
Application of the Pareto principle for concentration of basic knowledge of medical students in online learning

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Abstract: Education is of primary importance to those seeking education in wartime. Attacks on schoolchildren, students and teachers are not only attacks on their right to education, but also on their future. The protracted nature of conflicts today affects the future of entire generations of people. Medicine in general, and oncology in particular, requires knowledge of a huge amount of interdisciplinary information, principles of diagnosis, methods of treatment and prevention, as well as human psychology. If you try to learn everything at once, in the shortest possible time, in the conditions of constant air alarms, problems with the Internet and long-term distance learning without practicing practical skills, you can not wait for the result. The application of the Pareto principle in wartime is not only a concentration of basic knowledge, communication skills and educational tools that a student can acquire in a short period of time due to active military operations, daily repeated air alarms, lack of constant Internet connection, lack of access to professional literature and /or libraries, the lack of opportunity to practice practical skills in real life, but also an attempt not to postpone education "for later". The main components of remote online learning in an extreme situation are first of all high-quality modern lectures, online tests and clinical tasks, a simulated patient (recorded in Microsoft teams), video films demonstrating practical skills, videos from the operating room, independent projects for students in the form of PDF presentations, anonymous survey of students after the end of the cycle.

Key words: medical education, distance learning, training during war in Ukraine, online learning.

1. Actuality

Education is of fundamental importance for students in times of war. In addition to learning, schools and universities can provide students with routine, preserve a sense of "past peaceful life" and connect them to vital resources, such as mental health care. Fortunately, since March 2022,

students at Odesa National Medical University, like students at all Ukrainian universities, have had access to online and distance learning. This has reduced learning gaps and, more importantly, preserved a sense of normalcy. However, the long-term impact of the war on the quality of education and access to it remains worrisome. According to the Ministry of Education of Ukraine, more than 2,000 schools and universities have been damaged or destroyed since Russia's invasion on February 24. Russian troops shelled and bombed numerous schools and universities. The application of the Pareto principle in war conditions is not only a concentration of basic knowledge, communication skills and educational tools that a student can obtain in a short time due to active hostilities, recurring daily air raids, lack of constant Internet connection, lack of access to professional literature and/or libraries, lack of opportunity to practice practical skills in real life, but also an attempt not to postpone education "for later" [1; 2].

Attacks on schoolchildren, students and teachers are not only attacks on their right to education, but also on their future. The nature of protracted conflicts today affects the future of entire generations of people. Without access to education, a generation of children living in conflict will grow up without the skills they need to contribute to the development of their countries and economies, exacerbating the already desperate situation of millions of people [14]. Of course, we are particularly concerned about the impact of the Russian-Ukrainian war on medical education, namely the decline in the general level of education of future applicants and the decline in the level of medical education of students due to long distance online learning, which means that future doctors lack practical knowledge and skills.

In many countries around the world, armed conflicts continue to destroy not only the infrastructure of the education system, but also the hopes and ambitions of an entire generation of children. Given that armed conflicts vary in duration, intensity, and location, they have different impacts on education systems. The UNESCO report "Hidden Crisis" points to the significant negative impact of conflict on education systems. This legacy of conflict is visible at the national and subnational levels in 19 of the 25 conflict-affected countries analyzed by UNESCO [11].

Unfortunately, Ukraine is not alone. Education is under attack around the world, with an increasing number of cases of armed violence against students, teachers, and educational facilities. In fact, according to a new report by the Global Coalition to Protect Education from Attack, an average of six attacks on education facilities occurred daily in 2020 and 2021. In total, more than 5,000 cases of attacks or military use of schools were reported during this two-year period. More than 9,000 students, teachers and scholars were injured, wounded or killed in these attacks. In each of the nine countries, more than 400 attacks occurred, and more than 400 students or teachers were injured. The number of attacks increased in Mali, Myanmar, and Colombia compared to the previous two years, but decreased in countries such as Syria and Yemen, where the conflict has subsided [13]. Since 2014, massive artillery shelling and ongoing rocket terror have damaged thousands of schools across Ukraine.

When attacking education facilities, military and armed groups bomb, burn, and loot schools and universities, kill, rape, arbitrarily arrest, and recruit students and teachers. They use schools and universities for military purposes, for example, as bases, barracks or training grounds. Explosive weapons, which have been used in one-fifth of all recorded attacks on education worldwide and have been used in many attacks in Ukraine, have been particularly devastating.

