

The Creative Path of Academician Myroslav Ivanovych Zhaldak in the Informatization of Secondary and Higher Pedagogical Education in Ukraine

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Abstract: The article is about a prominent specialist in the field of informatics and methods of its teaching, the founder of a powerful scientific school and research areas, the author of many textbooks and manuals in mathematics and computer science. The stages of his formation as a scientist. Biographical and bibliographic information about him and his scientific achievements are given. The study highlights “First steps in life”, “Beginning of scientific path and management”, “Scientific works and educational materials”, “Scientific and organizational work and awards”, “Formation of the scientific elite of the state”, “Main activities of scientific school M. I. Zhaldak”. The achievements and main directions of functioning of the scientific school of M. I. Zhaldak are analyzed. The influence of the scientific school on the informatization of secondary and higher pedagogical education of Ukraine is determined.


1 INTRODUCTION

Historical and biographical research occupies a prominent place in the history of science and allows to personify the history of its branches, to assess the contribution of scientists, individuals involved in research and organization of science. In the context of biography, the method of organizing biographical information and research tools are important (Liashko, 2013). Therefore, the figure of a prominent Ukrainian computer scientist – Myroslav Ivanovych Zhaldak – was chosen for this study. The personal scientific achievements of M. I. Zhaldak and his students are an invaluable, socially significant contribution to solving the problems of informatization of the education system in Ukraine, humanization of education and humanization of the educational process, fundamentalization of knowledge and providing them with applied, practical significance.

The creation of scientific schools is a good national tradition, which is a consequence of the peculiarities of the cultural and historical development

of Ukraine. Trends in modern science, which gave rise to a number of problems, including problems related to the organization of research: creating optimal conditions for the most effective activities of research teams, ways to form and manage them – made relevant the study of the origin and operation of specific scientific schools. “Scientific School” is a community of scientists of different statuses, competencies and specializations who coordinate their research activities, who have contributed to the implementation and development of the research program and are able to actively represent and defend the goals and results of the program (Honcharenko, 2012). Thus, the scientific school is an informal association of scientists whose research is concentrated in the field of ideas created by scientists of high spiritual and intellectual potential. We emphasize that a necessary condition for the creation of a scientific school is the presence of spiritually and intellectually gifted personality of the scientist – the founder of the school (Leshchenko and Yatsyshyn, 2015). The organizer, leader and first initiator of scientific ideas of the school is its leader, and its students and staff form its staff. Such groups have a common ideology, it can be their own methodology and methodology, their own views and

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beliefs about certain facts and phenomena, their own vision of the main path of science. Important is the product of their activities, publication of results, i.e., school publications, which should be published regularly (periodically): thematic collections, monographs, etc. (Zaruba, 2007). The reasons for recording the existence of such a school are three generations of researchers: the founder of the school – his follower – the students of the follower (Marahovsky and Kozubtsov, 2012).

From the works (Honcharenko, 2012; Leshchenko and Yatsyshyn, 2015; Marahovsky and Kozubtsov, 2012; Zaruba, 2007) it can be concluded that the main tasks of the scientific school are: training of scientific and scientific-pedagogical staff; discussion of the main results of dissertations of graduate students, doctoral students, applicants and staff; opposing doctoral and candidate dissertations, preparing responses to abstracts, reviewing curricula, manuals, textbooks, guidelines, collections, etc.; study, generalization and dissemination of advanced interdisciplinary scientific and pedagogical experience; preparation, organization and holding of scientific and practical events of different levels.

Therefore, it is important to generalize the experience of the scientific school, the leader of which is Academician M. I. Zhaldak, and its role in the informatization of secondary and higher pedagogical education in Ukraine.

2 THEORETICAL BACKGROUND

The study analyzed scientific publications and supporting sources in several areas:

1. Publications devoted to the activities of scientific schools (Kremen and Levovitsky, 2012; Franchuk, 2017; Honcharenko, 2012; Marahovsky and Kozubtsov, 2012) and historical and biographical research (Liashko, 2013).
2. The source base of the study were publications about the personality of M. I. Zhaldak. The collection (Bibliographic Index, 2011) on the life and scientific path of M. I. Zhaldak presents the most comprehensive data, but this information now needs to be updated. The sources present certain biographical data (Nahorody, 2022) and memoirs of colleagues of M. I. Zhaldak (Mykhalin, 2010).
3. The training of scientific and scientific-pedagogical staff of the highest qualification for informatization of education is described in works (Leshchenko and Yatsyshyn, 2015; Spirin and Yatsyshyn, 2013; Spirin and Yatsyshyn, 2014;

Spirin et al., 2016) which mention the role of M. I. Zhaldak and representatives of his scientific school in this process.

