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# CONTENT

## ECONOMIC SCIENCES

**Kovalchuk Ju., Borisov P.**

IMPLEMENTATION OF TECHNOLOGICAL LEADERSHIP  
BUSINESS MODELS IN GLOBAL MARKETS ..... 3

**Mussanova L.**

PARTNERSHIP BETWEEN A CORPORATE UNIVERSITY  
AND A TRADITIONAL UNIVERSITY ..... 6

**Tanbayeva G.**

IMPROVEMENT OF QUALITY MANAGEMENT OF  
MEDICAL SERVICES ..... 9

## HISTORICAL AND ARCHEOLOGICAL SCIENCES

**Kulikova Ju.**

EPIGRAPHY AS A HISTORICAL SOURCE (BY THE  
EXAMPLE OF THE GALLIC EMPIRE) ..... 13

## MEDICAL SCIENCES

**Bandalieva A., Aslanov M., Guseinova A.**

MEDICAL WORLDWIDE IN THE CREATION OF FAMOUS  
POETS AND THINKERS OF ANCIENT AZERBAIJAN ..... 20

**Petrova A., Malezhik M.,**

**Shnitova I., Zhilyaeva O.**

DENTAL TREATMENT OF CHILDREN WITH SEDATION  
..... 24

## PEDAGOGICAL SCIENCES

**Akmalov A., Abduvakhobov D.**

DESCRIPTION OF A PROFESSION-ORIENTED ISSUE IN  
MATHEMATICS EDUCATION ..... 28

**Shertayeva N., Amirbekova E.M.,**

**Serikbaeva A., Toltayeva G.**

CRITERIA-BASED ASSESSMENT OF MULTI-LEVEL TASKS  
IN THE COURSE OF INORGANIC CHEMISTRY ..... 31

## PHILOLOGICAL SCIENCES

**Guliyeva I.**

THE INFLUENCE OF PHONOLOGICAL AWARENESS ON  
LANGUAGE ACQUISITION IN CHILDREN ..... 36

## TECHNICAL SCIENCES

**Fataliyev A.**

MOST IMPORTANT TPPs FOR PERFORMING  
GRAPHICAL USER INTERFACE AND SCIENTIFIC  
CALCULATIONS IN PYTHON PROGRAMMING  
ENVIRONMENT ..... 37

# ECONOMIC SCIENCES

## IMPLEMENTATION OF TECHNOLOGICAL LEADERSHIP BUSINESS MODELS IN GLOBAL MARKETS

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### Abstract

The article discusses aspects of the implementation of technological leadership business models in the context of companies digital transformation. The difference between the technological leadership business model and the traditional business model with the definition of the architecture of the business model of 4 links (technological, social, financial and responsibility) is established. It is proved that the implementation of the technological leadership business model is optimal for the formation of competitive advantages of the company in global markets. The reported study was funded by RSF (Russian Science Foundation), project number №23-28-01233, <https://rscf.ru/en/project/23-28-01233/>.

**Keywords:** technological leadership, business model, digital technologies, global market, competition, ecosystem, digital responsibility.

The modern economy is absolutely dependent on digital technologies and how they are incorporated into the functioning of companies, interaction with suppliers and customers. These processes are not something unique, because technologies have always had and continue to have an impact on production, services and business in general, but now companies are increasingly focused on achieving technological leadership in the markets. Such technological leadership does not just become one of the elements of the company's competitive advantages, but becomes the basis for the stability of competitive advantages in conditions of turbulence [1] and creates a prolonged position in business, unlike classical dominance in the markets due to the company innovative activity.

The digital economy has also absolutely expanded the boundaries of doing business, so technological leadership is most relevant for analysis in the aspect of global markets [2]. In addition, with the spread of artificial intelligence, there is a need to study the phenomenon of digital leadership [3]. Now there is a wide spread of technologies and technical achievements in the Industry 4.0 context, and companies in various industries and services in their activities are focused on active implementation in order to increase labor productivity and resource efficiency, as well as gain advantages over competitors based on knowledge of individual customer needs [4]. Digital transformation has actually reconfigured the boundaries of each individual company, made the company's products open to consumers as a community within the framework of joint consumption. It is a motive for companies specializing in new technologies or use to move to expand their activities.

The researchers note that the processes accompanying the introduction of new technologies related to digitization, digital transformation and servitization become an inevitable prerequisite for changing business

models [5] or even destroying it [6] in favor of the design of new business models. Big data allows companies to make more informed decisions to increase business sustainability [7]. In addition to significant technological restructuring, business models should take into account the emergence of new forms of competition, changing values in modern society, especially after the pandemic, as well as the need to reduce carbon dioxide emissions into the atmosphere and increase consumer confidence [8]. Companies should focus on the formation of open business models [9] on digital platforms that take into account open innovations [10] – it is these models that maintain competitiveness based on the design of digital cooperation networks for the production of personalized products for customers and allow them to adapt to changes in the business environment and the inevitable transformation in public administration. In general, companies need to change business models in order to at least survive the digital revolution and achieve technological leadership as much as possible.

The understanding of technological leadership for the company's development is connected with the actions of management, whose role is determined by the directions of digital business transformation [11]. On the one hand, the use of digital technologies can lead to disruptions in the functioning of the business during testing periods, but, nevertheless, it provides updated opportunities for effective competition in developed and new markets.

If we consider the architecture of the business model of a modern company in the context of achieving technological leadership, then this architecture should undoubtedly include the integration of the following components:

- technical architecture,
- social architecture,
- financial architecture;
- architecture of responsibility.

Technical architecture is important for an industrial company at the factory level, it includes the technological stack of using the basic technologies of the 4th industrial revolution – 3D printing, integration of ICT systems, internet of things for manufacturing, cloud computing, Big Data, artificial intelligence in the processes and production technologies of cyber-physical systems (CPS), also known as Smart Manufacturing, Smart Factory or Manufacturing 4.0. Nevertheless, for a company in the service sector, the production architecture will mean a set of technologies that it uses to conduct business, and these will also be mainly digital and information and communication technologies. This approach proved to be convincingly proven during the pandemic, when it was companies that, with the help of the development of these technologies, preserved and multiplied their competitive advantages in difficult business conditions.

Social architecture includes all resources that are related to the human potential of the company and the competencies of employees, including unique knowledge, talent and experience. Taking into account the aspects of the use of digital technologies and a creative approach in the implementation of projects, companies create working conditions for its employees for technological leadership, not only taking into account the current organizational culture, but also taking into account the organization of various forms of employment – again, the pandemic has shown how effective remote work can be. For example, the well-known classical problem of resistance to change and something new in such companies is solved through the work of teams based on the principles of Agile project management.

The financial architecture in the company's business model for technological leadership should provide both the basic processes of current financing, as well as attracting investments and financing capital expenditures. But it is important to note here that FinTech has significantly expanded the functionality of financial management, so different forms of settlements with customers and business partners should be taken into account. Depending on the legal jurisdiction of doing business or the company's residence, there are opportunities for embedding new forms of settlements using cryptocurrencies and using digital assets in the operation of the blockchain into the business model.

The architecture of responsibility is an original part of the company's business model for technology leadership. Along with the basic corporate social responsibility, there should be an ESG-trajectory of development and energy efficiency in conjunction with digital responsibility for the use of data and ensuring its own information security. The adoption of embedding robots and devices with artificial intelligence into production processes, real-time decision-making capabilities with full electronic traceability significantly expands the functionality of business processes, which is why there is such a significant addition in the modern business environment.

Thus, the business model of technological leadership is presented not so much as a model of creating value for the client in the form of personalized products [12], but as an architecture for ensuring competitive advantages in business related to the development of production technologies and the functioning of companies in modern business conditions.

Current technological leadership business models in global markets expand the boundaries of existing business models [13] and include ecosystem-type business models that are based on the basic principles of business ecosystems. In fact, this is how a network partnership is created on a structured digital platform, which allows you to implement a lot of business ideas and expand the potential for creating value for customers and increasing business profitability for both network participants and the entire ecosystem as a whole.

However, the influence of digital transformation has determined the property of modern ecosystems as technologically complex and stable systems of interaction between participants, the basis of which is not only trust [14], dynamic cooperation and partnership [15], but also technological compatibility and integration for the purposes of ecosystem functioning. The main advantage of the ecosystem for technological leadership is the unification and even sharing of assets and technologies based on the search for innovative forms of cooperation with all business partners throughout the value chain [16]. Consequently, it is possible to strengthen the foundation of technological leadership through the exchange of ideas and knowledge, generating profits and following the principles of responsibility in doing business.

Thus, in addition to the traditional presentation of a business model as a template for defining three elements (creating business value, value proposition for creating competitive advantages and obtaining value from consumers), it is necessary to distinguish the technological leadership business models that have a certain architecture and prove the inviolability of the relationship between technology and business companies. It is this format of the business model that will allow us to realize the trajectory of the company's movement towards technological leadership in both national and global markets, taking into account market turbulence.

In conclusion, it should be noted that the authors see a certain scientific problem in the absence of a scientifically based and empirically confirmed holistic set of approaches, methods and practical recommendations for overcoming problems on the way to achieving technological leadership in areas implemented primarily in the emerging (in developing countries) and actively transforming (in developed countries) digital environment. Such a holistic complex should be built in the interaction of companies, the state and society, taking into account the need to form digital trust systems. This is especially important for companies from developing countries that can realize the real potential of development in the global spheres of production and provision of services thanks to the digital transformation of society.

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## PARTNERSHIP BETWEEN A CORPORATE UNIVERSITY AND A TRADITIONAL UNIVERSITY

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### Abstract

The sustainability of an organization depends on its ability to develop the skills of its employees, promoting innovation, which in turn leads to improved organizational performance. With the advancement of technology in the business world, many organizations have tried to upgrade the skills of their employees to improve the efficiency of the organization.

The current socio-economic environment is characterized by extremely fast and competitive evolutionary dynamics. Accordingly, firms must implement training plans to improve their competitiveness. This has a profound impact on industries where competition is particularly fierce and requires vigorous approaches to improving the quality of corporate learning to adapt to, or even anticipate, profound technological, cultural, and social challenges. Thus, greater flexibility and social intelligence are needed to solve these complex problems, requiring the development and strengthening of human capital.

In summary, the partnership between corporate and traditional universities stands as a vital instrument for driving educational and economic progress. By bridging the gap between theory and practice, these collaborations have the potential to empower individuals and organizations alike, ushering in a new era of education and workforce development.

**Keywords:** education, corporate training, traditional universities, competitiveness, partnership.

**Main text of the article.** Partnerships between corporations and universities can offer the best of both worlds. Traditional business schools can create new opportunities for themselves by meeting companies' needs for rapidly changing skills, and corporate training departments can benefit from structured links with universities and colleges [1]. An example of a university-corporate partnership is the Tennessee Valley Authority, an electricity provider in the southeastern United States, which created its own corporate university, TVA University. CEO Katie Hammond and her team provide internal training to employees:

Previously, education and training were viewed as expenses. Today, training is considered an investment [2]. She and her team have done extensive work measuring the effectiveness of training in education, duplication of work/training, behavioral changes, and the value of training for current work. Although most of their training is done in-house, they also partner with the University of Tennessee at Chattanooga (UTC) to provide an Executive program MBA to their managers and executives who were targeted for promotion as part of their corporate succession plan.

As with the TVA / UTC partnership, a survey conducted at Corporate University Xchange, found that about 62 percent of corporate universities have partnerships with four-year colleges, and that share is expected to increase to 85 percent. Often this alliance is intended to legitimize courses, increase confidence, meet employee needs, and provide necessary knowledge in specific areas of study. In some cases, training staff may not have expertise or experience in specialized or advanced areas. Other benefits often include reduced program costs and freeing up HR trainers for other tasks [3].

Corporate universities are not a comprehensive solution. Some, even in high-tech sectors, believe that the missing piece is more a function of long-term performance rather than short-term needs for innovative, in-

demand products. These critics believe that they can only give part of the answer and that the traditional university is best suited for more well-rounded people who can see the big picture [4].

Real costs also need to be taken into account when designing a corporate university. Xchange Corporate University surveyed 120 corporate university deans and found that 64% of them currently conduct less than 20% of their teaching and learning using technology. However, this proportion is expected to grow rapidly and education will be delivered through one of five key technologies: intranets, satellites, the Internet, video conferencing and CD-ROM. Other technology alternatives may include video, audio, computer applications, video streaming, desktop computers, extranets, direct satellite communication to the home or office, and electronic productivity support [5].

Cost remains a complex issue when designing corporate universities and depends on the technology used and class size, as well as the needs of the participants. There is general agreement that online training should always be cheaper than an equivalent course delivered in a classroom, but it should be based on both quality and cost. An inexpensive course can be designed for live chat sessions; however, if the course must be interactive and use streaming video, audio, and synchronous and asynchronous learning, the price will increase. The costs for setup, equipment, technical support and training are initially very high. Other costs to consider include online library costs, online materials, faculty development, software, training, classrooms, computers for all participants, modern instructor podiums, light chamber, advanced equipment, increased security, frequent updates, maintenance and life cycle costs [6].

Savings, however, can be achieved by reducing travel time and costs as employees can learn while on the job. Training can be conducted during slow periods or scheduled within the workday. Custom Web-based

learning materials can be instantly updated and modified to minimize waste and reprinting costs [7]. There are systems that provide instant communication of test results to allow instructors and participants to immediately assess their knowledge.

#### *Motivations for Partnership*

**Mutual Knowledge Exchange:** One of the key motivations for this partnership is the exchange of knowledge and expertise. Corporate universities bring real-world insights and practical experience to the table, while traditional universities offer a strong academic foundation and research capabilities. By pooling their resources, these institutions create a more comprehensive educational environment.

**Skill Development:** The partnership allows for the development of programs that are tailored to the needs of the job market. Corporate universities often have a deep understanding of the specific skills and competencies required by industries. This insight, combined with the academic rigor of traditional universities, results in graduates who are well-prepared for the workforce.