There are several key steps that can be taken to protect education, both in Ukraine and elsewhere in the world. Ukraine took one in 2019, when it endorsed and implemented the Safe Schools Declaration, an intergovernmental political commitment to protect students, teachers, schools and universities in armed conflict. Ukraine has also taken important steps to fulfill its 2022 commitments to the Declaration in the midst of conflict, such as introducing distance learning and collecting data on attacks on education. Education must be protected at all times in Ukraine because our children - schoolchildren and students - are our future. Education must remain our top priority, and we cannot leave this issue "for later" - when the war is over [16].

Since the beginning of Russia's invasion of Ukraine, Odesa and Odesa region residents have heard air raid alarms 645 times as of November 16. In the first days of the war, air raids sounded in the city 2-3 times, and in the following days - from 3 to 8 times a day. The longest air raid in Odesa lasted 5 hours and 44 minutes on November 15, the day of the largest massive missile attack. The average duration of air alerts in Odesa and Odesa region was 55 minutes.

2. Methods and objectives

The war in Ukraine in the 21st century has given us a harsh verdict that our time is limited, it may not be enough to complete all the tasks and implement all the projects that seem interesting. Therefore, it is very important to focus on the main thing in order to get the most information in the shortest possible time. An interesting regularity called the Pareto principle is named after an Italian economist and sociologist, which translates as follows: "20% of effort produces 80% of the result, and the remaining 80% of effort produces only 20% of the result." Legend has it that in 1897, Wilfredo Federico Damaso Pareto, while having fun observing the pea plantings in his garden, noticed that only one-fifth of the pods produced most of the peas.

He was surprised by this fact, which he noted in his research notebooks: 20% of the most viable plants produce 80% of the ripe pea pods. Intrigued, Pareto decided to look for manifestations of the 80/20 principle in other areas of life and realized that it applies almost anywhere. In fact, the Pareto principle is a reflection of the uneven distribution of causes and effects in nature. The 80/20 rule is used as a basic guideline in analyzing the effectiveness of any activity and optimizing results. By correctly determining the minimum of important actions, you can quickly get a significant part of the planned result, while further efforts will be ineffective and most likely unjustified. The ratio given in Pareto's law cannot be considered unconditionally accurate: it is more of a mnemonic rule than a real benchmark. Although it is not always 80/20, examples confirm the relative stability of the proportions. 20% of the books read usually bring 80% of the benefits to human development. The other 80% are a waste of time and possibly impair vision [1].

The Pareto Law is not just a theoretical rule. By knowing and applying this principle to achieve results, you can prioritize your work and identify processes that waste resources. Of course, it's impossible to make sure that 1% of the effort yields 99% of the result, and that the rest of the tasks don't need to be done at all. Striving for utopia is futile, but achieving productivity gains is quite realistic. Our time is limited, it will never be enough to complete all the tasks and implement all the projects that seem interesting. That's why it's important to focus on what gives you the most return. When you start something new, especially when it comes to working on yourself, the hardest part is determining the first steps. There are so many courses, opportunities, and advice out there that it's easy to get sidetracked by the abyss of information. All you need to do is identify 20% of the key actions that you can start with in practice [15].

Medicine in general, and oncology in particular, requires knowledge of vast interdisciplinary information, diagnostic principles, treatment and prevention methods, and human psychology. If you try to learn everything at once, in the shortest possible time, in the face of constant air raids, problems with the Internet, and long distance learning without practicing practical skills, you may not get results.

First of all, we decided to define the minimum to start studying oncology, and then combine other people's experience and experiment. The main task that the entire staff of the Department of Radiation Diagnostics, Therapy, Radiation Medicine and Oncology at ONMedU faced during the Russian-Ukrainian war was to find out what kind of educational materials and skills could lead to results in the fastest way. We analyzed the literature, took advantage of other people's knowledge of how to preserve education during a crisis, war or epidemic, and chose the main areas of our work. Pareto's law cannot be outsmarted or defeated. With some effort, it is possible to achieve a higher percentage of return with less effort.

The main components of distance online learning in an extreme situation of the COVID-19 pandemic or war are, first of all, high-quality modern lectures, online tests and clinical tasks, a simulation patient (recording in Microsoft teams), videos demonstrating practical skills, videos from the operating room, independent projects for students in the form of PDF presentations, anonymous survey of students after the end of the cycle. All of this enables medical teachers to share their clinical experience with students when they cannot communicate face-to-face [2, 3].