We believe that the significant scientific heritage of Academician M. I. Zhaldak and his students has not been studied enough, and this study is an attempt to summarize the significant contribution of M. I. Zhaldak in the development of informatization of the educational process of secondary schools and universities of Ukraine.

The purpose of the article is to clarify the features of the scientific school of Academician M. I. Zhaldak and its impact on the informatization of domestic secondary and higher pedagogical education.

To perform this study, a set of methods was used:

- theoretical – biographical analysis and systematization to determine the stages of formation of M. I. Zhaldak as a scientist and manager; analysis and generalization to clarify the prerequisites for the creation of the scientific school of M. I. Zhaldak and determine the main directions of its work; concretization and generalization of the provisions shown in the scientific works of M. I. Zhaldak and his students; systematization of materials about the life and scientific achievements of M. I. Zhaldak; comparative method was used to determine the stages of formation and organizational features of the scientific school of M. I. Zhaldak, as well as to identify the importance of experience in training scientific and scientific-pedagogical staff of the highest qualification in the new scientific specialty “Information and Communication Technologies in Education”; bibliometric method for studying the citation of the works of the leader by his students and followers;
- empirical – conducting interviews with graduate students, doctoral students, applicants who performed dissertations under the guidance of M. I. Zhaldak and his students; supervision of training and certification of scientific and scientific-pedagogical staff in specialized scientific councils, which included M. I. Zhaldak.

3 RESEARCH METHODOLOGY

Liashko (Liashko, 2013) found that for a long time (since the XII century) mankind has created the principles and mechanisms of practical or normative classification of people who worked in the field of science. The basis of such a classification is a person's contribution to the development of a particular branch

of science on a formal basis – a degree, academic or academic title, acquired in the normatively defined manner. That is, it is the fixation of certain stages of normative recognition of a person's scientific achievements.

As already mentioned, each time, epoch, period of history is associated with the relevant people who influenced the development of science in a particular field, one of them is M. I. Zhaldak. Throughout his life, he demonstrated to society the potential of a talented scientist, strong leader, progressive educator, and wise mentor. The results of scientific work and his creative work give grounds to claim that he has currently formed a solid scientific school of researchers in the theory and methods of teaching computer science and the use of information and communication technologies in education (Franchuk, 2017).

The formation and development of scientific schools in each country is an extremely important problem of national importance. The development of one or another field of scientific knowledge, and accordingly – education, culture, and economy, largely depends on its support and consistent solution (Kremen and Levovitsky, 2012). According to (Honcharenko, 2012, p. 28), a full-fledged scientific school cannot exist without a teacher, without students, without the substantive content of joint activities, but each school in science necessarily differs in certain unique, unique, properties. The nature of science does not support reduplication, reproduction of standard products, the invention of the invention. Therefore, the function of learning, involvement in the tradition is inextricably linked in the scientific school with the search for new solutions and approaches – both conceptual and methodological. That is why every scientific school is unique.

Thus, scientific schools are the core informal structure of science because they make a significant contribution to its development, and their representatives usually achieve significant scientific results (Leshchenko and Yatsyshyn, 2015). Researchers of scientific schools (Honcharenko, 2012), and (Kremen and Levovitsky, 2012, p. 82), emphasize that the school operates not only through the development of scientific ideas, but also through the organization of scientific work on the basis of scientific principles, tact, respect, responsibility and creating an atmosphere of decency. And the educational influence on the personality of the applicant has the ability of the head of the school to think strategically. Also, the presence of mature intelligence, broad worldview, prudence, wisdom of life, the ability to generate ideas, anticipate the consequences of decisions, commitment, and self-discipline (Kremen and Levovitsky,

2012). In our opinion, M. I. Zhaldak meets all these qualities and therefore, to describe his path as a scientist and the work of his scientific school is an important and honorable task.

Myroslav Ivanovych was a doctor of pedagogical sciences, professor, full member of the National Academy of Educational Sciences of Ukraine, head of the Department of Theoretical Foundations of Informatics of the National Pedagogical Dragomanov University. He is a well-known scientist and organizer of national education and science in Ukraine and abroad. He himself was always at the forefront and involved his students, gained followers, gathered around him like-minded people. It is easy and difficult to study the biography and activities of the scientific school of M. I. Zhaldak, because he is friendly, open, respected by people, has charisma and his scientific achievements are large and diverse, and to thoroughly study this requires special research. M. I. Zhaldak was a prominent figure in modern Ukrainian pedagogical science.

