teachers, often aspiring to work in higher education institutions. In general, in the light of the difficulties in the process of receiving a doctoral degree in their educational specialization or due to special abilities and interest in applied pedagogy, i.e., subject didactics, university methodologists work on a doctoral thesis, and then even receive post-doctoral qualifications in pedagogy. Therefore, the group of special educators includes academic teachers working

as assistant professors and lecturers, who are formally obliged to continuously improve the teaching methodology in their major field of study. However, this group also includes doctors in pedagogy, who had previously completed studies in a given specialization. Fractality of trust, often in the form of limited trust between lecturers - specific methodologists and assistant professors, who are on the verge of receiving post-doctoral qualifications, is of diverse nature and tends to be an area of declarative peer recognition, but also competition and even envy.

On the basis of signal questionnaire studies among 72 pedagogy students (Koszalin University of Technology, January 2015), it can be noticed that: 1) general didacticians arouse trust (23.6%); 2) as well as subject didacticians (51.4%); 3) generally, there is mutual trust between general didacticians and methodicians – i.e., didacticians of subject teaching (41%); 4) mutual trust between them depends on: a) familiarization with the scientific output (37.5%); b) academic degrees and titles (34.7%); c) better sale of textbooks than theoretical books (26.4%); d) the fact that there are footnotes and bibliography in theoretical publications (9.7%); e) the fact that footnotes and bibliography are often missing in non-academic textbooks (8.3%). Students' suggestions concerning what can be done to deepen the trust between general and subject didacticians focus on: 1) participation of both parties in subject methodology workshops (66.7%); 2) raising mutual awareness of deep transformations of education (20.8%); 3) organizing discussion of general and subject didacticians through mass media (23.6%); 4) making use of students' initiatives undertaken at conferences of student research clubs (19.4%); 5) encouraging both sides to internet contacts concerning, among other things, the discussion on some published books and articles (19.4%).

Areas of limited fractal trust between general educators and methodologists

Limited fractal trust among general educators and methodologists teaching educational subjects at universities, but also in teacher training centers, can be considered in terms of formal commitment and implementation of curriculum and syllabuses addressed to trainee teachers and teachers participating in improvement courses aiming at career advancement. Fractal trust can be graphically drawn and photographed (with the consent of the individual, the person). However, without sophisticated mathematics, a computer fractal becomes complex and very difficult, although it can be made on a metaphorical example by simulating trust allegorically using images from nature and sophisticated computer graphics.

The liberty of the individual, with agreement to social and personal trust, is not a benefit of culture. Liberty has undergone restrictions through the evolution of civilization, and justice demands that these restrictions shall apply to all (Freud, 1930, pp. 32–33, as cited in: Ball, 2007, p. 516). Therefore, in the context of limited trust, even among theorists of general didactics and in mutual relations with methodologists teaching educational subjects in higher education institutions and at lower levels of education, there can be seen various reasons for “diverting” trust; e.g., old papers and scientific articles, even the most important ones, sometimes become forgotten. Scientists do not read old literature, but they cite more recent review articles or books on a particular topic (Ball, 2007, p. 511). Commonly, theorists of general didactics have a limited ability to track the “production” of scientific books and textbooks on educational subject teaching methodology, which are published at home and abroad, although they are eager for information about educational achievements in the sphere of the effectiveness and efficiency in teaching.

The identification of the number of connections with the wealth of books and textbooks on general didactics and educational subject methodology, dominated by multimedia and the Internet, suggests that in society there is freedom of choice, and where the ability to get (educational - note KW) “market share” depends on the already gained share, and the probable result of which is the power law distribution of inequality (Ibid, p. 510). In the real world the cause of “limiting” the power law and expression of trust, e.g., between theorists of general didactics, methodologists and authors of textbooks for teachers and students, are factors that impose a maximum limit on the number of interconnections used to express substantive, methodological and didactic trust. In fact, there are several small worlds of direct and indirect contact (seminars and conferences), which have a preferred number of connections and a decrease in the number of vertices with a large number of connections. According to Barabási, there are no exceptions at the other end of the network vertices, which have a large number of connections, as there is a “menagerie of networks” (Ibid, p. 512).

Areas of limited trust among general educators and methodologists teaching educational subjects are related to: 1) the social changes revealed in the processes of democratization in universities and schools, and the empowerment of teachers, pupils-students and parents; 2) the changes in the virtual space-time as a result of the dynamic development of computer technology and IT networks; 3) equality in the management and availability of data resources and messages related to the particular subject, while using the possible control systems and evaluation of their reliability; 4) gaining a higher level of social awareness in the sphere of trusting people and creating a sense of dignity, while searching for authority, e.g., teach-

ing authority in lifelong learning; 5) the development of courage and boldness in expressing legitimate views and opinions about trust in theorists and methodologists - practitioners of the educational subject teaching; 6) becoming aware of the functional values related to one's own subject, including: an interest in teaching and didactics, security of research and applied didactics, reliability and accuracy in the selection criteria related to the evaluation of people who are trustworthy; 7) continuous acquisition of new social competences focused on teaching quality, which are relevant to the changes in teaching and applied didactics.

In the discussion on the limited fractal trust between theorists of general didactics and educational methodologists and practitioners, it is necessary to add that people sometimes try to introduce moral truths which correspond to educational trust and to their own teaching experience. Therefore, such a discussion reveals reasons to believe that certain aspects of human morality have evolutionary roots. However, it does not authorize the statement that our moral systems are the product of evolution, but that they were created in the process of social adaptation and that they generally reflect human nature, although moral precepts promote some evolutionary predisposition formed at the expense of others (Stewart-Williams, 2014, p. 283).