The most promising areas for improving online distance learning for medical students:

1) Online learning should be convenient for everyone, including the teacher. Students can ask questions or send answers to tests at a late hour, they can be in areas where there is no electricity or Internet for a long time, the class can be interrupted several times due to air raid alarms;

2) Instead of dictating endless classifications of diseases, we suggest giving students their own clinical examples of patient treatment, or explaining that the main goal of solving each problem is teamwork, namely a multidisciplinary approach.

3) Online learning builds a barrier between the student and the teacher, and the teaching process does not bring the desired satisfaction. But studies have shown that with the right level of engagement, it can be achieved in online learning. Therefore, the emotional process of establishing relationships becomes very important.

4) Activating students' hidden potentials and encouraging them to work independently (projects, reports, presentations). By forcing students to think and share their thoughts, you give everyone a chance to speak up in a collaborative discussion. Moreover, unlike face-to-face learning, students have the opportunity to let their thoughts "mature", better analyze a new topic and prepare a project.

5) Combination of different forms of learning: visual and visual methods, problem-based learning, role-playing games, gamification elements.

3. Educational tools

The first thing we propose to emphasize is the lecture. Let's take, for example, 3 classic full-length lectures according to the oncology cycle curriculum at the Department of Radiation Diagnostics, Therapy, Radiation Medicine and Oncology at Odesa National Medical University. Previously, some lecturers simply dictated to students all the necessary information: etiology, carcinogenesis, statistics, modern classification, algorithm of patient examination and abbreviated principles of treatment of a specific pathology. Therefore, very often the lecture became just a process of transferring the lecturer's notes to the student's notes without both participants realizing this process. It's no secret that there are lecturers with poor presentation skills and objectively poor Power Point presentations. All of this underestimates the value of the lecture as a teaching tool and cannot interest students.

That is why we decided to radically change the presentations, update the format of information provision, supplement the presentations with our own clinical cases and online recordings of surgical interventions by lecturers or other members of the department's teaching staff. In our opinion, it is better to leave the video cameras on during an online lecture to see the degree of student engagement, namely the interest in the eyes of the students.

Unfortunately, the realities of war, such as frequent air raids or poor Internet coverage, may require the lecturer to record the lecture to allow students who are not on the air for one reason or another to listen to it [4]. The lecturer should be so interested in the student that after the lecture is over, he or she would want to further deepen his or her knowledge and find even more information on the lecture topic on the Internet, on professional medical websites, or in an online library. A modern, high-quality online lecture should motivate and inspire students, encourage them to further reflect and discuss, help them understand the basic principles of medicine, and perhaps fall in love with such a difficult part of medicine as oncology.

It is important to divide the lecture into fragments, interrupting to perform small interesting tasks, and ask questions about the material that has been listened to, which stimulates active learning. In

online lectures, you can use the Flipped classroom method, when during the lecture, various types of activities are conducted on the topic of material previously studied by the student (for example, textbook chapters, articles, or videos) [9].

The second thing to pay attention to is the control of the knowledge gained. Unfortunately, the last two years of distance learning due to the COVID-19 pandemic have also revealed the disadvantages of online learning. Unscrupulous students speculate on the situation, do not prepare for practical classes under the pretext of bad Internet or lack of electricity, or disappear from the air during the survey [5, 6].

To this end, we have completely updated the database of tests for each discipline, namely Oncology and Palliative Hospice Care. The staff of the Department of Radiation Diagnostics, Therapy, Radiation Medicine and Oncology developed clinical tasks for each topic of the discipline in accordance with the work program, accompanied by illustrative material.

In online learning, there are basic principles of knowledge control that can be implemented in the form of tests (activation of existing knowledge), video guidance (explanation and demonstration), and final tests (application of acquired skills) [7]. Of course, there are limitations here: in this mode, it is impossible to fully teach patient examination or master practical skills (for example, palpation of the mammary glands, or peripheral lymph nodes, or thyroid gland). However, the first 2 principles (activation and explanation) can be effectively applied until the moment of returning to the classroom mode of training, when only the practical component remains to be mastered [4]. Another tool that increases students' interest and engagement in the learning process is the creation of educational resources (projects, presentations) by students on their own. In addition to involvement in the educational process and receiving a grade for the project, this has a number of other benefits: students' understanding of their own effectiveness and experiential learning.