According to the results of generalization and clarification of the system of basic criteria, which determine the scientific and pedagogical school among other scientific associations, the following criteria include (Honcharenko, 2012):

- creation of educational materials of different nature, recognized at the national and regional levels, fully provide the educational process from the block of academic disciplines and constitute the content of the educational process in a particular specialty (group of specialties);
- the use of original or creatively adapted teaching methods with essential elements of developmental learning and the use of modern means of communication in the scientific community;
- conducting teaching activities from the block of academic disciplines that constitute the educational and content core of the program of a particular specialty (specialties) during the period of specialist training;
- the topic of dissertation research of members of the scientific school should be conceptually related to the direction of scientific research of its leader. This indicates a set of qualitative indicators, primarily conceptual, related to the continuation of scientific direction and the development of ideas of a scientific school;
- recruiting new members of the community, including from the student body of the university, until the end of the training of highly qualified specialists;

- conducting scientific-practical and scientific-theoretical events (conferences, seminars, etc.), including a permanent seminar of scientific and methodological nature. During these events, the function of replication of pedagogical innovations is realized;
- simultaneous implementation of two functions: 1) the initiator of fundamental scientific ideas, their dissemination and protection; 2) training of young scientific candidates (Doctor of Philosophy) and Doctor of Sciences (Bykov et al., 2017).

To conduct this study, the analysis of biographical information about the life and scientific achievements of M. I. Zhaldak is paramount. After all, in (Kremen and Levovitsky, 2012) it was determined that it is important to analyze the personality of the founder and head of such a school as the most important factor in its formation. Next, it is worth considering the school's research program – when the leader involves students in their own ideas, creativity, which involves his desire for collective forms of work and the need to relay their views and their discussion. An important condition for entering a scientific school is the identification of the student with the teacher, that is, the perception of his methods, ideas, way of thinking and acting. The identification of the student with the teacher and with the scientific school is a characteristic feature of scientific schools and is extremely important for understanding them as a pedagogical phenomenon. Inheritance and identification ensure the transmission and preservation of the achievements and traditions of the scientific school. However, this should not prevent the formation of the scientist's independence, the discovery of his own professional and personal position.

4 RESULTS

4.1 The First Steps in Life

Myroslav Ivanovych Zhaldak (figure 1) was born into a family of teachers on August 15, 1937 in the village of Lazirky (formerly Lazirkivsky, now Orzhytsky district), Poltava region. He began his studies at the school in 1944 in the village of Tarandyntsi (formerly Lazirkivsky, now Lubensky district) Poltava region, which he graduated in 1954.

The future scientist was educated at the Taras Shevchenko Kyiv State University, where he studied at the Faculty of Mechanics and Mathematics, graduating in 1959. It was also fateful that for the first time



Figure 1: Myroslav Ivanovych Zhaldak.

in 1959 graduates of this faculty were awarded qualifications in Mathematics. mathematics-calculator, which received and M. I. Zhaldak.

While still a student, he met a close person, Valentina Nikolaevna Babakova (1936–1973), whom he married in 1958. He had three sons – Andrew (1958), Igor (1961), Vladimir (1968), and now grandchildren.

After graduating from university, Myroslav Ivanovych was sent to work in Tula (Russia) as an engineer (DKB subscriber box 56). However, in 1960 he returned to Kiev and was enrolled in the position of assistant professor of higher mathematics at the Kyiv Higher engineering radio engineering schools of air defence forces.

4.2 The Beginning of the Scientific Path and Management Activities

Zhaldak's scientific path began in 1960 with admission to part-time graduate school at the Department of Higher Mathematics of the Kyiv State Institute of Food Industry (now the National University of Food Technology), and his supervisor was Doc-

tor of Physical and Mathematical Sciences, professor S. I. Zukhovyt'sky (1908–1994). And again, the fateful case directed the further future of M. I. Zhaldak, because in 1962 he was transferred to the inpatient graduate school of the same institute, where in the same 1962 (due to a change of place of work of the supervisor), transferred to graduate school at the Department of Mathematical Analysis of the Kyiv State Pedagogical Institute named after O. M. Gorky (now the National Pedagogical Dragomanov University). He graduated from graduate school in 1964 and was enrolled as a junior researcher in the computer laboratory at the Department of Mathematical Analysis of the Kyiv State Pedagogical Institute named after O. M. Gorky, and later was transferred to the position of assistant professor of higher mathematics. In May 1965 M. I. Zhaldak presented his scientific results in the form of a candidate's dissertation and received the degree of candidate of physical and mathematical sciences.

M. I. Zhaldak began to hold leading positions in 1968, working as Deputy Dean of the Faculty of Physics and Mathematics, and later, in 1980 – Head of the Department of Higher Mathematics. During this period, the range of scientific issues studied by the scientist significantly expanded. He was awarded the title of Higher Mathematics in 1970. In connection with the organization of the Department of Fundamentals of Informatics and Computer Science he became an associate professor of this department and was appointed Deputy Head of the Department, and in 1989 was elected Head of the Department.