The barrier limiting the fractality of trust between theorists of general didactics, methodologists teaching educational subjects and educational practices, is revealed primarily among materialists, who do not believe in idealistic archetypes of timeless values and who try to limit the discourse by saying that "there is no evolution", "global warming", etc. .. This, in turn, irritates liberal scientists, although many of them do not see the "veracity" of solutions based on awareness and explaining quantum paradoxes. Therefore, removal of ideological barriers between materialists and idealists requires reduction of dogmas, often inherited from generations. In this context it is worth encouraging general educators and methodologists to engage in creative learning, where educational failure is often an integral part of the innovative and creative way to achieve success. This is connected with the linearity of teaching suggestions and solutions. And the traditional teaching lacks innovation. It is focused on excessive predictability and control, and it does not trigger quantum self, where the most important are: intuition, imagination and inspiration (Goswami, 2014, pp. 224–225).

Conclusion

Considerations on the fractality of trust among general educators and methodologists teaching educational subjects indicate only some issues intentionally

selected from available sources. They allow for the determination of a number of problems to be addressed with the help of advanced fractal theory, which is an integral part of chaos theory. The sociological theoretical premises outlined by P. Sztompka on the so-called geometry of trust somehow correspond to fractal theory, which can be used to a limited extent in the study, especially in the graphical presentations with the use of bit computers, and in the near future with the use of quantum and subquantum computers.

In reference to the content of this article, there is a need to propose some corrective actions in order to increase trust between theorists of general didactics, methodologists teaching educational subjects and teachers - practitioners. The first step is to read each other's publications, in print or online, although it is worth remembering about the technique of speed reading and application of the synthetic, multimedia and hypertext versions for particularly interested teachers. It would be also important for theorists of general didactics, methodologists, teachers - practitioners and students to participate in seminars, symposia and conferences, although they should bear in mind their budget. New didactics, related to the computer and the network, should not dominate the book and the article in printed versions, though it is worth noting the difficulties in understanding texts and graphic drawings among readers due to the limited resource of conceptual designates.

References

- Bereźnicki, F. (2007), *Dydaktyka kształcenia ogólnego*, Oficyna Wydawnicza "Impuls", Kraków.
- Chmielecka, E. (ed.), (2010), *Autonomia programowa uczelni. Ramy kwalifikacji dla szkolnictwa wyższego*, Published by: Ministry of Science and Higher Education, Warsaw.
- Dryden, G., Vos J., (2003), *Rewolucja w uczeniu* [The Learning Revolution], Translation by B. Józwiak, Wydawnictwo Zysk i S-ka, Poznań.
- Freud, S. (1930), *Civilization and its Discontents*, Hogarth Press, London 1973, in: Ball, P. (2007), *Masa krytyczna Jak jedno z drugiego wynika* [Critical Mass: How One Thing Leads to Another], Translation by W. Turopolski, Wydawnictwo Insignis, Kraków.
- Goswami, A., (2014), *Kwantowy umysł. Naukowe dowody na potęgę Twoich myśli* [Quantum Creativity: Think Quantum, Be Creative], Translation by: A. Rutkowska, Wydawnictwo: Studio Astropsychologii, Białystok.

- Gnitecki, J. (2005), *Przemiany informatyki oraz cywilizacji i edukacji informacyjnej*, Wydawnictwo Naukowe Polskiego Towarzystwa Pedagogicznego Oddział w Poznaniu, Poznań.
- Klus-Stańska, D. (2009). *Polska rzeczywistość dydaktyczna – paradygmatyczny taniec św. Wita*, [in:], L. Hurło, D. Klus-Stańska i M. Łojko (ed.), *Paradygmaty współczesnej dydaktyki*, Oficyna Wydawnicza "Impuls", Kraków.
- Kudrewicz, J. (2007), *Fraktale i chaos*, Wydawnictwo Naukowo-Techniczne, 4th edition, revised and extended, Warsaw.
- Kupisiewicz, Cz. (2000), *Dydaktyka ogólna*, Oficyna Wydawnicza: GRAF PUNKT, Warsaw.
- Okoń, W. (2003), *Wprowadzenie do dydaktyki ogólnej*, Wydawnictwo Akademickie ZAK, Warsaw.
- Peitgen, H.-O. Jürgens, H. Saupe, D. (1996), *Granice chaosu. Faktale. Część 2*. [Chaos and Fractals. New Frontiers of Science, Part 2], Translation by K. Pietruska-Pułaba, K. Winkowska-Nowak, Wydawnictwo Naukowe PWN, Warsaw.
- Pilch, T. Bauman, T. (2001), *Zasady badań pedagogicznych. Strategie ilościowe i jakościowe*, Wydawnictwo ŻAK, Warsaw.
- Postman, N. (1995) Technopol. *Triumf techniki nad kulturą*, Państwowy Instytut Wydawniczy, Warsaw.
- Półturzycki, J. (2014), *Niepokój o dydaktykę*, Wydawnictwo Naukowe Instytutu Technologii Eksploatacji, Państwowy Instytut Badawczy, Radom.
- Sztompka, P.(2007), *Zaufanie. Fundament społeczeństwa*, Wydawnictwo ZNAK, Kraków.
- Śliwerski, B. (2009) *Współczesna myśl pedagogiczna. Znaczenie, klasyfikacje, badania*, Oficyna Wydawnicza IMPULS, Kraków.
- Tempczyk, M. (1998), *Teoria chaosu a filozofia*, Wydawnictwo CIS, Warsaw.
- Wenta, K. (2011), *Teoria chaosu w dyskusji nad pedagogiką*, Wydawnictwo: Instytut Technologii Eksploatacji – Państwowy Instytut Badawczy, Radom.