4. Communication skills

There is no doubt that communication skills are an integral part of a doctor's daily practice. Therefore, they play a leading role in modern medical education at Odesa National Medical University. Historically, communication skills were formed intuitively during daily rounds, working at the patient's bedside. In recent decades, in the West and now in Ukraine, the process of teaching communication skills has undergone some changes, primarily due to restrictions on students' access to patients. This restriction has arisen for various reasons: an increase in the level of legal knowledge of patients themselves, a change in the mentality of the population as a whole, and a tendency to increase the level of patient safety. One way or another, all these trends have led to the use of "patient-replacement" technologies to help students [8].

The most famous such technology is simulated and standardized patients (SP). Most often, these are professional actors who imitate the manifestations of diseases and syndromes through their behavior and answers to questions. Communication with such patients helps the future doctor to improve the skills of taking anamnesis, resolving conflict situations, communicating negative news, and forms behavioral constructs that he or she will be able to effectively apply in practice in dealing with real patients in the future. Moreover, the methodology allows not only training, but also assessment of communication skills. OSCI stations with the participation of SPs have been used for many years all over the world, and in the last 4 years, at Odesa National Medical University as the second stage of accreditation of medical specialists.

Traditionally, the SP methodology involves face-to-face communication between SP and students in a clinical setting with direct visual, verbal, and often tactile contact [10]. In the context of self-isolation and distance learning, it would seem that this technology has no place. However, we started using this method online during the war at the Department of Radiation Diagnostics, Therapy, Radiation Medicine and Oncology thanks to interns who willingly help the department staff and play the role of patients online.

Third, to assess the effectiveness and quality of distance learning, we returned to the anonymous survey of students conducted at our department. To this end, all fifth-year students filled out a questionnaire after completing the Oncology cycle and sent their answers online to their professor.

Questionnaire #1.

Anonymous survey of fifth-year students.

1 How do you evaluate the informative content of the educational material of the cycle ONCOLOGY (how widely and fully are the issues of organization of oncological care, fundamental aspects of carcinogenesis, modern methods of diagnosis and screening, the latest methods of treatment covered)? - unsatisfactorily

- satisfactorily
- excellent
- difficult to answer

2 How do you assess the level of communication between your lecturer and students (able to activate students, answer questions, ready to explain complex issues)?

- unsatisfactory
- satisfactory
- excellent
- difficult to answer

3 How do you assess the quality of lectures in this discipline (how interesting and accessible are they, does the lecturer have a good command of the material)?

- unsatisfactory
- satisfactory
- excellent
- difficult to answer

4 Name the lecture topic from the entire ONCOLOGY cycle that you liked the most.

5 How do you assess the quality of the discipline presentation (how connected and logically organized is the educational material, are the basic terms clearly explained, are visual materials used - X-rays and CT/MRI images)? - unsatisfactory

- satisfactory
- excellent
- difficult to answer

6 How do you evaluate the quality of assessment of students' progress that exists at the department (clinical tasks, tests, oral examination)?

- unsatisfactory
- satisfactory
- excellent
- difficult to answer

7 Please name the topic from the entire ONCOLOGY cycle that remained the most understandable to you (you liked it the most):

8 Please select the reason why this topic was the most understandable for you (you liked it the most): - The material is presented in a very clear and accessible way

- Very detailed and in-depth explanation of the material using a presentation accompanied by clinical examples- I am completely satisfied with everything.

- The lecturer has excellent oratory skills, interested students,- The lecturer presented the lecture material in a non-standard way.9 Please name the topic from the entire ONCOLOGY cycle that remained the most unclear or difficult for you.

10 Please select the reason why this topic remained the most unclear or difficult for you:

- I was absent from the lecture, and it is difficult to understand on my own
- I am not interested in the topic, so I did not understand it in depth.

- The teacher did not explain well and did not answer my questions- There is a lot of information that is difficult to quickly comprehend

11 Do you agree with the statement that your teacher has a deep knowledge of the subject and is a professional in his/her field? - Yes- no

- it is difficult to answer

12 Do you agree with the statement that your teacher is creative in his/her work? - Yes- no

- it is difficult to answer

13 Do you agree with the statement that the teacher treats all students objectively when assessing their knowledge? - Yes- no- it is difficult to answer

14 What, in your opinion, is the advantage of the ONCOLOGY cycle that should be preserved in case of its modification?

15 How do you assess the quality of the laboratory assistant's work (timely access to classrooms and auditorium, provision of all electronic materials of the ONCOLOGY cycle)?