From the mid-60's to the mid 70's of the twentieth century. in the laboratory of computer technology of Kyiv State Pedagogical Institute named after O. M. Gorky worked a group of young scientists who worked on one electronic computer "Minsk-1". In this group of young researchers stood out M. I. Zhaldak, who not only worked on the computer "Minsk-1", but also excellently taught future teachers. "Personally, I (recalls H. O. Mykhalin (08.01.1945–03.12.2020)) enjoyed the lectures of M. I. Zhaldak on probability theory (Mykhalin, 2010)". M. I. Zhaldak in 1972 was an experienced associate professor of higher mathematics and at the same time conducted research at the Main Computing Center of the Ministry of Education of Ukraine and which already had the most modern computers of the ES series. During the period from 1960 to 1985, young scientists of the Kyiv State Pedagogical Institute named after O. M. Gorky worked on computers of all generations – from the earliest to the most modern and involved their students and graduate students in this activity (Mykhalin, 2010).

As H. O. Mykhalin noted, a team was gradually formed around M. I. Zhaldak, and later a scientific school, which he headed. During the 25 years from 1985 to 2010, this school included hundreds of teachers from all over Ukraine, whose scientific and pedagogical activities are related to the pedagogical software GRAN, created under the leadership of M. I. Zhaldak (Mykhalin, 2010).

In 1989 the attention of the scientific community was drawn to the dissertation of M. I. Zhaldak for the degree of Doctor of Pedagogical Sciences "Teacher training system for the use of information technology in the educational process", which was defended in 1990 at the Research Institute of Content and Methods of Teaching USSR (Moscow). The scientific consultant was Doctor of Physical and Mathematical Sciences, Corresponding Member of the Academy of Educational Sciences of the USSR, later a full member of the National Academy of Educational Sciences of Ukraine, Professor M. I. Shkil (1932–2015). After defending his doctoral dissertation, the leading role of M. I. Zhaldak was fully manifested. If during the period from 1965 to 1990 under his leadership only two dissertations were prepared and defended (Yu. V. Tryus and N. V. Morze), then for the period from 1990 to 2010 the number of defended as PhD and doctoral dissertations, and now his students work in all parts of Ukraine and in leading institutions of higher education (Mykhalin, 2010).

In 1991 M. I. Zhaldak received the title of professor, and in 1992 he was elected a corresponding member, and in 1995 – a full member of the Academy of Educational Sciences of Ukraine.

At the National Pedagogical Dragomanov University of Institute of Informatics was established in 2008, where M. I. Zhaldak was elected its director and head of the Department of Theoretical Foundations of Informatics, which he headed until the end of his life.

Myroslav Ivanovych Zhaldak passed away on February 26, 2021. His heart stopped beating at the age of 84. Myroslav Ivanovych was buried in the town of Rzhys'hchiv, Obukhiv district, Kyiv region, Ukraine.

4.3 Scientific Works and Educational Materials

Scientific schools carry out theoretical and methodological, information-analytical, scientific-organizational, experimental-pedagogical, and innovation-research activities. By exchanging experience, ideas, scientists enrich each other's innovative potential, create an environment of productive sci-

entific communication, creative style of teamwork, contribute to the development of new effective methodology and original methods of scientific knowledge of innovation processes (Kremen and Levovitsky, 2012).

It should be noted that in the early 1990's at the National Pedagogical Dragomanov University were created positive prerequisites for the emergence of scientific and pedagogical school on the problem of informatization of secondary and higher pedagogical education. Under the leadership and with the direct participation of M. I. Zhaldak, a number of concepts, standards, educational materials, educational and methodological and program-methodological complexes were developed: content and programs of courses "Numerical Methods", "Mathematical Logic and Theory of Algorithms", "Fundamentals of Informatics", "Informatics", "Computational Practice" for physics and mathematics faculties of pedagogical institutes (1992), in-depth study of mathematics at school (2001), the concept of informatization of education in Ukraine (1994), the concept of the content of end-to-end education of Informatics and Computer Engineering for All Levels of Education (1993), State Standard of General Secondary Education in Ukraine in Informatics (2003), standard program of the candidate exam in specialties 13.00.02 "Theory and methods of teaching computer science" (1999) and 13.00.10 "Information and communication technologies in education" (2008), Industry standards of higher education in the direction of training 0101 Pedagogical education, Specialty 6.010100 Pedagogy and methods of secondary education – Mathematics and Physics (2002) (Bykov et al., 2017).