**Workforce Readiness:** Employers today seek graduates who are not only academically proficient but also possess the ability to apply their knowledge in practical settings. This partnership focuses on producing graduates who are work-ready and can seamlessly transition into their chosen careers.

Traditional universities are facing competition from corporate universities, and many of them are actively joining partnerships with corporate universities to put an end to revenue losses. Others were under pressure to “professionalize” their mission and eliminate or change underfunded programs in favor of introductory, service-based, and scientific curriculum. There is currently debate over the university curriculum, and often commercial interests conflict with the university curriculum [8]. Universities are struggling to prevent liberal arts curricula from being swamped by technology and science [9]. Colleges and universities have been criticized for selling out to corporate America as business training grounds and turning college presidents into full-time fundraisers who are more like CEOs than academic leaders [10].

Corporate universities can either threaten or provide opportunities for traditional universities. Many universities are increasing the number of distance education programs. Between 1995 and 1998 alone, the number of distance learning programs increased by 72% [11]. Business schools at traditional universities are a key group seeking to become more relevant and responsive to corporate needs. Universities are also looking for ways to recoup money lost due to fewer students seeking traditional degrees. The pool of adult students is now larger than the traditional 18- to 24-year-old college market and is expected to grow. To serve non-traditional students, universities must now compete with corporate universities, certificate programs, virtual universities, and even for-profit education firms [12].

It should be noted in the surveys that should be taken into account when planning a corporate university:

- Does your organization have a specific problem that needs to be solved? Can these issues or problems be resolved with the help of a corporate university?
- How do you see a corporate university? A group of people? Online training? Will there be a faculty?
- Will students be certified?
- Is the progress of participating students tracked? How will you measure success?
- Can you provide critical training?
- Will the costs be lower than if the training took place at a traditional university?
- Do you have staff (or can you use staff) to write course content, develop training materials, develop curriculum and pathways, deliver materials and evaluate results?
- Can you provide the services yourself or will you also collaborate with commercial firms?

Through corporate partnerships, traditional universities meet the needs of adult students who have left university programs. Since universities already have many, if not all, of the facilities needed for distance learning, corporations can rely on these classes to save on the costs and learning curve associated with implementing new distance learning technology.

Universities will continue to be a great source of knowledge for corporate universities as more e-commerce courses and other courses related to current business issues are being added. In addition, corporations would be required to partner with existing colleges to offer transferable college credits toward degrees [13].

As the future of corporate universities includes more online learning as well as the challenge of keeping pace with evolving technologies, accreditation and program evaluation will become more important to ensure the credibility and legitimacy of corporate universities. Both employees and employers will find it necessary to identify certified programs that are effective as degree programs continue to proliferate at corporate universities and through corporate and traditional university partnerships [14]. Accreditation agencies will struggle with quality and student learning as more corporate universities seek equivalent university and professional credentials.

The research directions of corporate universities will go hand in hand with the future directions of corporate universities. Assessments of student learning, program goals, and cost-effectiveness will be important, as will the ability to achieve the organization's strategic goals.

While the partnership between corporate and traditional universities holds great promise, challenges can arise. These include issues related to governance, alignment of goals, and potential conflicts of interest. Effective communication and shared vision are critical to overcoming these challenges.

In conclusion, the partnership between a corporate university and a traditional university represents a powerful synergy that offers a multitude of benefits to both institutions and, by extension, to students and the broader community. By combining the strengths of academia with the practical knowledge of the corporate

world, this collaboration fosters innovation, enhances educational opportunities, and equips individuals with the skills and knowledge necessary for success in an ever-evolving global economy. As these partnerships continue to evolve and thrive, they will undoubtedly play a crucial role in shaping the future of education, workforce development, and the overall advancement of society.

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## СОВЕРШЕНСТВОВАНИЕ УПРАВЛЕНИЯ КАЧЕСТВОМ МЕДИЦИНСКИХ УСЛУГ

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## IMPROVEMENT OF QUALITY MANAGEMENT OF MEDICAL SERVICES

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## Аннотация

В статье главным образом рассмотрено понятие и категория «качество медицинской услуги», как весьма актуальный вопрос в современных реалиях. Ведь важность соблюдения качественного уровня медицинских услуг сложно переоценить, они имеют огромное социальное (общественное) значение. В данной статье представлены и раскрыты принципы управления качеством медицинской помощи, подходы при оценке качества медицинских услуг.

## Abstract

The article mainly considers the concept and category of "quality of medical service" as a very relevant issue in modern realities. After all, the importance of compliance with the quality level of medical services is difficult to overestimate, they are of great social (public) importance. This article presents and discloses the principles of quality management of medical care, approaches to assessing the quality of medical services.

**Ключевые слова:** качество медицинских услуг, медицина, услуги, пациент, медицинские работники.

**Keywords:** quality of health services, medicine, services, patient, health workers.

Качество предоставления медицинских услуг получает большое внимание организациями здравоохранения из-за усилившейся конкуренции на рынке. Для большинства медицинских учреждений предоставление высокого качества услуг – это самая важная часть их бизнес-стратегии. Качество услуг является первичным фактором, дифференцирующим одно учреждение здравоохранения от другого. Администраторы медицинских учреждений постоянно стараются использовать разные стратегии предоставления услуг, удовлетворяющие пациентов, и фокусируются на непрерывной оценке уровня предоставления услуг и пытаются улучшить уровень качества, который предлагают их учреждения. Проблема для организаций здравоохранения состоит в том, чтобы гарантировать и максимизировать высокий уровень услуг, т.е. того, что клиент хочет и ожидает.

ВОЗ определяет следующие задачи системы обеспечения качества медицинских услуг: «Каждый пациент должен получить такой комплекс диагностической и терапевтической помощи, который бы привел к оптимальным для здоровья этого пациента результатам в соответствии с уровнем медицинской науки и биологическими факторами; при этом для достижения такого результата должны быть привлечены минимальные средства, риск дополнительного травмирования должен быть минимальным, пациент должен получать максимальное удовлетворение от процесса оказываемой медицинской помощи».

Максимально полным определением является следующее: «качество медицинских услуг – это

свойство процесса взаимодействия врача и пациента, обусловленное квалификацией профессионала, т.е. его способностью выполнять медицинские технологии, снижать риск прогрессирования имеющегося у пациента заболевания и возникновения нового патологического процесса, оптимально использовать ресурсы медицины и обеспечивать удовлетворенность пациента от его взаимодействия с медицинской подсистемой».

Вполне справедливо, что в этом определении, как и в большинстве других, само понятие качества формулируется через условия его обеспечения и содержит целый ряд составляющих, без которых невозможно улучшить оказание медицинской услуги, включая:

- высокую квалификацию персонала;
- обеспечение надлежащей технологии;
- единство профилактической и лечебной работы;
- наличие достаточных материально-технических ресурсов и их оптимальное использование;
- обеспечение удовлетворенности непосредственного потребителя медицинской услуги, т.е. пациента.

Необходимость решения разных задач является одним из факторов, обусловивших появление различных вариантов понятия качества медицинской услуги. И в этом плане существование множества подходов к определению качества оказания медицинской услуги является не только оправданным, но и необходимым, так как в совокупности они образуют определенную систему показателей,

каждый из которых имеет свою область применения.

Следовательно, и при оценке качества медицинских услуг могут быть использованы различные подходы. Изучение качества возможно как с позиций процесса оказания медицинской помощи, так и с позиции сферы потребления медицинской услуги. В самом деле, если медицинскую помощь оказывают квалифицированные врачи в условиях, отвечающих всем требованиям научно-технического прогресса, то при прочих равных, и результат будет наилучшим, т. е. уровень качества будет наивысшим.

Такой взгляд переключается с тремя аспектами качества медицинских услуг:

- качество структуры (организационно-техническое качество ресурсов: материально-техническая база, обеспеченность кадрами и т. д.);

- качество процесса (верный диагноз, выбор адекватной технологии лечения, соблюдение норм и стандартов, принятой тактики лечения);

- качество результата (эффект от проведенных мероприятий) [1].

В конце прошлого века произошли фундаментальные экономические и социальные изменения во всех сферах, в том числе и медицинской, процесс которой в Казахстане продолжается до сегодняшнего дня. Сейчас существуют следующие формы медицинских организаций: частные, государственные, ОМС, страховые компании. Вход на рынок хоть и имеет ряд ограничений в виде аккредитаций и лицензирования, в основном, свободный для новых игроков. В реалиях Казахстанского рынка медицинских услуг и их поставщиков, компаниям необходимо иметь конкурентное преимущество для удержания и роста на данном рынке, для чего необходимо выстроить грамотный маркетинг, так как становится все более трудным удовлетворить клиента. В такой ситуации необходимо понять, что удовлетворение пациента является истинным стандартом для оценки качества обслуживания. Таким образом, только клиент может судить о фактическом качестве услуги. Так, когда речь идет о вопросе здоровья, клиенты хотят качества и стоимость услуг не является решающим фактором в выборе медицинского учреждения. Вот почему люди выбирают те медицинские учреждения, которые имеют компетентных врачей, передовое оборудование, полный ассортимент услуг под одной крышей, общий качественный уход вместе с учтивым и заботливым штатом. Соответственно, для медицинской организации необходимо знать уровень качества услуги, которые предлагаются ее клиентам. Это позволяет ей определить ошибки и провести последующие корректирующие меры и сфокусироваться на определенных областях для улучшения.

По ориентации на целевую аудиторию и разделения на качество услуг, можно разделить медицинские учреждения Казахстана на 3 группы:

Первая группа – клиники, ориентированные на элиту и средний класс, предоставляемые им услуги отличаются высокой добавленной стоимостью, с

использованием высокотехнологического оборудования, сложных материалов, «ноу-хау» технологии высшего уровня. Все это сопровождается эксклюзивным сервисом, удобной геолокацией, индивидуальным подходом. К этой группе можно отнести: Private clinic Almaty, ЦКБ Управления Делами Президента Республики Казахстан, Keruen Medicus.

Вторая группа клиник ориентирована на средний и предсредний класс. Ассортимент услуг может быть идентичен первому типу, но по более низким ценам и без сопровождения люкс-обслуживания. Например, Рахат, Сункар, Достар Мед, Сана, Лс Клиник, SBS Medical Clinic.

Третья группа – это самая многочисленная группа, представлена в основном государственными предприятиями. Основная часть населения города обслуживается в данном сегменте. Это Городские Больницы №7, 12, 4, Больница Скорой Медицинской Помощи.

Система контроля качества в секторе здравоохранения разрабатывается с 1996 года. В рамках процесса реализации системы обязательного медицинского страхования в период с 1996 по 1998 года была разработана система контроля качества медицинских услуг. Эта система носила преимущественно «карательный» характер и предусматривала различные санкции и штрафы в отношении поставщиков медицинских услуг в случае ненадлежащего качества их работы. И хотя эта система штрафов была позднее упразднена, анализ и оценка медицинских услуг продолжали действовать, причем особое внимание в них уделялось исследованиям уровня удовлетворенности пациентов и вопросам соответствия медицинских услуг установленным медицинским стандартам. В настоящее время, в медицинских учреждениях Казахстана внедряют Программы по улучшению качества и безопасности пациентов (далее - Программа) разработана для формирования единой системы и контроля за качеством оказания медицинских и немедицинских услуг в медицинской организации [2].

Программа предназначена для разработки, внедрения и контроля действий, предотвращающих возникновение рисков для пациентов, управления отраслевыми программами контроля качества подразделений: инфекционного контроля, радиологической безопасности, деятельности лабораторий, системы управления рисками клинической деятельности, программой безопасности здания и среды, движения и хранения медикаментов.

С января 2012 года вопросы экспертизы качества услуг переведены в автоматизированный программный комплекс «Система управления качеством медицинских услуг». С его помощью многие изъяны качества медуслуг можно получить из автоматической выборки для пациентов, получивших лечение в стационаре. Данная выборка проходит двухэтапную оценку. Это первичная оценка качества предоставления помощи и далее информация поступает в Комитет контроля качества и Комитета оплаты медуслуг, где эксперты выносят завершающее заключение Комитет по контролю качества ме-

дицинских услуг (далее - Комитет). Миссией Комитета по контролю за качеством медицинских услуг является обеспечение гарантий населению в получении безопасной, доступной и качественной медицинской помощи. Деятельность Комитета направлена на обеспечение государственного контроля за качеством предоставляемой медицинской помощи в республике, соблюдением стандартов в области здравоохранения, принятием мер по улучшению медицинской помощи. [3].

Помимо обязательного соответствия требованиям государства к качеству услуг, менеджменту медицинских учреждений необходимо обращать внимание на следующие ключевые критерии качества медицинской помощи с развитием данных направлений: 1) эффективная и своевременная помощь; 2) эффективное использование ресурсов; 3) удовлетворение потребностей пациентов; 4) результативность лечения.

Качество, по определению является потребительским определением, основанным на фактическом опыте потребителя с продуктом или услугой, по отношению к его потребностям, явным или неявным, сознательным или просто ощущаемым, объективным или совершенно субъективным и состоит из двух половин, зависимых друг от друга: качество фактическое и качество воспринимаемое. Фактическое качество — это соответствие стандартам. Воспринимаемое качество — это соответствие ожиданиям. Оба понятия должны быть определены, измерены и оценены. В процессе совершенствования качества услуг, необходимо усилить следующие направления, а именно:

1) Ожидания пациентов являются одним из важных факторов при определении и измерении качества медицинских услуг. Два человека, получив одинаковый по уровню пакет медицинских услуг могут иметь разный уровень удовлетворения своих потребностей в свете своих собственных изначальных ожиданий. Ключ к предоставлению высококачественных услуг - сбалансировать потребительские ожидания и восприятие и преодолеть разрыв между двумя.

2) Непостоянство качества услуг, поскольку их производство связано с обязательным участием людей — а значит, очень высокое значение приобретает человеческий фактор. Качество услуг варьируется в зависимости от его настроения и физической формы во время общения с целевым клиентом. Поэтому медицинские учреждения должны уделять особое внимание управлению качеством и принимать меры по их контролю и поддержанию высокого качества, влияющего на конкурентоспособность.