- unsatisfactory- satisfactory- excellent- difficult to answer

16 How do you assess the general condition of classrooms and auditoriums (availability of repair, all necessary furniture for students, bathroom, air conditioning, lighting)?

- unsatisfactory – satisfactory - excellent- difficult to answer

17 Additional comments and suggestions

The experience of the Department of Radiation Diagnostics, Therapy, Radiation Medicine and Oncology of Odesa National Medical University demonstrates that despite all the limitations of distance learning, it can be not only interesting but also effective. The results of the last 8 months of distance online learning of the Oncology cycle by fifth-year students of Odesa National Medical University during the war showed that for most students this format of learning seemed effective, the goals of the class were achieved, and no one noticed any technical difficulties in its implementation. The students themselves noted that the cycle was more intensive, productive and informative. The opportunity to make a project or a presentation helped students to be more focused and involved in the learning process than during a face-to-face session.

5. Conclusions

1) Education should remain our top priority, we cannot leave this issue "for later" - when the war is over. It is very important to focus on education from the beginning of the crisis, because the war creates chaos, and we have to think about the future.

2) The Pareto principle provides an opportunity to focus on what gives the greatest return and will have results today.

3) The use of modern technologies in the educational process, the emphasis on lectures by leading researchers with extensive clinical experience, online demonstrations of surgical interventions and an online simulation patient, and the opportunity for students to complete projects independently allow students to adapt and continue their education in the face of war and other unusual situations.

References:

1) Bondar O.V., Rybin A.I., Kuznetsova O.V. Medical education during the COVID 19 pandemic: problems and solutions / Scientific Bulletin of the South Ukrainian National Pedagogical University named after K.D. Ushynsky. 2021. - Issue 4 (137). - P. 26-31. <https://doi.org/10.24195/2617-6688-2021-4-2>

2) Bondar O.V., Rybin A.I., Patskov A.O. Emotional burnout and issues of professional psychological training of oncologists / Medical education. 2021. - №3. - P. 23-30. DOI 10.11603/m.2414-5998.2021.3.12424.

3) Bondar O.V., Rybin A.I., Kuznetsova O.V., Patskov A.O. Our experience of medical online education during the war / Actual problems of transport medicine. - 2022. - №4 (70) - P.142-151. <http://dx.doi.org/10.5281/zenodo.7495399>

4) Sandars J., Correia R., Dankbaar M., de Jong P., et al. Twelve tips for rapidly migrating to online learning during the COVID-19 pandemic. *MedEdPublish*. 2020; 9 (1): 82. DOI: 10.15694 / mep.2020.000082.1

5) Eachempati, P., & Ramnarayan, K. (2020). Ten maxims for out of class learning to outclass the academic challenges of COVID-19. *MedEdPublish*. Vols. 9 (1): 89. DOI: 10.15694/mep.2020.000089.1

6) Kachra R., & Ma I. (2020). Practical tips for faculty development workforce training under pressure in the time of COVID-19 pandemic. *MedEdPublish*. Vols. 9 (1): 81. DOI: 10.15694/mep.2020.000081.1

7) Khalafalla, H., & Taha, M. (2020). The assessment clock: A model to prioritize the principles of the utility of assessment formula in emergency situations, such as the COVID-19 pandemic. *MedEdPublish*. Vols. 9 (1): 88. DOI: 10.15694/mep.2020.000086.1

8) Sabzwari, S. (2020). Rethinking Assessment in Medical Education in the time of COVID-19. *MedEdPublish*. Vols. 9 (1): 80. DOI: 10.15694/mep.2020.000080.1

9) Taylor, D., Grant, J., Hamdy, H., Grant, L. & et al. (2020). Transformation to learning from a distance. *MedEdPublish*. Vols. 9 (1): 76. DOI: 10.15694/mep.2020.000076.1

10) World Health Organization. URL: <https://www.who.int/ru/about/governance/world-healthassembly/seventy-second-world-health-assembly> 25.01.2020.

11) <https://reliefweb.int/report/world/ukraine-points-threat-education-during-war>

12) <https://educateachild.org/explore/barriers-to-education/fragile-and-conflict-affected-situations/armed-conflict>

13) <https://www.unicef.org/education-under-attack>

14) <https://www.unisender.com/ru/glossary/zakon-pareto>

15) <https://www.nrc.no/perspectives/2018/education-during-wartimenew-page/>