M. I. Zhaldak, a reviewer of more than 100 scientific and methodological works, is the author and co-author of more than 300 works, including 50 books and brochures (figure 2), including:

- Zhaldak, M. I., Kuzmina, N. M., and Mykhalin, H. O. (2009) Probability theory and mathematical statistics: a textbook for students of physical and mathematical specialties of pedagogical universities. Poltava. 500 pages.
- Zhaldak, M. I., Kuzmina, N. M., and Mykhalin, H. O. (2009) Collection of problems and exercises in probability theory and mathematical statistics: a textbook for students of physical and mathematical specialties of pedagogical universities. Kyiv. 610 pages

and others (Naukova diyalnist, 2022).

In the works of M. I. Zhaldak introduced modern computer-based methodological systems for teaching mathematics and, in part, physics, focused on a

harmonious pedagogically appropriate and balanced combination of traditional methodological systems of teaching and modern information and communication technologies.

The software complex GRAN (figure 3), which is well known today in schools and pedagogical universities of Ukraine, was developed by M. I. Zhaldak and his graduate student A. V. Penkov (1958–2016) as early in 1989. The program and methodological complex GRAN, together with other textbooks and manuals for students at pedagogical universities, teachers and students of secondary schools ("Probability Theory and Mathematical Statistics" (Zhaldak et al., 2020), "Stochastics", "Mathematics with a computer (Zhaldak et al., 2012)") contains more than 20 books, electronic copies of which are available on the website of the Department of Theoretical Foundations of Informatics (<https://ktoi.fi.npu.edu.ua/>).

You can get acquainted with GRAN software using Open Virtual Desktop (OVD) cloud technologies. The Ulteo OVD system was used to deploy Remote Desktop. For this purpose, the work of two servers (application server and session manager server) was organized, using the web-oriented virtual environment PROXMOX.

One server, namely the session manager server, is configured using the Linux Ubuntu operating system. Using the Windows operating system, an application server was configured on which the GRAN software (Gran1, Gran2D, Gran3D) was installed (Zhaldak and Franchuk, 2020).

You can get to the virtual desktop to the remote server at the link <http://gran.npu.edu.ua>. As a result, a page with the form (Ulteo Open Virtual Desktop) will open, where in the line "Username" you need to select from the proposed list one of the available names, such as "gran", and then in the line "Password" enter the password "gran" (Zhaldak et al., 2021).

It should be noted that developed by M. I. Zhaldak and his colleagues approved the textbook "Probability Theory and Mathematical Statistics" in 2008 by the Ministry of Education and Science of Ukraine as a textbook for students of physical and mathematical specialties of higher pedagogical educational institutions (Bibliographic Index, 2011; Zhaldak et al., 2020).

M. I. Zhaldak was a member of organizing committees and regularly participates in many masses' scientific events, both in Ukraine and abroad. Particularly M. I. Zhaldak was the permanent head of the All-Ukrainian scientific-methodical seminar on the problems of informatization of the educational process.

Here are the indexes of citations of publications M. I. Zhaldak according to Google Scholar



Figure 2: The main books of M. I. Zhaldak.

(<https://scholar.google.com.ua/citations?user=SDRlaCAAAAJ>) as of February 2023: general citation statistics – 4698, h-index – 34, i10-index – 58 (figure 4).

To convey his work, M. I. Zhaldak successfully used digital technologies. In particular, he created profiles in various citation systems so that everyone could see the real value of his publications. Especially for domestic research, especially in the social sciences and humanities, it is mandatory to publish in publications that are indexed in international databases Web of Science or Scopus. In figure 5 (<https://www.scopus.com/authid/detail.uri?authorId=16424101400>) we can see the number of publications as well as the years of these publications. It is from this that it can be argued that in this case the scientist was one of the first to place his work in scientometrics databases. However, it should be noted that Myroslav Ivanovych was a supporter of the publication of his works in Ukrainian scientific journals.

4.4 Scientific and Organizational Work and Awards

Scientific and organizational achievements of M. I. Zhaldak is reflected in his character traits: friendliness, perseverance, principledness, great diligence and the ability to bring the case to an end. The scientist can be described as a purposeful leader who had broad scientific interests, because he always supported new developments and improvements in technical means and tried to implement them in the educational process.