3) Недолговечность услуг, которая означает, что ее нельзя хранить с целью продажи или использования в будущем. Поэтому организации всегда сталкиваются с серьезными проблемами в результате колебания спроса. Поэтому систематически необходимо разрабатывать меры по устранению возможного несоответствия между спросом и предложением на целевом рынке.

4) Неотделимость услуги от процесса ее производства и потребления. Персонал всегда должен быть хорошо подготовлен к эффективному, профессиональному, успешному и качественному взаимодействию с пациентами. Поэтому необходимо повышать профессионализм, квалификацию персонала, в соответствии с появлением на рынке новых технологий и улучшать материально-техническую базу.

5) Лицензирование врачей как поставщиков медицинских услуг является ключевым фактором эффективной и качественной системы здравоохранения согласно совместному отчету ВОЗ. Могут наблюдаться незначительные различия между лицензированными и нелицензированными врачами в соблюдении мер по безопасности. Однако лицензированные врачи знают, какие необходимые дальнейшие вмешательства нужно предпринять для соблюдения стандартов ухода за пациентом и обеспечения качественного медицинского обслуживания. Систематический мониторинг качества, индивидуальная обратная связь с поставщиками, а также обучение пациентов и другие нижеперечисленные методы являются другими методами повышения качества медицинской помощи.

6) Клиническое управление — это концепция, используемая для улучшения управления, подотчетности и обеспечения качественного ухода, и включает в себя систематическое продвижение таких видов деятельности, как: клинический аудит (экспертиза качества оказания медицинских услуг); управление клиническими рисками; вовлечение пациента в уход и лечение; профессиональное образование и развитие медицинских кадров; исследование и развитие клинической эффективности; использование информационных систем и работа постояннодействующих медицинских комиссий в медицинских организациях. В целом эти мероприятия обозначаются как «clinical governance activities» (управление клинической деятельностью) и они эффективны как в развитых, так и развивающихся странах. Наиболее приемлемыми механизмами для продвижения управления клинической деятельностью являются те, которые признают профессиональное лидерство (то есть лидерство медицинских работников над административными работниками) и позволяют внедрять это в личной профессиональной практике врачей и других медицинских работников.

7) Обучение и контроль над медицинскими работниками (“training and supervision”) — то есть обучение и наставничество — является одним из наиболее распространенных мер по улучшению качества медицинского обслуживания в странах с низким и средним уровнем доходов. Исследования показывают ключевую роль не только непрерывного повышения квалификации (НПР) медицинских работников, но и поддержки медицинских работников со стороны руководства медицинской организации как решающее значение — поэтому спонсоры (плательщики) программ НПР и политики должны в приоритет ставить контроль над медицинскими работниками (наставничество) [4].

Между тем, на государственном уровне, министерством предлагаются комплекс мероприятий по улучшению качества медицинской помощи: Первое - повышение компетенции врачей и медицинских сестер ПМСП для качественного обследования и лечения пациентов и замещения базовых консультативно-диагностических услуг;

Второе - внедрение новой модели гарантированного объема бесплатной медицинской помощи и ОСМС;

Третье - внедрение проектов ГЧП для создания компактных центров ПМСП, максимально приближенных к месту жительства прикрепленного населения;

Четвертое - закрепление ответственности местных исполнительных органов, в рамках которого предлагается предоставить местным исполнительным органам в рамках трансфертов общего характера обязательств по созданию малых компактных центров ПМСП. Ведется активная работа по цифровизации отрасли. Оснащение компьютерами рабочих мест медицинских работников до уровня городов и районных центров составляет 85,2%. В 96% медицинских организаций внедрены медицинские информационные системы. Осуществлен переход всех медицинских организаций на электронные медицинские записи. Количество сформированных электронных паспортов населения составляет более 11 млн. единиц. Это обеспечивает удобство и прозрачность процесса получения медицинских услуг, а также лекарственного обеспечения [5].

Известная истина гласит, что внедрение быстрых изменений требует адекватных методов оценки эффективности этих изменений. В сфере здравоохранения такими методами является измерение

результатов, достигнутых лечением. Когда данные, собранные при помощи этих методов, анализируются и предаются огласке, многие медицинские организации вынуждены столкнуться с огромным общественным давлением, что в конечном итоге приводит к работе над повышением качества услуг. Даже без давления извне, со стороны государственного контроля, у медицинских компаний сейчас есть все инструменты для качественного измерения достигнутых результатов. Принцип разработки данных методов должен базироваться на мониторинге состояния пациента после окончания лечения, все это работает на нужды и потребности пациента [6].

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# HISTORICAL AND ARCHEOLOGICAL SCIENCES

## EPIGRAPHY AS A HISTORICAL SOURCE (BY THE EXAMPLE OF THE GALLIC EMPIRE)

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### Abstract

One of the most important types of archaeological sources is epigraphy, which has become a separate auxiliary historical discipline. Inscriptions are quite objective and, most importantly, contemporary informational material, so the use of epigraphic data in any study can be justified both by the need to confirm the historicity of an event or a specific person, and by extracting the necessary information from the text of the inscription itself. For young researchers, working with such material can be difficult. Therefore, the purpose of this article is to try to clarify the directions and possibilities of using epigraphy in one's research using a specific historical example. This is the reason for the relevance of the work aimed at stimulating interest in working with epigraphic material.

**Keywords:** historical source, epigraphy, inscriptions, Gallic Empire, Roman Empire, province, altar, milestone, Germans.

Among the historical sources at the disposal of the historian, epigraphy is one of the most important types, which can be analysed for research as an independent evidence base, or used in combination with other types and types of sources. Such evidence is especially important for complex periods of history, such as the third century A.D., since the written sources are scattered or date back to later centuries.

The localization of inscriptions can be evidence of the region's belonging or subordination to the Roman state, or, conversely, withdrawal from the jurisdiction of the state. The inscriptions can be used to trace the change of power, policy directions, military conflicts, as well as to clarify the names and titles of emperors, and individual events mentioned only in one written source or in passing. For example, the Latin The panegyrics and Ausonius provide valuable information about the revolt in the main city of the Aedui tribe, Augustodunum, which began at the end of the reign of the Gallic emperor Victorinus and whose events can only be clarified through the integrated use of archaeological and epigraphic data.

In general, the inscriptions of the provinces of Britain, Spain, Gaul, and the two Germanys provide valuable information about the socio-economic and political life of the regions. Sometimes they throw light on important events that we could only guess or know from the very brief reports of ancient authors. For example, the fact that Spain recognized Postumus as emperor, and later returned to the jurisdiction of Rome. Thanks to epigraphic data, it is possible to find out the social and ethnic composition of the population of the area, the peculiarities of everyday life, to understand the relationship between various collegiums and organizations existing in these provinces, to learn the nature of crafts, and the dynamics of urban growth.

Sometimes inscriptions concerning the "Gallic Empire" can be found where they are not expected. For example, among the inscriptions of the Danubian regions there are military inscriptions, which provide the

fact that one of the military units, having sworn allegiance to the first Gallic emperor, received his name - I Aelia Dacorum Postumiana, but changed it during the reign of the last Gallic emperor - I Aelia Dacorum Tetricianorum (CIL, VII, 820, 822; Dobo, 719-720).

Of the various categories of inscriptions—municipal, sacral, veteran, military, dedicatory, slave and freedman—it is very difficult to single out those that are of primary importance for this study. They must be evaluated since each of the categories provides the necessary information about the socio-economic development of the "Gallic Empire". The inscriptions give a fairly complete list of handicraft specialties in various regions, show the ethnic and social affiliation of people engaged in certain craft specializations, in mines and mines, and also show which segment of the population is of great importance in a given city or locality. Epigraphy provides data on the functioning of the administration, in particular on conflict situations between Victorinus and the envoy of the Roman emperor, who sought to return the fallen regions to the jurisdiction of the Roman Empire. The existence of colleges of various crafts, merchants, etc., on the territory of Gaul is also noted by epigraphic sources. The inscriptions on the mile stones, as well as the number of these stones, allow us to make assumptions about the relation, for example, of Victorinus or Tetricus, to a certain area of the "Gallic Empire", highlighting the most significant ones. No less important for this study is the policy of the Roman emperors in relation to the "Gallic Empire". Thus, epigraphic data make it possible to determine Aurelianus's claim to regain all the lost provinces, making the Roman state whole and powerful. This can already be traced in the titular of the Roman emperor, which is found in inscriptions made, apparently, immediately after the accession of Aurelian to the throne.

Marcus Cassianus Latinus Postumus was one of the most influential governors appointed by the Roman Emperor Valerianus. He controlled Gaul and the two



contains an inscription bearing his name (ILS, 562; CIL, XII, 4943). In Cadiz, a mile stone with the name of Postumus was found, dating back to 260 AD, which allows us to say that Spain made a fairly quick decision about its position. Until the reign of Claudius II Gothicus, Spain was under the rule of the first Gallic emperor, according to archaeological, epigraphic, and numismatic evidence. Evidence of Britain and Spain coming under the control of the Gallic emperor is the fact that two British and one Spanish legions disappear from Gallienus' coins. It is known that the Spanish legion VII Gemina was transferred from the city of Léon to the Gallic city of Lugdunum (modern Lyon), which was under the control of Postumus, in order to ensure the security of the entire region. It should also be noted that one of the mints of the Gallic emperor was located in Lugdunum. Archaeological and numismatic data provide information that the Gallic emperors minted coins at the mints of Lugdunum, Narbonna, Colonia-Agrippina, Augusta Treverorum, Mogontiacus, as well as in a number of mint workshops in the subject territories. Archaeological excavations of the last decade provide unique information about the numerous workshops in Britain.

Part of the British Legio I Ulpia Victrix was stationed in Bonn, which was the headquarters not only of the governor of the provinces of Upper and Lower Germany, but also the base of the classis Germanica fleet. The initiator of the revolt, Legio I Minervia, was also originally located here, as evidenced by the coins of Postumus issued later (Elmer 309 (Aur.), 313 (Ant.): MINER(va) FAVTR(ix)). According to epigraphic data, the legion was served by natives of different provinces, for example: 6 legionnaires originating from the Three Gauls, 9 from Germany, 2 from Noricum, 1 from Pannonia, 1 from Dalmatia, 4 from Thrace, 1 from Syria (CIL, XIII, 1832; CIL, XIII, 1846: Cassianus Lupulus (Lyon); IGR, III, 80 = ILS, 9476: Victorius Sabinus, Velocassimus (Heraclea Pontica); CIL, XIII, 1844 = Riese, 608: Aurelius Primus, civis Remus (Lyon); CIL, XIII, 1887: Aludisas (Lyon); Adnamatius Dubitatus (Bonn). CIL. X. 3896: Silvanus Silvester, natus Col. Agrippinense (Caserta); CIL, XIII, 1844 = Riese, 608: Modestinius Peregrinus, civis Agrippiensi (Lyon); CIL, XIII, 8002: Opponius Paternus, Agrippinensis (Lessenich); CIL, XII, 8091 = Riese, 2290/1: T. Manilius Genialis, Agripp., T. Manilius Iucundus ? (Bonn); CIL, XIII, 8278 = Riese, 520: Aurelius Aristaenetus pater, Aurelius Aristides filius, Agripp. (Köln); CIL, XIII, 8566: Cassius Victor (Neub): CIL, XIII, 8040 = Riese, 527: ignotus natione Frisauus (Bonn): Iulius Betto (Rom); CIL, XIII, 8068: Haldavvon[ius] V[erus ?] (Bonn)).

The sources at our disposal allow us to conclude that the following military units swore allegiance to Postumus [a German researcher is certain of the oath of only six legions – 17, s. 89; 11, p. 27]: the Legio I Minervia, who may have been transferred to Augusta Treverorum (Cohen, V, 2, 387, 259–462), the Legio XXX Ulpia victrix (Cohen, V, 2, 394, 552–557), who later supported Leliana's rebellion. Both legions were stationed in Lower Germany. The Legio XXII Primigenia was stationed in Mogontiacus (Upper Germany), the Legio

VIII Augusta was based in the Argentoratus (Strasbourg) and with its oath decided the fate of Upper Germany. Part of the legion was stationed at Augusta Treverorum; Legio VI Ulpia Victrix of Britain, part of which was stationed at Bonna in 260 (AE, 1930, Vol. 35) and managed to visit Rhaetia at about the same time (in Britain the legion was based at Glevum: CIL, VI, 3346); The Legio II Gallica, stationed at Arausionus (Orange), the Legio VIII Ulpia Victrix of Spanish, relocated to Lyon due to the invasions of Germanic tribes. The XX Legion Valeria Victrix of Britain (Chester), part of which may have been vexillationes, was redeployed to the Rhine and Danubian frontiers, in particular to Mogontiacus [28, p. 428]. Legion V Macedonia supported the revolt of Ingenuus and Regallianus, and after their defeat joined the "Gallic Empire" (Cohen., VI.2, 375, 61; CIL, V, 1881). In 275, the legion returned to Aurelian's control. However, its location was the Danube, the territory of the Tres Daciae, apparently on the border with Rhaetia (IV Macedonia was based on the Rhine). Also worth mentioning is the Legio IV Flavia, stationed in Moesia Superior; Legio XIII Gemina, stationed in Gallia, Legio II Augusta of Britannia (Richborough) [28, p. 435], XIV Gemina of Pannonia Superior, Legio III Gallica, which may have been transferred to the "Gallic Empire" [28, p. 434]. With a high degree of probability, III of Italy from Raetia (Cohen., V.2, 268–271; ILS, 8882). Legio II Trajana of Egypt, called Germanic (CIL, III, 1205), was relocated to northern Italy (where the revolt of Aureolus, who swore allegiance to Postumus) took place, and X Fretensis, stationed in Palestine, was sent to Britain [28, p. 435]. Both legions seem to have sworn allegiance at the end of Postumus' reign. This explains why the last three legions appear on the coins of Victorinus and are absent from Gallienus.