M. I. Zhaldak was the scientific editor of many monographs and manuals, was a member of the editorial boards of professional publications in pedagogical sciences of Ukraine, namely: the scientific journal “Computer at school and family”, “Mathematics at school”, newspaper “Informatics”, electronic publication “Information technologies and teaching aids”, editor-in-chief of the collection of scientific works

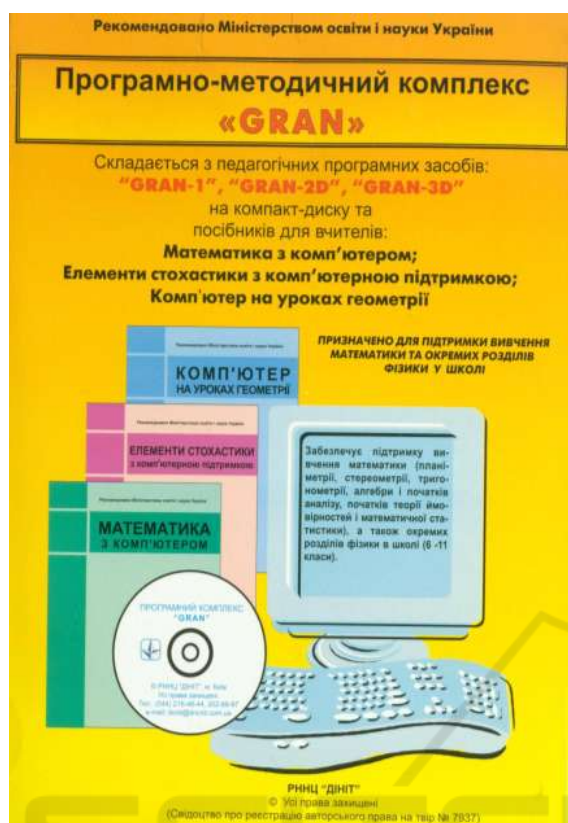


Figure 3: Software and methodological complex GRAN.

“Computer-based learning systems” and others (Nahorody, 2022).

Scientific and organizational activities of M. I. Zhaldak include work in numerous methodological commissions and groups, including: member (later chairman) of the methodological commission on informatics at the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine (1985–2005), member of the Interdepartmental Council for Coordination of Scientific Research in Pedagogical and Psychological Sciences in Ukraine, Chairman of the Informatics Section of the Commission for Higher Pedagogical Education (0101) of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine (since May 2007), Chairman of the Working Group for Development direction 6.040302 Informatics* training of specialists in higher educational institutions at the educational and qualification level of bachelor (since October 2007). From 1987 to 2002 he was the chairman of the jury of regional and national competitions in computer science, national competitions “Teacher of the Year” in computer science (2002, Kherson) and mathematics (2004, Bila Tserkva), participated. in the work of the Small

Academy of Sciences (1998–2000, chairman of the jury), Vice-President of the Kyiv Small Academy of Sciences of Ukraine (Bibliographic Index, 2011).

The selfless scientific and organizational work of M. I. Zhaldak was worthily awarded numerous state and scientific awards. For 59 years of work at the university M. I. Zhaldak received (Bibliographic Index, 2011; Nahorody, 2022):

1. Letter of thanks from the administration of the secondary school number 2 town Ukrainka (1984).
2. Diploma of the Kyiv State Pedagogical Institute named after O. M. Gorky (1985).
3. Excellence in Public Education of the USSR (1987).
4. Diploma of the Kyiv City Committee of Trade Unions (1988).
5. Excellence in Education of the USSR (1989).
6. Veteran of Labor (1997).
7. Diploma of the Academy of Educational Sciences of Ukraine (1997).
8. Diploma of the II degree of the Academy of Educational Sciences of Ukraine (1997).
9. Honored Worker of Science and Technology of Ukraine (2000).
10. Excellence in Education of Ukraine (2004).
11. Diploma of the first degree of National Pedagogical Dragomanov University (2004).
12. Diploma of the Cabinet of Ministers of Ukraine “For significant personal contribution to the development of education, training of highly qualified specialists, many years of hard work” (2005).
13. Gratitude of National Pedagogical Dragomanov University (2007).
14. Sign “K. D. Ushynsky” (2007).
15. Title of Honorary Professor of Chernihiv State T G Shevchenko Pedagogical University (2007).
16. Award of the National Academy of Sciences of Ukraine “For preparation of scientific change” (2009); Medal of M. P. Kravchuk “For scientific achievements” (2010).
17. Diploma of the Verkhovna Rada of Ukraine “For special services to the Ukrainian people” (2010).
18. Title of Honorary Director of the Institute of Informatics of National Pedagogical Dragomanov University (2011).
19. Honored Professor of National Pedagogical Dragomanov University (2011).