Doubts are raised by the Legio II Augusta, called in one of the inscriptions of this period "Germanicianarum", "Britannicianarum" (CIL, XIII, 3228), as well as VI Gallicana, stationed on the Rhine. The information about this legion appears only in sources dating back to the reign of Aurelian, who tried to regain control not only of the provinces, but also of the legions (SHA. XXVI, 7, 1). Of the auxilia auxilia, of which there is information: in Britain, the numerus Frisiorum (CIL, VII, 415) and their cohort (CIL, VII, 214), the numerus of the Sarmatians (CIL, VII, 218), the second cohort of the Tungri, which even under Gordian had the honorary title of Latin citizens (CIL, VII, 882), which included as subdivisions the German hundreds, such as the pagus Vellau and the pagus Condrustis (CIL, VII, 1072, 1073); numerus Hnaudifridi, who wrote an inscription to the goddesses Alaisiagas, to whom two inscriptions cives Tuihanti cunei Frisiorum were dedicated (ILS, 4760, 4761). There is also information about another military unit. One of the inscriptions mentions praefectus equitum alae Sebussianae Postumianae Flavius Ammausius. Earlier inscriptions mention a military unit based in Lancaster, praefectus II Gallorum Sebosiana (CIL, XVI, 48, 69). Thus, from the epigraphic data, we know of the units of the Britannia inferior that swore allegiance to Postumus: equitibus



alae Sebussianae Postumianiae (RIB, 605) from Lancaster; cohorts I Aelia Dacorum Postumiana (RIB, 1883, 1886) of Birdoswald near Hadrian's Wall, and a detachment assigned to the first Gallic emperor from the *res publica civitatis Carvetiorum* (AE, 1965, № 216) from a settlement also near Hadrian's Wall. From Britannia superior - Isca Silurum (RIB, 2255) from Mergem, a military unit from Trecastle Hill (RIB, 2260), a Deva unit from Chester and Segontium from Kervanon (JRS, 1962, 52, № 24), a subdivision of Isca Dumnoniorum (RIB, 2232) of Exeter.

Of the auxiliary units located in other regions, the following are known from epigraphic data: ala Indiana Gallorum, in which, apparently, Victorinus served. It was this part that went over to the side of Postumus in 264-265 [17, s. 70; 1, s. 19; 22, p. 166; 27, s. 832]. In Upper Germany, units from the Colonia Agrippina and Noviomagus (CIL, XIII, 6779, 9092; BRGK, 1938, 27, 120); in Lower Germany, *custos armorum* Veranius Verinus from Bonn (AE, 1930, № 35, 54). From Tarraconian Spain, military units from León, San Miguel de Confino, Puerto de Sevier, and Acci from Cadiz were placed at Postumus's disposal (CIL, II, 4919, 4943, 5736). Curiously, one of the units was provided by the *Scorcia Onnacau Ammiae Caelionicae ex gente Peniorum*. From the testimonies of ancient authors, it is known that the Gauls placed at the disposal of the first Gallic emperor auxiliaries and cavalry (Eutr., IX, 9; SHA. XXIII, 4, 4; 7, 1; XXIV, 3, 4; 6, 2; Zosim., I, 38; Zonaras, XII, 24).

The inscriptions of the provinces that became part of the "Gallic Empire"—Britannia, Hispania, three Galliae and the two Germaniae, and Rhaetia—provide valuable information about the socioeconomic and political life of the regions. They cover important events that we could only have imagined or known from the very brief accounts of ancient authors. In particular, the inscriptions on the mile pillars, as well as the number on them, allow us to make assumptions about the attitude of the Gallic emperors to a certain area of the "Gallic Empire", highlighting the most significant ones<sup>2</sup>. For example, a mile post with the inscription and name Victorinus found in the area of the Decumate Fields allows us to say that this territory was under the control of the Gallic emperors for some time [17, p. 269]. On the other hand, coins of Postumus and one of his successors, Marius, have been found in the area [9, p. 235; 24, p. 162-164]. All this suggests that the Decumate Fields were under the control of the "Gallic Empire", since only in this case could this region serve as a buffer zone.

According to epigraphic data, Gaul in the 3rd century A.D. was a diverse territory in terms of class and ethnic composition (CIL, XII, 2522, 3349; XIII, 1943, 1974, 2020, 4335) [14, p. 259; 4, p. 5-7; 25, p. 27]. The local population continued to be divided into pagi (CIL,

XII, 1114, 1376, 2556, 2611; XIII, 2949, 3106, 5063, 5064, 6211). Epigraphic evidence proves that pagi persisted in both Spain and Britain during this period [3, p. 274-275; 13, p. 63; 26, p. 164, 200].

The inscriptions give a fairly complete list of handicraft specialties in various regions, show the ethnic and social affiliation of people engaged in certain craft specializations, in mines and mines, and also show which segment of the population is of great importance in a given city or locality. The inscriptions provide us with the names of the professions prevalent in this period, such as lapidaries of precious stones, processors of precious metals, goldsmiths, goldsmiths and silversmiths (CIL, XIII, 2024, 2828, 2901, 4391, 4465, 4475, 5154; XII, 446, 4391, 4456, 4474, 4475). According to epigraphic data, slaves and convicts worked in the mines, as well as small landowners whose farms were located in the vicinity of the mines (*Pagani ferrarienses* — CIL. XIII. 384, 1150; XII. 3336) [Grenier A. VOL. II. P. 957]. Some mines were privately owned and located within estates, while others were owned by individual towns and civitates (D. M. *Primionis ferrariae (um servi) vitalis contules* — CIL. XII. 3336) [19, p. 11-12; 20, p. 97]. The extraction and processing of iron gave rise to a number of craft specializations and professions: blacksmiths, stampers; gunsmiths and related manufacturers of armor, helmets, etc. (CIL, XIII, 2828, 384, 5699, 1-12; 5701, 1-68; 10029. 1-27; XII, 3355, 4475; ILTG, 355). It should be noted that metal works (including bronze and precious metals) were quite diverse.

Archaeological data allow us to note the intensification of construction on the territory of the "Gallic Empire". The inscriptions not only confirm this fact, but also provide irrefutable proof that the construction was carried out not only at the expense of the municipalities [5, p. 167-168], but also at the expense of rich and influential people, who began to willingly invest money in their construction [12, p. 241-242.]. It is also noteworthy that the supply of building materials and human resources was often carried out by private individuals or private partnership [5, p. 167]. For example, a certain Probia Justina restored the temple of the local goddess in Hove (Britain) entirely at her own expense for her son Tercinius Justina (CIL, XIII, 7917). On another occasion, at Remagenus, the prefect restored a clock (*horologium*) at his own expense (CIL, XIII, 7800).

The resumption of work in the mines for the extraction of precious metals, in craft workshops, in stone quarries, and the intensification of civil construction are just some of the factors in the economic success of the policy of the Gallic emperor, who, despite difficult times, managed to restore the old trade relations of the regions and establish new ones, going beyond the borders of the "Gallic Empire".

<sup>2</sup>The Decumate section of the limes, located in the fields of the same name, was about 382 km long, with a small concentration of auxiliary units, remote (even too) legion camps, and the absence of a natural defensive line in the form of a large water barrier, represented a weak link in the defence of Rome on the Rhine. The Decumate fields were annexed under the Roman emperor Domitian, at the same time a section of the

limes was built from the river Lahn to the confluence of the Kindig with the Main. Under Trajan, it was built the section between the Main and the Neckar. Reconstruction of the limes began during the reign of Hadrian. Under Antoninus Pius, the Odenwald section of the limes was advanced eastward around 30 km.



Respect, recognition and trust in Postumus was so great that after his death, the heirs failed to preserve the integrity of the created state. One by one, the regions gradually came under the rule of the Roman emperors, apparently seeing in the stabilization of the central authority greater benefits for development and security.

Sources are rather vague about the origin of the Gallic emperor Victorinus, who was, in fact, the heir of Postumus (SHA. XXIV, 4; Eutr., IX, 9, 3; Oros., VII, 22; Aur. Vict., De Caes., XXXIII, 12; Epitom., XXXIV, 3; Pol. Silv., 49). However, the wealthy house excavated in Augusta Treverorum (present-day Trier) yielded much more information than all the narrative sources. A mosaic with an inscription was found inside the house (M(arcus) Pia(v)onius Victo(r)inus tribunus p(l)r(a)et[or]ia(n)orum | [d(e) ? s(uo) ? oder domum ? restituit]. Trier. CIL, XIII, 3679 = ILS. 563), which makes it possible to assert that it belonged to the Gallic emperor Victorinus, who apparently came from among the wealthy Gallic aristocracy [23, p. 44–46. Taf. 42, 2 (Mosaik), 48, 5 (Inschrift); 10, s. 19], which previously could only be inferred based on the special position and influence of his mother Victoria. There is one inscription that allows us to assert that Victoria is a historical person (Dis Manibus. | L(ucii) Victorini Victoria | piissima Victorini | uxor [. . .]rin[us]. | vato | e- - -v- - -frumen(to)? This only surviving inscription seems to prove the reality of the existence of Victoria, Victorinus' mother. Landres. CIL, XIII, 5868). Moreover, ancient authors treated it with special respect and admiration (SHA. XXIV, 6, 2; XXXI, 4; XXV, 25, 4), because it was she who contributed to the proclamation of subsequent Gallic emperors, including the Roman senator Tetricus.

During his reign, Victorinus lost the eastern part of Narbonne Gaul (Britannia – RIB, 2246; Hispania – CIL, II, 3834, 4879, 4505; Narbonnaise – CIL, XII, 2228, 5511). Modern scholars suggest that this territory took either a vacillating position [29, p. 464] or relative neutrality, since it was in this region that refugees from the rebellious Augustodunum were hiding [13, p. 41; 20, s. 159]. In any case, from the very beginning of the reign of Claudius of Gotha, part of Narbonne Gaul came under the rule of Rome. An inscription from Graziacum, dated 269, is made in honor of the Roman emperor, showing that this part of the Narbonensis recognized Claudius II, and that Julius Placidianus was stationed here with the cavalry (CIL, XII, 2228). Thus, it became known about the conflict between Victorinus, who sought to preserve the integrity of the "Gallic Empire", and a representative of the administration of the Roman emperor, sent to this region with the opposite goal. The presence of Placidianus in the eastern part of Narbonne Gaul is also known from another inscription (CIL, XII, 1551.). Nevertheless, the city of Vienne remained part of the "Gallic Empire" for the entire period of its existence [16, IV, p. 332; 21, p. 143–158], while the constant rivalry of that city with Lugdunum must have driven it into the opposite camp. Victorin's inscriptions have been found in various areas, for example, in Mainz, Nantes, Lescorlaud, Sainte-Meloire-des-Bois (CIL, XIII, 9009; XIII, 8999; XIII, 9006; XIII, 9012), in Belgica (Brimont – CIL, XIII, 9040;

Kyllward – CIL, XIII, 12090; Upper Germania – AE, 1971, №279), Britain (at the same time, it should be borne in mind that an inscription by Claudius of Gotha has also been found in Britain: RIB, 2246), and are found on the Nantes-Tours-Bourges-Dijon-Besançon-Basel line (CIL, XIII, 8958; CIL, XIII, 8959, 8961; Bank account details. 2241 = ILS, 565).

The religious preferences of the civilian and military population of the regions that became part of the "Gallic Empire" are also important. It should be noted that the religious policy of the Gallic emperors is most widely represented in coin legends, on the basis of which we can speak of the worship of Hercules (a set of dedicatory inscriptions on altars from Glan and Gaul: AE, 1954, № 101–103), Mercury, Fortuna (dedications to Mercury were especially popular in Mogontiacus: AE, 1951, № 136; 1953, № 42; 1954, № 91, 154; 1955, № 110, 143), Apollo (AE, 1954, № 145; 1950, № 233), Jupiter (in particular, three inscriptions dedicated to Apollo were made by a Gallic merchant trading with Britain: AE, 1953, № 269; AE, 1950, № 27, 140, 231; 1952, № 196), and Mithras (it is known that this oriental deity is especially widespread among the military: AE, 1950, № 199; 1953, № 2). The religious quests of the population, especially of Gaul, were bound to lead to a return to the old gods and the old religion. Moreover, close contacts were again established between the continental and insular Celts. Many inscriptions in Spain, Gaul and Britain are dedicated to tribal gods (AE, 1949, №93 (Mother Goddess), 94, 95, 101; 1950, № 22–24, 28, 213, 219–220, 222–225; 1952. №84, 86 (Mother Goddess), 130; 1953, №99 (dedication to the little-known Germanic deity Usnehae), 260–261; 1954, № 92, 94–96, 107 (Hammer Sylvanus), 130; 1955, № 30, 234) [10, p. 300 e al.]. It is during this period that a return to traditional Celtic beliefs, such as the dedication to Epona, is characteristic. This, as well as much of the above, became the basis for the assertion that it is possible to talk about such a phenomenon as the "Celtic Renaissance". However, in the centuries since the conquest of Gaul, much has changed, both within the region and in the worldview of the Gauls who inhabited it. The influence of neighbouring provinces, Romanization are just some of the factors that refute the hypothesis of the revival of Celtic civilization.

In 274, the "Gallic Empire" came to an end. The regions that were part of it were gradually returned to the jurisdiction of the Roman emperors. The idea of a "Gallic Empire" took deep roots, but the official policy of the Roman emperors and their administration was aimed at the complete destruction of any evidence of separatism in the middle of the third century. Mile posts erected by Gallic rulers were used to build new defensive fortifications, or simply discarded and replaced with similar ones, but with the names of Roman emperors. The deeds of the Gallic emperors were credited to the emperors of Rome, so that after a while historians had almost no information about the "Gallic Empire". An entire period of time was erased from the official chronology, and, as a result, from the entire history. But no matter how hard Roman official propaganda tried to erase any reminder of the times of the Gallic emperors, it failed.

Interest in the problem is growing with the discovery of more and more new facts, which at the end of the 19th century were only hypotheses, and now, thanks to numerous epigraphic findings, have received a solid evidence base, especially in combination with other types and types of sources. Thus, epigraphy as a separate type of sources can be used in research as an independent basis for proving certain processes or phenomena, and in a complex of other types of sources to deepen the understanding of the events that took place, confirm the facts, and provide an additional basis for the evidentiary base of the research.

#### List of abbreviations:

- AE – L'Année Épigraphique. Paris.  
 ANRW – Aufstieg Niedergang der Römischen Welt.  
 Aur. Vict. De Caes. – Aurelius Victor Sextus. De Caesaribus. Origo gentis Romanae. Liber de viris illustribus urbis Romae. Epitome de Caesaribus / ed. Fr. Pichlmayr, corr. by R. Gruendel, Leipzig 1966.  
 BRGK – Berichte der Römisch-Germanischen Kommission  
 CIL – Corpus Inscriptionum Latinarum.  
 Cohen – Cohen H. Description historique des monnaies frappées sous l'Empire romain : Tom. I–VI. Paris, 1881–1886.  
 Dobo – Dobo A. Inscriptiones extra fines Pannoniae Daciaeque repertae ad res earundem provinciarum pertinentes. Budapest, 1975.  
 Elmer – Elmer G. Die Münzprägung der Gallischen Kaiser in Köln, Trier und Mailand. Bonn, 1941.  
 Epitom. – Pseudo-Aurelius Victor. Epitome de Caesaribus. URL: <http://thelatinlibrary.com/victor.caes2.html> (дата обращения 27.02.2023).  
 Eutr. – Eutropius. Breviarium Ab urbe condita / Ed. C. Santini (Teubner). Leipzig, 1979.  
 ILS – Dessau H. Inscriptiones Latinae Selectae. Berlin, 1892–1916.  
 JRS – Journal of Roman Studies.  
 NC – The Numismatic Chronicle. The Royal Numismatic society. Cambridge Univ. Press. London.  
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 Riese – Riese A. Das Rheinische Germanien in den antiken Inschriften. Berlin, 1914.  
 RE – Revue Épigraphique. Paris.  
 SHA – Scriptores Historiae Augustae: Bd 1-2 / ed. E. Hohl. Lipsiae, 1965.  
 ZfN – Zeitschrift für Numismatik.  
 Zonaras – Zonaras. Epitome Historiarum / Ed. Dindorf. Leipzig, 1870.  
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# MEDICAL SCIENCES

## MEDICAL WORLDWIDE IN THE CREATION OF FAMOUS POETS AND THINKERS OF ANCIENT AZERBAIJAN

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### Abstract

The study of the history of world medicine is directly related to the in-depth study of the ethnic composition, way of life, geographical environment, as well as the historical and cultural development of large and small peoples who lived on earth and now exist. The great achievements in all fields of science in the tenth and thirteenth centuries formed the basis of further scientific progress. In Azerbaijan, as in the whole East, all fields of science are poetry, philosophy, science, architecture, medicine and medicine, mathematics, geometry, theology, law, etc. Developed. Scientists and specialists educated in the central cities of the East (Cairo, Alexandria, Baghdad, Tabriz, Samarkand, Bukhara, Isfahan) cooperated scientifically. Among them, Abul-ula Ganjavi, Falafi Shirvani, Ibrahim Ibn Ali Najjar Khagani, Ibn Yusuf, Sheikh Ilyas, Nizami Ganjavi, Qatran Tabrizi, Imameddin Nasimi, Omar Osman oglu and others entered the world cultural treasury.

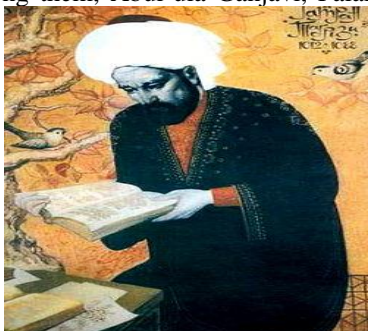
**Keywords:** medicine, poetry, philosophy, medieval Azerbaijan, poet.

The great achievements in all fields of science in the tenth and thirteenth centuries formed the basis of further scientific progress. In Azerbaijan, as in the whole East, all fields of science are poetry, philosophy, science, architecture, medicine and medicine, mathematics, geometry, theology, law, etc. Developed [1,3].

Scientists and specialists educated in the central cities of the East (Cairo, Alexandria, Baghdad, Tabriz, Samarkand, Bukhara, Isfahan) cooperated scientifically. Among them, Abul-ula Ganjavi, Falafi

Shirvani, Ibrahim Ibn Ali Najjar Khagani, Ibn Yusuf, Sheikh Ilyas, Nizami Ganjavi, Qatran Tabrizi, Imameddin Nasimi, Omar Osman oglu and others entered the world cultural treasury [4, 5].

Qatran Tabrizi, one of the famous poets of medieval Azerbaijan 1012-in Tabriz near Shadi-abad was born in the village. The poet's full name is Abu Mansur Qatran Jili Azerbaijan. Qatran is the author of "Tovsname", "Gushname", "Vamig and Ezra", as well as a large divan consisting mainly of poems.



*Tabrizd where Qatran Tabrizi was also buried Tomb of Poets*



*Afzaladdin Khagani*

The great thinker and poet Khagani Shirvani, who was born in Shamakhi, the ancient land of Azerbaijan, has a wide literary activity in medicine.

*I got inspiration from medical science.*

*That is why I am a Socrates of the realm of words.*

*My mind has taken a share of a thousand and one seas*

*I met the grass from Mount Qaf.*

Speaking about his uncle in one of his poems, Khagani writes: "He explained to me in a very easy way what 'one', 'two', 'three', 'four', 'five' mean. 'Five' are members of the senses." four "-the beginnings of the world-are water, air, fire and earth," "three" -is inorganic nature, "two" -is body and soul, "one" -is God. " Apparently, such healing centers in Azerbaijan

has become very popular. So that, "Mahsati and Amir Ahmed" in the saga Ganja The hospital is described as a "hospital". There, patients line up to see a doctor [6].

It is no coincidence that Khagani, who continues the tradition of Omar Osman's son, writes: hypocrisy, enmity, and lying"

It is very interesting that Azerbaijani poets and ashugs skillfully described the achievements of medical figures and their miraculous medicines in their poems. The medical meetings of the genius Nizami, who gave incomparable works to the treasury of world culture, his advice on prophylaxis, his attitude to the theory of humor, testify to his deep acquaintance with medicine [2]. .

Ilyas Yusif oglu Nizami Ganjavi was born in 1141 in Ganja, the oldest cultural center of our country.

It is known from his works that the poet created a great divan and became famous as an author of ghazals and poems. Nizami's lyrics are distinguished by high artistry, secular attitude to love, humanistic thoughts about human destiny. However, Nizami entered the history of world literature as the author of "Khamasa" (Five), consisting of five poems ("Treasure of Secrets", "Khosrov and Shirin", "Leyli and Majnun", "Seven beauties", "Alexander's letter"), which he wrote in the form of a proverb [9].

Nizami Ganjavi died on March 12, 1209 in the city of Ganja.

In many works of Nizami Ganjavi, medical meetings in the field of humor and prophylaxis, diet are astonishing. At the same time, his complaints about time and tyrants, the law of non-disappearance of substances testify to his encyclopedic scholarship. Nizami Ganjavi says about health and medicine:

*If he loses his temper, if his way,  
Health is very difficult to capture.  
Do not eat or drink too much with appetite,  
There will be a sweet smile on his lips.  
No one gets hot from a little food, but  
Hundreds die every day from eating too much,  
look.*



Nizami Ganjavi (1141-1209)

by Narrow-mindedness there was also a medical academy. The Shamakhi poet Seyid Imadeddin Abu Said Hussein Nasimi, after studying the relevant sciences of the eminent scholars of the VIII-IX centuries AH, reached the service of Fazlullah Naimi (Hij. 796 m) and reached the highest levels of spirituality, benefiting from his education and training. The analysis of the poet's works shows that Nasimi was

*It is haraam to comb the grass,  
To make the body need medicine*

Nizami writes in "Iskendername":  
*A doctor who cures pain is never  
Did not find and will not find a cure for death*

The law of non-disappearance of substances in the world is said to have been discovered by Lavoisier and Lomonosov. In fact, the great Nizami explained the law of non-disappearance of substances long before them in the following verse:

*Our servants who rot in the ground  
Destroys, changes, does not destroy repair,  
If it stays in place, it will be destroyed*

*When it comes together, it comes to life again.  
Things spilled on the ground completely  
He rises from the ground again*

From Islam Later, Shamakhi became one of the major cultural centers. There were many schools, madrasas, poetry and music festivals famous all over the East, and rich public and private libraries. A little outside the capital, Ointment famous poet in the so-called place Xaqani Shirvaninin uncle-scientist and doctor Kafiaddin created [13].

able to get a perfect education in Shamakhi to meet the requirements of the best universities of that time. O, classic East and ancient Greek philosophy, as well as a deep knowledge of literature, a close knowledge of the basics of Islam and Christianity, medicine, astronomy and astrology, mathematics and logic had mastered his sciences. He learned languages so well that Azerbaijan Persian and Arabic he could write equally beautiful poems.





*Imadeddin Nasimi (1369-1417)*

Prominent medieval Azerbaijani poet and thinker Mohammad Suleyman oglu Fuzuli was born in 1494 in the Iraqi city of Karbala. He is known as one of the greatest representatives of the *divan* genre in the history of Azerbaijani-Turkish literature. He is often referred to as *Baghdadi*. But the poet in Baghdad not famous near him Karbala. He is known to have been born in Karbala [8].

Fuzuli in three languages *ghazal*, in verse, *sanctuary*, *clause*, *experience*, *rūbai*, *continent*, *jamand* so on. wrote. His philosophical poems, "Seven Glasses", "Anisul-Qalb", "Health and Disease" are the products of old age. He collected his poems as a separate work and compiled them into a book, composing *divans* in Turkish, Persian and Arabic.

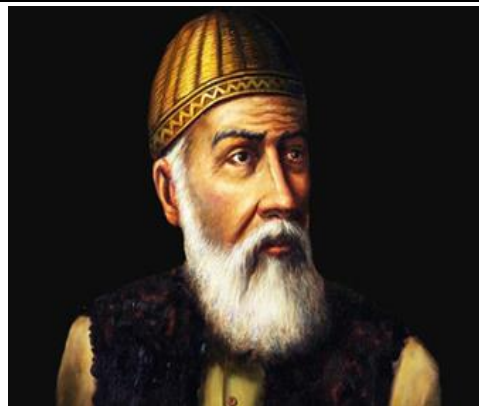
Fuzuli was acquainted with ancient Greek and Eastern philosophy. His philosophical views are reflected in his work "Matlaul-etiqad", written mainly in Arabic. Fuzuli is here Aristotle, Plato, Empedocles, Democritus and the ideas of other Greek philosophers, influenced by the philosophical heritage of al-Nizam.

The medical outlook of the great Azerbaijani poet Mohammad Fuzuli and his work gave a strong impetus to the development of medicine, as well as many other areas.

Genius Fuzuli's deep philosophical outlook, unparalleled medical imagination and sharp cognitive power allowed him to create an extremely sublime and imaginary, poetically unique work called "Health and Illness".

Mohammad Fuzuli describes the body of a healthy person with great enthusiasm and love, brings joy to the world with it and rejoices himself. Fuzuli explains the body's ability to fight the disease, shows that the cause of the disease depends on the composition and ratio of 4 body fluids. This work explains psychophysiological problems. Fuzuli's psychophysiological theory is consistent with the psychophysiological theory of IP Pavlov and PK Anoxin. His book "Health and Disease" fully explains this issue.

In his work "Health and Disease" Fuzuli for the first time explains his applause and gratitude to the Creator as the beauty of the scientific mind and the investment of the mind [12].



*Muhammad Fuzuli (1494-1556)*

Fuzuli came to the following conclusion after examining the medical and philosophical heritage of Hippocrates, the father of medicine, Sheikh-ur-Ra'is Ibn Sina and other physicians and scientists of the East, and weighing them on the scales of reason.

The juices and fluids that control the body and the health of the body (blood, mucus, bile and bile) are sometimes relevant and sometimes different.

The health of the body is ensured when the 4 fluids that own this land are in harmony with each other, that is, when their composition and proportions are stable. Otherwise, if the composition and proportions are disturbed, the body becomes ill.

The genius Fuzuli sees the violation of the composition and ratio of fluids in the violation of the relationship between nature and the body, that is, the composition of the organism corresponds to the composition of nature, the body must use a full range of fluids present in nature. Then the composition and ratio of liquids remain constant.

When these fluids circulate in the body, the body feels sweetness, bitterness, salinity and acidity. At the same time, they create dryness, moisture, heat and cold in the body. All this determines the "taste" of the body, that is, the absolute individual characteristics.

There are copies of Fuzuli's work "Health and Disease" in various libraries and museums under the names "Ruhnama", "Husnu-eshq". In a *ghazal* with the line "Doctor", Fuzuli sums up all his medical thoughts and writes:

*There is a punhan disease in my soul out of love,  
O doctor!*

*Please do not express my sorrow to the people, O doctor!*

*Don't be offended, take your hope from Fuzuli,  
Who is not sick, O doctor!*

The books written by the great thinker Fuzuli on the philosophy, science and medicine of the Azerbaijani people in the 16th century were a great event.

Fuzuli's writings covered great scientific questions. Fuzuli was deeply interested in natural and medical sciences. His writings "Talking to Nature", "Health and Disease" can be mentioned. Fuzuli writes about the beauty of the nature of his native land in his book "Conversation with Nature".