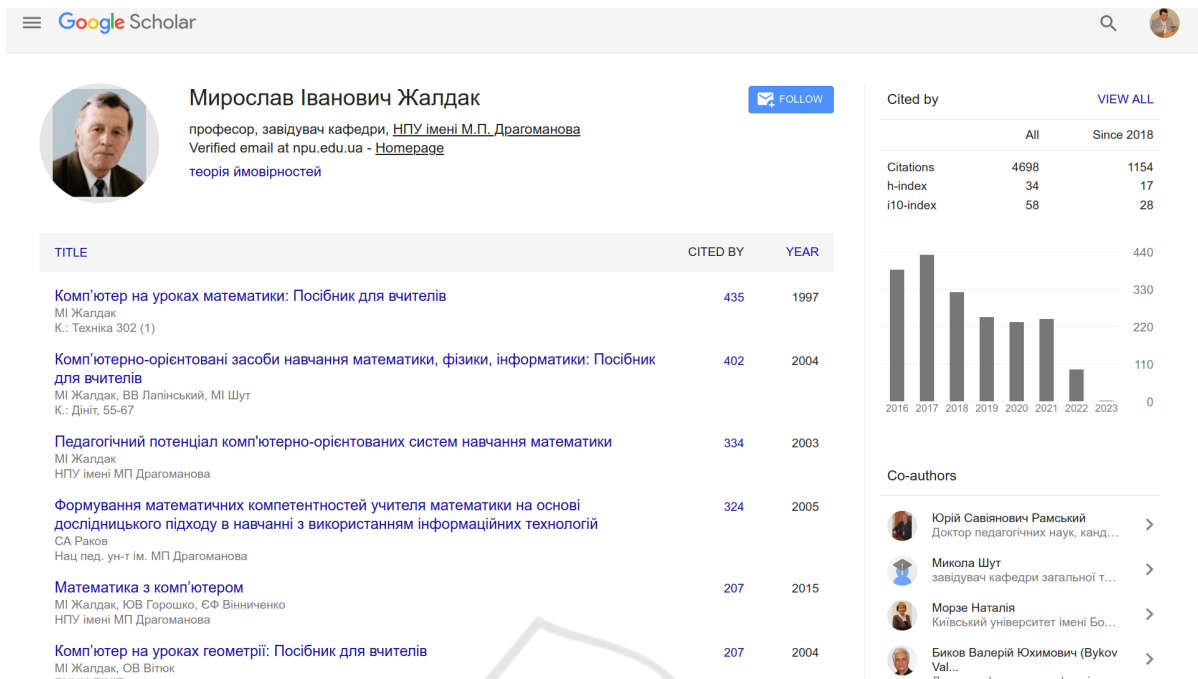


Figure 4: Citation indices of M. I. Zhaldak's publications according to Google Scholar.



Figure 5: Citation indices of M. I. Zhaldak's publications in Scopus.

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| 20. Medal “Grigory Skovoroda” (2012). | of Educational Sciences of Ukraine (2012). |
| 21. Gold Medal “Mykhailo Petrovych Dragomanov 1841-1895” (2012). | 23. Medal of M. P. Kravchuk “For scientific achievements” (2012). |
| 22. Diploma of the Institute of Information Technologies and Teaching Aids of the National Academy | 24. Diploma of the Kyiv City Organization of the Trade Union of Education and Science Workers |

of Ukraine (2017).

25. Diploma of the Verkhovna Rada of Ukraine (2017).
26. Medal “Dragomanov Family” (2018).
27. Medal “People’s Honor to Ukrainian Scientists 1918–2018” (2018).

4.5 Formation of the Scientific Elite

Being an effective form of organization of scientific life of the researcher, the scientific school greatly contributes to the acquisition of scientific experience, the formation of values in the implementation of research. Involvement of a young scientist in scientific research, giving him real powers and rights, the opportunity to choose a personally significant problem, pedagogical support and trust have a positive effect on the overall development of the researcher’s personality and significant results (Kremen and Levovitsky, 2012). Training of scientific personnel in postgraduate and doctoral studies is one of the main sources of constant replenishment and renewal of the intellectual potential of the state, its scientific elite (Biriukova, 2010).

M. I. Zhaldak was a permanent member (and since 2003 chairman) of the specialized Academic Council D 26.053.03 at the National Pedagogical Dragomanov University on the defense of doctoral dissertations in the specialty 13.00.02 – theory and methods of teaching (mathematics, computer science). Note that it is under the leadership of M. I. Zhaldak, this scientific field has reached the highest popularity, because applicants came from all over Ukraine to defend their scientific results in this specialized scientific council.

The most common method of identifying scientific schools is the study of various candidate and doctoral theses of scientists who are part of these informal teams (Marahovsky and Kozubtsov, 2012).