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**ЛЕЧЕНИЕ ДЕТЕЙ НА СТОМАТОЛОГИЧЕСКОМ ПРИЕМЕ ПРИ ПРИМЕНЕНИИ СЕДАЦИИ****Петрова А.М.***ФГБОУ ВО «Читинская государственная медицинская академия»**Заведующая кафедрой стоматологии детского возраста, к. м.н.**Чита, Россия***Малежик М.С.***ФГБОУ ВО «Читинская государственная медицинская академия»**Доцент кафедры стоматологии детского возраста, к.м.н.**Чита, Россия***Шнитова И.В.***ФГБОУ ВО «Читинская государственная медицинская академия»**Ассистент кафедры стоматологии детского возраста***Жилыева О.А.***ФГБОУ ВО «Читинская государственная медицинская академия»**Доцент кафедры иностранных языков, к. культурологии**Чита, Россия***DENTAL TREATMENT OF CHILDREN WITH SEDATION****Petrova A.,***Candidate of Medical Sciences,**Head of the Department of Pediatric Dentistry,**Chita State Medical Academy**Chita, Russia***Malezhik M.,***Candidate of Medical Sciences,**Associate Professor of the Department of Pediatric Dentistry,**Chita State Medical Academy***Shnitova I.,***Assistant of the Department of Pediatric Dentistry,**Chita State Medical Academy***Zhilyaeva O.***Candidate of Cultural Sciences,**Associate Professor of the Department of Foreign Languages,**Chita State Medical Academy*DOI: [10.5281/zenodo.10077592](https://doi.org/10.5281/zenodo.10077592)**Аннотация**

Закись азота – это фармакологический препарат, используемый в медицине для снятия психоэмоционального напряжения, т. е. для того, чтобы пациент перестал испытывать страх и другие негативные эмоции. Закись азота (ЗАКС) входит в список основных лекарств ВОЗ (Всемирной организации здравоохранения), разрешена к применению в РФ. Применение закиси азота в детской стоматологии позволяет добиться высоких результатов, так как облегчает работу врача и вызывает у ребёнка положительное впечатление от посещения стоматолога.

**Abstract**

Nitrous oxide is a pharmacological drug used in medicine to relieve psycho-emotional tension, and to eliminate the patient's fear and other negative emotions. Nitrous oxide (NOS) is included in the list of main drugs of the WHO (World Health Organization), approved for use in the Russian Federation. The use of nitrous oxide in pediatric dentistry makes it possible to achieve high results, as it facilitates the work of a doctor and gives the child a positive impression from visiting a dentist.

**Ключевые слова:** стоматология, седация, закись азота.

**Keywords:** dentistry, sedation, nitrous oxide.

**Introduction.**

One of the most challenging current health issues proves to be the high dental morbidity of children and adolescents. The specifics of the physiological and psychological development of a child, the labor intensity and duration of treatment procedures, as well as the emotional unprepared parents explain the fact that for many children, dental treatment is a real stress factor.

The child's behavior is guided by emotions that can impede the work of the dentist and affect the quality and prognosis of treatment. Visiting a dentist for a child is associated with a forced position in a chair with an open mouth, specific sounds, bright light, unknown smells, as well as communication with strangers. All these factors give rise to tension and fear. Memory for negative



effects can arise and become fixed in the child's mind for all his life.

To provide high-quality dental care, a child needs to create special conditions in which he will feel calm and comfortable. The solution of the problem of such treatment is possible with the use of nitrous oxide sedation [2, p.7].

#### **Background.**

The prevalence and intensity of tooth caries has increased among the child population in recent decades in Russia largely, due to the unsatisfactory hygienic state of the oral cavity in children of early and pre-school age. The increase of the carious process in temporary teeth leads quickly to complications of caries, and premature loss of teeth. From an early age, children already need different types of dental care, which is a great clinical and organizational problem for children's dentists.

The vast majority of young patients are afraid of dental treatment, especially those who have already had negative experience with the dentist. Children often refuse from treatment or, unfortunately, sometimes doctors are forced to treat young patients against their will.

Children are often afraid of the specific situation of the dental clinic, and physiologically cannot safely endure long-term procedures, while the treatment of the oral cavity in normal conditions requires an average of 3-4 or even more visits, and as a result, it turns into chronic stress for them, provoking dentistry phobia.

Faulty communication between doctor and young patient makes the qualified dental care unrealistic or even impossible, so children are more widely used than adults in general pain relief or treatment in sedation conditions.

However, the method of general pain relief for the rehabilitation of children with a negative attitude towards dental treatment is used in a limited number of medical institutions.

Moreover, the method of sedation with preserved consciousness also deserves attention. It should be noted that this type of anesthesia aid is of a great concern and constantly growing. In our country, for many reasons, including organizational ones, this type of anesthesiological allowance in dental treatment is used on rare occasions in adult patients, and only in single clinics in children.

Sedation (from Latin *sedatio*) means an artificially caused reversible state of the body, which results in minimal depression of consciousness; protective reflexes, the ability to breathe independently and verbal contact are preserved. Consequences of sedation are reduced psychomotor excitation and affective tension, weakened responses to external stimuli, depressed aggression.

Nitrous oxide (oxygen sedation) is most often used in pediatric dentistry. Nitrous oxide is a chemically stable compound that is an odorless and colorless gas at room temperature.  $N_2O$  has high diffusion capacity, which is 30 times higher compared to nitrogen, which is the main component of atmospheric air. As a result of this phenomenon, nitrous oxide has a pharmacological property beneficial from the standpoint of anesthesiology rapid achievement of saturation in blood and

tissues, and the same rapid elimination from the body [3, p. 37].

This chemical compound was discovered by the English chemist Joseph Priestley in 1772, the properties of this gas being thoroughly studied later in 1796 by his compatriot Humphrey Davy. After auto experiments he was the first to express the idea of the possibility of its use for anesthesia. For this, in 1799, H. Davy called nitrous oxide "laughing gas" ("Lach-gas" in German, a term is still being used today). Nitrous oxide was first used for anesthesia in 1844 by the American dentist Horace Wells on his own, while his colleague John Riggs removed a healthy molar from the subject. Then in 1868 it was established that the  $N_2O$  only physically dissolves in the blood, without changing the chemical composition of the latter, that is, it is present in plasma in a free state. In the same year, Professor of Surgery from Chicago Edmund Andrews began to combine inhalation of nitrous oxide with the addition of oxygen, which made it possible to use anesthesia for a longer time.

Nitrous oxide anesthesia was successfully applied in Russia in 1869 for the first time by L. Bernardo-Berkmeer, who proposed painless tooth removal, as well as surgeons S.P. Botkin and S. Klimovich used it during childbirth. In 1888, this gas was used by St. Petersburg's dentists for anesthesia. Since 1948 nitrous oxide - oxygen sedation is used in countries with progressive dentistry [1, P. 68-69].

The pharmacological effect of the  $N_2O$  is manifested in the fact that it inhibits the transmission of nerve impulses to the CNS, changes the cortical-subcortical relationships, non-specifically interacting with the membranes of neurons.

Nitrous oxide causes a certain analgesic result associated with its antinociceptive effect, which develops due to the release of opioid peptides in the brain stem, activation of the descending inhibitory pathways and the sympathetic  $\alpha 1$ -adrenergic system, the release of norepinephrine in the neurons of the posterior horns of the spinal cord. The upstream path of transmission of pain impulses from the periphery to the center at the segmental level is modulated. The analgesic effect of the  $N_2O$  is not enough for dental manipulation, therefore, local anesthesia should be additionally performed [5, p. 16].

According to the "American Society of Anesthesiologists" (ASA) classification m sedation is divided into the following levels:

1) Mild sedation – the patient is awake, is in contact with the doctor, but his informative function and coordination can be reduced. This level corresponds to from 0 to 2 points on the Richmond scale of agitation-sedation.

2) Mean sedation – depression of consciousness, patients respond to a slight tactile stimulus, and are able to interact with a doctor, there is no need to support airway patency, adequate spontaneous breathing and cardiovascular function are preserved. This level corresponds to 3 points on the Richmond scale of agitation-sedation.

3) Deep sedation – patients cannot be easily awakened but respond to repeated or painful stimulus, airway patency support may be required, spontaneous breathing may be impaired, cardiovascular function preserved. This level corresponds to 4 points on the Richmond scale of agitation-sedation [4, P. 115-116].

Indications for the use of NOS in pediatric dentistry are:

1. the need to relieve moderate fear of dental intervention in a child capable for treatment;
2. increased emetic reflex;
3. traumatic interventions (local anesthesia, removal, preparation of the carious cavity);
4. long-term treatment.

Contraindications to NOS are:

1. irresistible fear in a child after receiving negative treatment experience from a dentist and unwillingness to make contact with a doctor;
2. mental illness and intellectual disabilities that impede the possibility of bilateral contact;
3. impaired nasal respiration (adenoids, ARVI), when the child will breathe with his mouth and will not be able to use the nasal mask;
4. overcrowded stomach, and nausea and vomiting may occur (the last meal should be carried out 2 hours before the start of sedation);
5. hyper excitability, since there is a possibility of a paradoxical response to sedation.

The doctor, analyzing the behavior of the child at the consultation, can predict the effect of NOS on the patient.

**Aim of the work.** To carry out the comparative analysis of clinical records of the children being treated in children's clinics of LLC "Childhood" of Chita under a sedation and to study activity of doctors during implementation of the protocol of a sedation.

**Materials and methods.** The research was carried out on the basis of children's clinics LLC "Childhood" in the city of Chita. One hundred and fifty case histories of patients aged 2 to 15 years were analyzed. Observation and study of doctors' activities during the implementation of the sedation protocol in the treatment of 15 children was studied.

**Results.** Analysis of case histories of patients treated at LLO "Childhood" indicates that most often sedation was used in children aged 3 to 8 years and lasted about an hour. The difference in the use of NOS in boys and girls was not statistically found, since psycho-emotional differences in children have not yet been formed at this age [2].

The staff of LLO "Childhood" worked according to the protocol for the use of nitrous oxide in working with children. The  $N_2O$  was supplied using special equipment. The Matrix apparatus is a rotameter (mixer) that allows to adjust the ratio of gases in the mixture, a reserve bag, a breathing circuit with a nose mask and a source of gases (cylinders). In a playful form, a mask was tried on and the doctor explained to the child what would happen to him. It is important to obtain the voluntary consent of the patient to put on a mask – this is the first component of success.

The introduction into the sedation state began with the supply of 100% oxygen at a rate of 4-6 l/min and

the gradual addition of nitrous oxide, the permissible  $N_2O$  concentration being 70%. The most optimal ratio at which the planned treatment can be carried out is 30% nitrous oxide and 70% oxygen.

However, the control of nitric oxide concentration depends on its effect, and in each case it is an individual indicator that was recorded in the map.

After the start of inhalation, the blood is saturated with gas in 5-7 minutes. As soon as inhalation stops, the gas is completely removed by the lungs unchanged. A feature of NOS, unlike other sedative drugs, is the rapid onset of sedation and the absence of a trace effect: it is completely eliminated from the body within 5-10 minutes due to inhalation of 100% oxygen at the final stage [6].

The average sedation time was 7 minutes with an extreme oscillation limit of 5 minutes to 12 minutes. We did not find any relationship between the duration of the onset of the effect of  $N_2O$  administration with the age of the child and, accordingly, with his weight.

Symptoms of sedation were manifested in the form of a comfortable, relaxed state, satisfactory spirit, soft, inhibited body movements, lack of resistance, deep breathing, decreased movement of eyes, easily fixed gaze, reduced sound perception. Patients were disoriented and easily suggestive.

A pronounced effect was marked in 23% of children. The patients were in a semi-sedate calm state with isolated weak motor reactions. HR was reduced by an average of 10 bpm, RR - by 5, BP did not change.

Almost all children showed a good results (75%), which was manifested by calm behavior. The child did not sleep, but was clearly inhibited. Occasionally, crying and sluggish movements of the limbs were observed. The hands were dry, warm; HR was reduced by 8 bpm; RR - by 2, BP remained at baseline.

Only 2% of patients showed a weak effect. Their heart and respiratory rate remained almost at baseline, blood pressure increased in some children, but slightly (by 5-10 mm Hg). Moderate motor agitation, monotonous crying were noted. Completion was carried out under the residual influence of nitrous oxide. The recovery from sedation was smooth and ended with inhalation of 100% oxygen for 3-5 minutes.

### Conclusion.

Thus, the method of sedation with preserved consciousness does not negatively affect the general condition and behavior of children and provides the possibility of oral sanitation with significantly calmer behavior of children.

The assessment of nitrous oxide agents' sedation scale in pediatric dentistry allows to make the following conclusions:

1. The NOS method creates comfortable conditions for both the patient and the dentist, while improving the quality and volume of the dental intervention performed, which makes it possible to fully sanitize the oral cavity.

2. Despite the positive qualities of NOS, it should be used by the doctor strictly according to the indications, taking into account also possible contraindications to the procedure.

3. In the city of Chita, with a population of about 351,784 people, there are only 3 clinics equipped with modern equipment, where the NOS procedure is possible, which is not enough, and cannot adequately provide conditions for comfortable dental treatment in those ones having indications for it.

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# PEDAGOGICAL SCIENCES

## ХАРАКТЕРИСТИКА ПРОФЕССИОНАЛЬНО-НАПРАВЛЕННОЙ ЗАДАЧИ В МАТЕМАТИЧЕСКОМ ОБРАЗОВАНИИ

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### DESCRIPTION OF A PROFESSION-ORIENTED ISSUE IN MATHEMATICS EDUCATION

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#### Аннотация

В данной статье раскрывается вопрос об использовании профессионально-направленных задач в математическом образовании а также приведены примеры и их характеристики связанные с ними.

#### Abstract

This article highlights information on the use of professional-oriented issues in the implementation of mathematical education, outlines several relevant issues, and gives descriptions of them.

**Ключевые слова:** Математика, образование, ученик, задача, профессионально-направленная задача, характеристика.

**Keywords:** Mathematics, education, student, issue, profession-oriented issue, description.

Известно что теоретические знания в математическом образовании доводятся до учеников через примеры в конкретной, ясной форме. Математику нельзя представить без задач и поэтому в математическом образовании примеры и задачи имеют особое место. Их помощью можно закрепить знание учеников, формировать логическое мышление, образовать аналитические и критические умения. По требованиям современности сегодня важно не только освоить знания, но необходимо развить компетенции применения этих знаний.

Каждый овладевающий знаниями человек в обществе превращается в обладателя какой-либо профессии, поэтому необходимо формировать умения применять знания в практической профессиональной деятельности. Математика в определённой степени присутствует почти во всех сферах деятельности из этого следует полезно вооружать учеников профессионально направленными задачами исходя из их интересов к какой-либо профессии. В этом направлении свои исследования проводили такие учёные, как Т.А.Кузьмина, Р.М.Зайкин, Е.Г.Халзанова и Г.Р.Алиматова. В их работах встречались задачи с профессионально-направленным содержанием.

**Профессионально направленными задачами** - мы называем такие задачи в условии которых имеются профессиональное содержание, смысл и понятие.

Профессионально направленные задачи точки зрения педагогики выполняют следующие функции:

- повышение интереса к математике;
- укрепление математических знаний;
- формировании практических прикладных умений;
- формирование понятий касающихся профессий;
- научиться математически анализировать в профессиональных условиях;
- способность находить математические пути решение проблемных ситуаций;
- развитие умений творческого подхода.

Ниже мы приведём несколько примеров профессионально-направленных задач и их проанализируем.

**1-задача.** В фирме для поручения виде залога определенной суммы осуществляется повседневная дополнительная плата в размере 2%. Если клиент взял долг в количестве 100 денежных единиц, то за 8 дней какое количество денег, он должен будет возвратить?

**Решение.** Данная задача решается в двух случаях.

Для 1-случая к количеству денег взятых займы добавляется ежедневный процент от суммы

и для других дней тоже добавляется процент от суммы взятой займа денег.

Тогда процент от долга за 1 день  $100 \cdot 0,02 = 2$   
За 8 дней  $8 \cdot 2 = 16$

*Ответ:* Задолжник должен будет возвратить 116 денежных единиц.

Во втором случае в первый день к количеству денег взятых займа добавляется процент от взятой суммы, начиная со второго дня процент берётся уже с основной суммы и прибавленной к ней дополнительной суммы. Для такого случая считаем при помощи функции такого  $y = a \cdot (1,02)^x$  вида.

Здесь  $a$  - количество денег;  $x$  - количество дней. В нашем случае  $x = 8$  дней

$$y = 100 \cdot (1,02)^8$$

$$y = 100 \cdot 1,17$$

$$y = 117$$

*Ответ:* Значит задолжник должен возвратить 117 денежных единиц.

**Характеристика задачи.** В этой задаче ученики могут увидеть применение математики. А то, что здесь учитывается два случая даёт возможность ученикам анализировать то, что если дано конкретное условие то возможно вычислить для конкретного случая. Данную задачу можно дать ученикам младшего класса в обучении темы проценты (в данной ситуации вводятся дополнительные данные касающиеся 1 случая задачи.) а также можно применить при обучении показательная функция для того, чтобы показать практическое применение данной темы. Здесь следуя из двух случаев ученики делают вывод о том, в каком из случаев фирма получает больше дохода.

**2-задача.** Рост годового дохода компании составляет 40%. Если рост продолжится в таком темпе, через сколько лет доход компании превзойдёт 96% тов?

*Решение.* Осуществим, используя данное равенство

$$1,96a = a \cdot 1,4^x$$

здесь  $a$  - доход компания

$$\frac{196}{100}a = a \left(\frac{14}{10}\right)^x$$

$$\left(\frac{14}{10}\right)^2 = \left(\frac{14}{10}\right)^x$$

$$x = 2$$

*Ответ:* За 2 года доход компании перевалит 96%.

**Характеристика задачи.** При помощи решения задач такого типа можно закрепить знания учеников по теме показательные уравнение, формировать экономические понятия, а также развивать умения применять знания на проценты в практических профессиональных процессах.

**3-задача.** В производстве денег ставятся отдельные шифры для денежных единиц. Если данные цифры состоят из начала из 2 букв и 6 цифр, то сколько денег можно произвести, используя такой способ шифровки? (Количество букв считаем равным 24)

*Решение.* Изначала напишем способ шифровки таким образом AA000000. Если обратим внимание на буквы то на месте каждого из них возможны

находится 24 буквы, а на месте каждой из 6 цифр могут находиться от 0 до 9 ти, то есть 10. Таким образом можно всего произвести денег в количестве  $24 \cdot 24 \cdot 10^6 = 576\,000\,000$  штук.

*Ответ:* 576 000 000 штук.

**Характеристика задачи.** При помощи таких задач формируются знания касающиеся комбинаторики в смысле профессии объясняется необходимость учитывания возможностей производства использующего способ шифрования денег. То есть при исчерпании всех комбинаций необходимо перейти к новому способу шифрования. Изучается практическое применение комбинаторики.

**4-задача.** Текстильная фабрика в день производит товаров в количестве 400 штук. Фабрика получила заказ на 12360 штук товаров. Если в производстве осуществить ежедневное производства товаров с дополнительной нагрузкой в 10 штук, то за какой срок можно выполнить заказ?

*Решение.* Если использовать арифметическую прогрессию, то  $a_1 = 400$ ,  $d = 10$  и  $S_n = 12360$ . Необходимо найти  $n = ?$

На основе формулы нахождения первых  $n$  членов арифметической прогрессии  $S_n = \frac{2a_1 + (n-1)d}{2} \cdot n$  подставляя значения данных получим

$$12360 = \frac{2 \cdot 400 + (n-1) \cdot 10}{2} \cdot n$$

$$24720 = 800n + 10n^2 - 10n$$

$$n^2 + 790n - 2472 = 0$$

$$n_1 = -103; n_2 = 24$$

Учитывая при вычислении дней не может быть отрицательных чисел, то мы берём ответ 24.

*Ответ:* Производство выполнить заказ за 24 дня.

**Характеристика задачи.** При помощи такой задачи закрепляются математические знания, обучаются математические способы решения проблемных ситуаций. Анализируется возможность выполнения заказа предприятием с использованием дополнительных сил. Данная задача показывает то, что если не использовать способ дополнительной, нагрузки заказ бы выполнили за 31 дней, а используя дополнительную ежедневную нагрузку математически обосновали возможность выполнения за 24 дня.

В заключение можно сказать что задачи с профессиональным содержанием, понятием или ситуацией (имеют математические способы решения) разрешаются математическими способами. Ситуация указанная в условии задачи должна быть близкой к реальной. Его решение соответственно не должно содержать противоречивые ситуации в отражении решения поставленной задачи.

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**КРИТЕРИАЛЬНОЕ ОЦЕНИВАНИЕ РАЗНОУРОВНЕВЫХ ЗАДАНИЙ ПО КУРСУ  
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Shymkent, Kazakhstan*DOI: [10.5281/zenodo.10077606](https://doi.org/10.5281/zenodo.10077606)**Аннотация**

В статье рассматривается использование разноуровневых заданий в качестве средства оценивания. Приведены критерии оценивания уровневых заданий по балльной системе и их обоснование. Выделены специфические особенности заданий первого, второго и третьего уровней сложности заданий по неорганической химии. В заданиях первого уровня преобладает репродуктивный характер деятельности обучающихся. Они направлены на формирование практических умений и навыков по составлению дидактических материалов. Задания второго уровня сложности носят частично-поисковый характер познавательной деятельности студентов и развивают практические умения и навыки по разработке методических материалов. В заданиях третьего уровня сложности доминируют поисковая деятельность, творческий и авторский подход по созданию дидактических материалов с учетом современных требований к школьному образованию. Проанализированы различные подходы к оцениванию были разработаны общие и специфические критерии для оценивания разноуровневых заданий по неорганической химии. Представлены результаты апробации разработанных критериев и показано значение критериального подхода для использования оценивания разноуровневых заданий по неорганической химии.

**Abstract**

The article discusses the use of multi-level tasks as a means of evaluation. The criteria for evaluating level tasks according to the point system and their justification are given. The specific features of the tasks of the first, second and third levels of complexity of tasks in inorganic chemistry are highlighted. In the tasks of the first level, the reproductive nature of the students' activities prevails. They are aimed at the formation of practical skills and skills for the compilation of didactic materials. Tasks of the second level of complexity are partially exploratory in nature of students' cognitive activity and develop practical skills in developing methodological materials. The tasks of the third level of complexity are dominated by search activity, creative and author's approach to creating didactic materials taking into account modern requirements for school education. Various approaches to evaluation have been analyzed, general and specific criteria have been developed for evaluating multi-level tasks in inorganic chemistry. The results of the approbation of the developed criteria are presented and the significance of the criterion approach for the use of evaluation of multi-level tasks in inorganic chemistry is shown.

**Ключевые слова:** разноуровневые задания, оценочные средства, обучение неорганической химии, оценивание, дифференциация, критерии, показатели.

**Keywords:** multi-level tasks, evaluation tools, teaching of inorganic chemistry, evaluation, differentiation, criteria, indicators.

Сегодня большое внимание уделяется таким вопросам, как оценивание достижений учащихся (В.М. Блинов, В. Писарев, В.М. Полонский, А.Н. Майоров и др.) и разноуровневый подход к обучению химии (О.Е. Лебедев, Л.М. Перминова, А.П. Тряпицына и др.). Значительное число работ по этой проблеме выполнено зарубежными исследователями (К. Ингенкамп, I. Costa, P. Wohlseller, D. Nixon, G. Cawelti, M. Holt и др.) [1].

За критерий оценки деятельности ученика принимаются его усилия по овладению материалом, творческому его применению. Темы же, предписанные стандартами образования, остаются едины для всех уровней обучения. При этом не допускается овладение учебной программой на уровне ниже базового.

Цель данной работы является применение критериального подхода к оцениванию заданий разного уровня сложности по курсу неорганической химии и создание условий учащимся, проявляющим интерес и способности к предмету неорганической химии для усвоения материала на более высоком уровне.

Разноуровневые задания можно использовать на различных этапах урока, иногда целесообразно включать лишь отдельные его элементы. Если новый материал дается фронтально, уровневую дифференциацию можно использовать при закреплении нового материала, при даче и проверке домашнего задания, а также при написании проверочных работ. Например, после изучения определенной темы закрепление знаний проводим по вопросам нарастающей трудности. Осуществляя дифференцированный подход, учитель должен делать все возможное, чтобы нейтрализовать негативное его проявление. Только в ходе длительного изучения учащихся можно сделать выводы об их учебных возможностях. Ученики не должны знать об их разделении на группы. Правильно осуществляемый дифференцированный подход не вызывает у учащихся никаких стрессовых ситуаций [2].

В обучении неорганической химии разноуровневая дифференциация имеет особое значение. Учителю важно учитывать, как познавательные интересы учащихся, так и индивидуальный темп их развития. Такой подход основан на многоуровневом планировании результатов обязательной подготовки учащихся (усвоение минимума) и формировании повышенных уровней овладения материалом. Учащиеся получают право и возможность выбирать уровень обучения, учитывая свои способности, интересы, потребности, варьировать свою учебную нагрузку, учиться адекватно оценивать свои знания. Самостоятельный выбор задания дает дополнительную возможность самореализации ученику [3].

В соответствии с ведущими функциями оценивания нами выделено три этапа оценивания по неорганической химии: этапы диагностики, мониторинга и аттестации. Главной целью диагностики является оценивание исходного, начального состояния качества обучения в начале урока, перед изучением темы (раздела, модуля) курса неорганической химии. На этапе мониторинга осуществляется непрерывное слежение за качеством обучения в течение урока, в ходе изучения темы (раздела, модуля), курса. Главной целью этапа аттестации является оценивание итогового качества обучения в конце урока, после изучения темы (раздела, модуля), курса. Среди форм оценивания мы выделяем такие, как текущее оценивание в ходе урока, промежуточное оценивание в ходе изучения темы (раздела, модуля) и итоговое оценивание в процессе изучения материала курса неорганической химии [4].

Требования к знаниям и умениям учащихся, критерии оценки, содержание оценивания должны быть доведены учителем до сведения учащихся заранее.

С учетом действующей пятибалльной системы оценки достижений учащихся преобразование результатов измерения в привычные баллы приведены в таблице 2.

Таблица 2.

Система оценки достижений учащихся

Уровень знаний	Качественная оценка	Процент набранных баллов от общей суммы баллов	Отметка
недопустимый	неудовлетворительно	0-49	2
допустимый	удовлетворительно	50-64	3
достаточный	хорошо	65-89	4
высокий	отлично	90-100	5

С целью качественной и количественной оценки качества знаний и умений учащихся нами использовалась специально разработанная система заданий (тесты, письменные контрольные, проверочные и самостоятельные работы), а также различные измерительные шкалы, ранжирование, поэлементная оценка знаний и пооперационная оценка умений [5-6].

Для оценивания качества выполнения учащимися заданий первого, второго и третьего уровня сложности в курсе «Неорганической химии» мы разработали общие критерии, включающие:

- поиск и нахождение информации;
- использование теоретических знаний из курса «Неорганической химии» и других курсов, показывающих межпредметную связь;
- точность воспроизведения учебного материала (воспроизведение терминов, алгоритмов, методик, правил, фактов и т.п.);
- точность в описании фактов, явлений, процессов с использованием терминологии;
- точность различения и выделения изученных материалов.



Для оценивания заданий второго и третьего уровня сложности помимо перечисленных выше критериев предложены и дополнительные:

– применение информационных материалов с целью создания образовательного продукта;

– предложение нестандартного решения.

Для каждого критерия разработаны показатели оценивания от 0 до 5 баллов, которые показаны в таблице 1.

Таблица 1.