M. I. Zhaldak took great care of young people and actively involved talented students in research, postgraduate studies, and recommended talented colleagues for doctoral studies. According to scientific advice M. I. Zhaldak trained 16 doctors of pedagogical sciences. Under his scientific guidance, the scientific results of 41 candidate dissertations have already been evaluated (Nahorody, 2022).

It is worth noting the historical experience and analysis of the current state of training and certification of domestic scientific and scientific-pedagogical staff of the highest qualification in the field of pedagogical sciences, particularly in the new scientific specialty 13.00.10 – “Information and communica-

tion technologies in education”, established in 2009 (Spirin and Yatsyshyn, 2014).

It should be noted that back in 2008 at the initiative of academicians of the National Academy of Educational Sciences of Ukraine V. Yu. Bykov and M. I. Zhaldak at the Institute of Information Technologies and Teaching Tools of the National Academy of Educational Sciences of Ukraine consisting of 11 people created a working group to prepare a draft passport of a new scientific specialty 13.00.10 – “Information and Communication Technologies in Education”, approved by the Higher Attestation Commission of Ukraine in 2009. to the field of pedagogical sciences, which investigates the theoretical and methodological problems of the use of ICT in education, psychological and pedagogical rationale for the development of these technologies to ensure the functioning and development of educational systems (Spirin et al., 2017).

In 2010 M. I. Zhaldak became a member of the specialized doctoral scientific council for the first time created in Ukraine in the Institute of information technologies and learning tools of the National Academy of Educational Sciences of Ukraine (now Institute for Digitalisation of Education of the National Academy of Educational Sciences of Ukraine) in the specialty 13.00.10. This council has a unique composition, as it combines outstanding personalities known not only in Ukraine but also abroad – scientists, managers, practitioners who have degrees in various fields of science and have made a significant contribution to the computerization of general and higher pedagogical educational institutions, informatization of scientific and educational space of Ukraine (Spirin et al., 2016).

4.6 The Main Activities of the Scientific School of M. I. Zhaldak

The scientific school is called the guardian of acquired traditions, scientific worldview, concentrated experience of many generations, a kind of relay transfer of experience, which helps to reveal the creative abilities of young scientists, their education, formation, and transformation into mature researchers. In modern conditions, the scientific school, in order to maintain its progressive character, must be armed with advanced methodology, have professional mobility (Leshchenko and Yatsyshyn, 2015).

Given (Mykhalin, 2010; Bibliographic Index, 2011; Nahorody, 2022) we outline the main directions of the scientific school, headed by Academician M. I. Zhaldak:

- features of teaching computer science in secondary schools and training computer science

teachers for this;

- development of electronic educational resources (pedagogical software) focused on the school course of mathematics, easy for students to master, easy to use;
- creation of computer-oriented systems of teaching mathematics in various educational institutions;
- development and improvement of methodical systems of teaching computer science and mathematics to university students;
- introduction of technologies of distance learning of computer science and mathematics disciplines;
- development of information-didactic and educational-methodical materials, in particular creation of new textbooks, task books, textbooks for school, for teachers and students of pedagogical universities;
- introduction of information and communication technologies for training, management, and support of scientific research (Bykov et al., 2017).

According to many leading scientists, the scientific school of Academician M. I. Zhaldak is a source for the creation and development of new scientific schools, which will later be headed by his students.

5 CONCLUSIONS

M. I. Zhaldak was a man of hard work and modesty, versatile talent, deep knowledge, and wisdom of life. High decency, simplicity, modesty, principledness and determination in defending their positions, the ability to work with people became an example of devotion and service to the pedagogical field to which he dedicated himself. His fruitful work is generous with life-giving fruits, respect, and love. And the result is an extremely powerful scientific school.

M. I. Zhaldak managed to prepare and focus highly qualified scientific and scientific-pedagogical staff on priority and promising areas of informatization of the educational process in schools and universities, which determine the innovative development of education and science of Ukraine. The study provides grounds to argue about the significant role of the scientific school of M. I. Zhaldak and its impact on the development, promotion of international prestige and authority of national education and science.

From his own many years of experience working with M. I. Zhaldak, we note that in the educational process, research, and management, he uses effective innovative approaches. M. I. Zhaldak is a great professional, whose potential is realized in all spheres of

education and science. His colleagues and students know that it is worth working with him according to his principles and at his own pace. And his principledness in scientific and organizational issues ensured the respect of colleagues and students and contributed to his scientific recognition.

Carrying out research on the biography, scientific achievements of Academician M. I. Zhaldak and his scientific school, it should be noted that he is one of the leaders, scientists, creators of educational innovations: teacher, scientist, organizer of education and science.

In the future it is expedient to study the phenomenon of development of scientific schools of students and followers of Academician M. I. Zhaldak.

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