Оценка качества выполнения заданий разного уровня сложности

Критерий оценивания	Уровень задания	Показатели оценивания, баллы		
		0-2	3-4	5
Правильность и полнота выполнения заданий	I, II, III	Задания выполнены с существенными ошибками не в полном объеме	Задания выполнены с незначительными ошибками в полном или неполном объеме	Все задания выполнены без ошибок
Использование теоретических знаний из курса «Неорганическая химия» и других образовательных областей	I, II, III	Теоретические знания использованы фрагментарно, при ответе допущены ошибки	Необходимые теоретические знания при решении заданий использованы, иногда допускаются неточности	Теоретические знания использованы из разных образовательных областей без существенных ошибок
Обоснование ответа	I, II, III	Ответ не обоснован	Ответ обоснован фрагментарно	Ответ обоснован в полном объеме
Поиск и нахождение информации	I, II, III	Для решения не найдена необходимая информация или ее недостаточно для ответа	Для решения информация подобрана из разных источников, имеются затруднения в ее использовании при ответе	Для решения информация подобрана из разных источников, использована на основе анализа и системного подхода
Предложение нестандартного решения	I, II	Нестандартный способ решения отсутствует	Нестандартный способ решения предложен с помощью преподавателя	Нестандартный способ решения предложен самостоятельно или предложено несколько путей решения задания
Применение информационных материалов с целью создания образовательного продукта	I, II	Образовательный продукт не создан или создан без учета современных требований к учебному процессу	Образовательный продукт создан, имеются недочеты содержательного характера	Образовательный продукт создан с учетом современных требований к учебному процессу

В таблице 1 показаны критерии оценивания качества выполнения заданий I, II и III уровня сложности. Обучающимся на практических занятиях дисциплины «Неорганическая химия» предлагалось выполнить задания по темам:

1. Атомно-молекулярное учение.
2. Классификация и номенклатура неорганических соединений
3. Строение атома. Модель Резерфорда. Постулаты Бора.
4. Периодический закон и периодическая система Д.И. Менделеева.

5. Химическая связь. Направленность ковалентной связи. Теория гибридизации атомных орбиталей. Пространственная конфигурация молекул.

6. Пространственная конфигурация молекул. Донорно-акцепторный механизм образования ковалентной связи. Ионная связь и механизм ее образования.

7. Теория электролитической диссоциации

8. Окислительно-восстановительные реакции

Учащиеся индивидуально выбирали уровень сложности заданий. Результаты оценки качества выполнения заданий разными группами обучающихся представлены на рисунках 1–3.

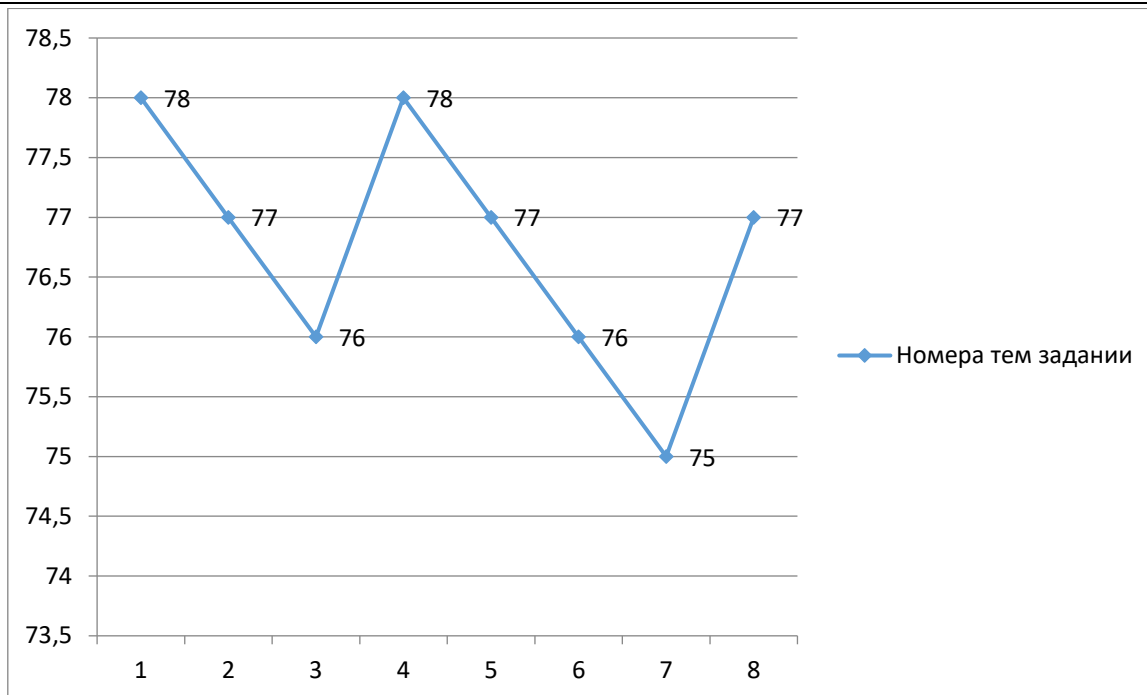


Рисунок 1. Результаты выполнения заданий первого уровня сложности

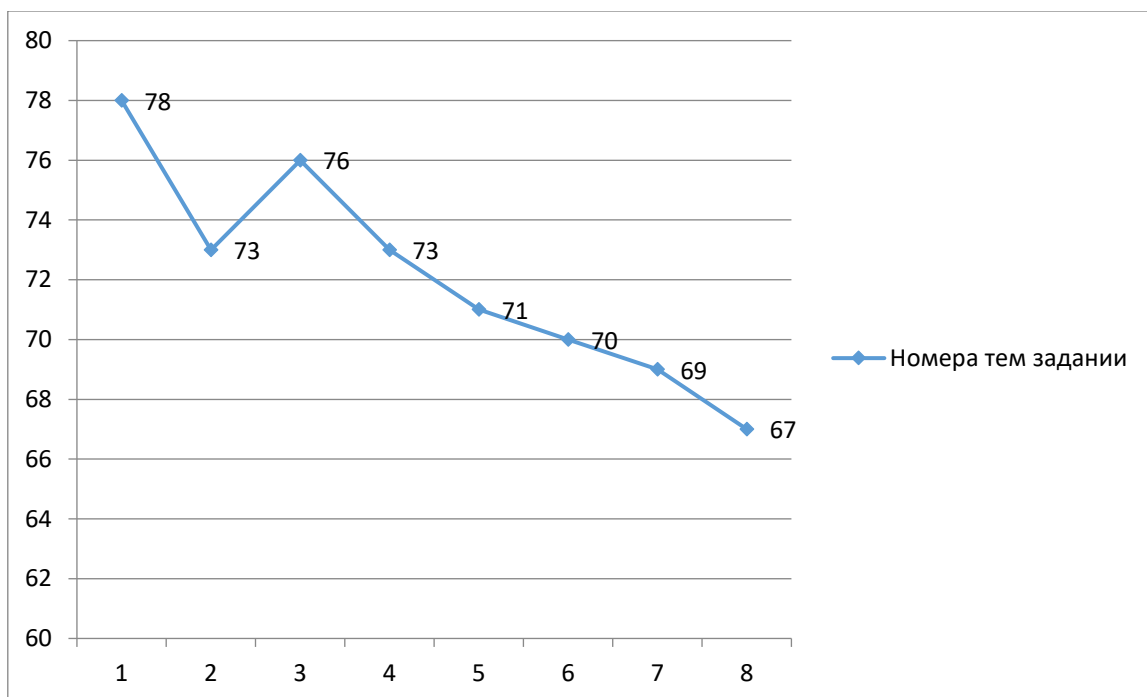


Рисунок 2. Результаты выполнения заданий второго уровня сложности

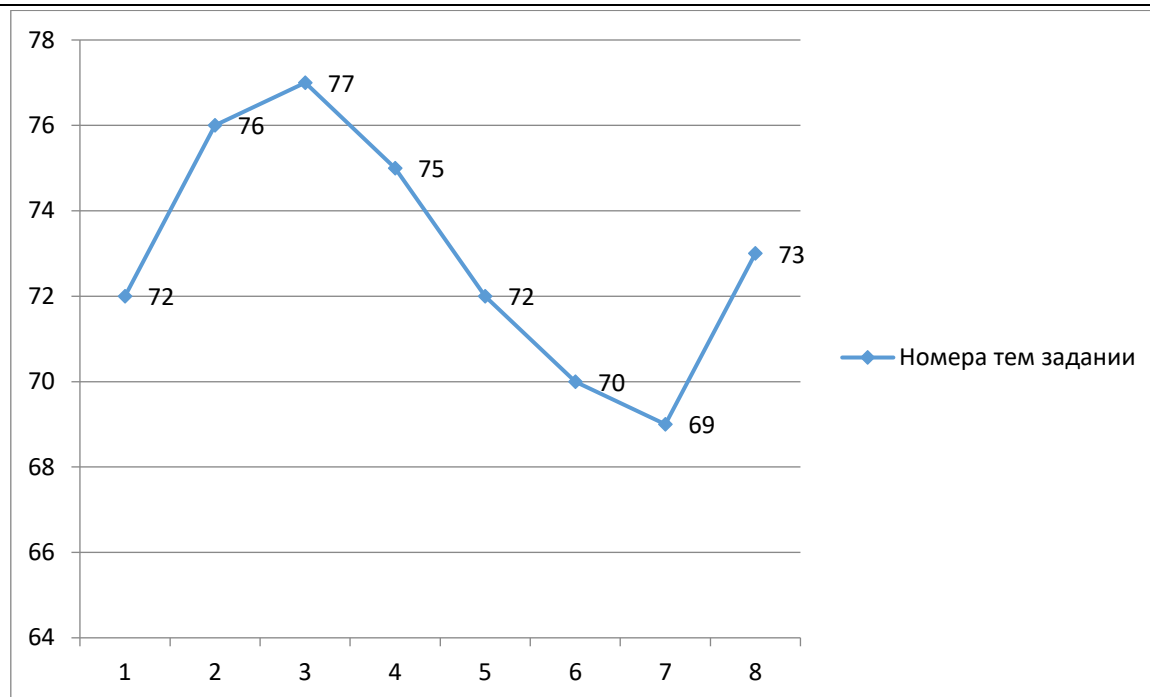


Рисунок 3. Результаты выполнения заданий третьего уровня сложности

Средний показатель качества выполнения заданий первого уровня составил чуть выше (76,8 %), чем показатели второго (72,1 %) и третьего (73,0 %) уровней сложности, что вполне объяснимо. Задания первого уровня сложности выбрали учащиеся, имеющие некоторые сложности в усвоении учебного материала (10 человек), второго уровня сложности – обучающиеся с хорошей предметной подготовкой, но испытывающие некоторые сложности творческом подходе при разработке учебных материалов (15 человек), третьего уровня сложности – учащиеся, обладающие творческими способностями и неординарностью (5 человек). Для объективной оценки выполненных заданий разного уровня должны быть разработаны соответствующие шкалы оценивания, согласно которым за ответы на задания первого, второго и третьего уровня сложности с одинаковыми баллами выставляются разные отметки, учитывающие уровень дифференциации заданий.

Таким образом, в рамках исследования критериальный подход к оцениванию заданий по курсу «Неорганическая химия» разного уровня сложности позволяет преподавателю оценить различные виды познавательной деятельности обучающихся, их творческие замыслы, мотивировать учащихся к дальнейшему профессиональному росту. Учащийся же, работая в рамках критериального подхода, может самостоятельно оценить свои возможности, впервые выполняя эти задания, а в перспективе – наметить пути самосовершенствования в методической и педагогической деятельности.

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# PHILOLOGICAL SCIENCES

## THE INFLUENCE OF PHONOLOGICAL AWARENESS ON LANGUAGE ACQUISITION IN CHILDREN

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### Abstract

This research investigates the impact of phonological awareness on language acquisition in children. It examines the development of phonological awareness skills in relation to language proficiency and explores potential applications for improving language education. The study combines quantitative assessments of phonological awareness with qualitative analysis of language acquisition in a sample of 200 elementary school children.

**Keywords:** Phonological Awareness, Language Acquisition, Children, Language Proficiency, Education.

### Introduction

Phonological awareness, the ability to recognize and manipulate the sounds in spoken language, plays a crucial role in language development. This study delves into the relationship between phonological awareness and language acquisition in children. The research is motivated by the significance of these skills for educational success and effective language instruction.

This section reviews existing research on phonological awareness and its connection to language acquisition. It covers studies that have investigated the development of phonological awareness in children and its effects on vocabulary and reading skills.

The research methodology used in this study is described, including participant selection, data collection procedures, and the phonological awareness assessments. The combination of quantitative and qualitative methods is detailed, explaining the rationale for this approach.

This section presents the quantitative findings of the study, focusing on the development of phonological awareness in children and its correlation with language proficiency. Qualitative data from interviews and language assessments are discussed in relation to these results.

The results are analyzed in the context of the existing literature, emphasizing the role of phonological awareness in language acquisition. Implications for language education and early intervention programs are explored. The limitations of the study and avenues for further research are also considered.

The study concludes by summarizing the key findings, emphasizing the critical role of phonological awareness in language acquisition, and suggesting strategies for enhancing language instruction. It highlights the potential for educational interventions to improve children's language development.

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# TECHNICAL SCIENCES

## MOST IMPORTANT TPPs FOR PERFORMING GRAPHICAL USER INTERFACE AND SCIENTIFIC CALCULATIONS IN PYTHON PROGRAMMING ENVIRONMENT

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### Abstract

Python (mainly Payton "and sometimes pronounced such as" python ") is developed by Guido Van Rossum in 1991. There are so many positive aspects of this language that the number does not end. First of all, Python is universal, this language can be written in various programs in this language. And the programs written in this language can work very easily in any operating system. In addition, Python fully meets the modern requirements of programming, its structural, object-oriented, functional and imperative are from OSAs advantages. One of the most advantages of Python language is that it is very easy to learn this language

**Keywords:** Python, editor, WinPython, Windows CMD, WinPython.

### 1.1 Graphical user interface (GUI) in the Python programming environment

First of all, for the convenience of the user (programming, testing, etc.), Python has a very popular basic programming environment (Python shell) at the level of interactive shell IDLE (Integrated Development Environment) Here, similar to Matlab, as a "calculator" from the command line can also be used. To write any calculation expressions and get the result, it is enough to press the "Enter" key of my keyboard, fig. 1.1.

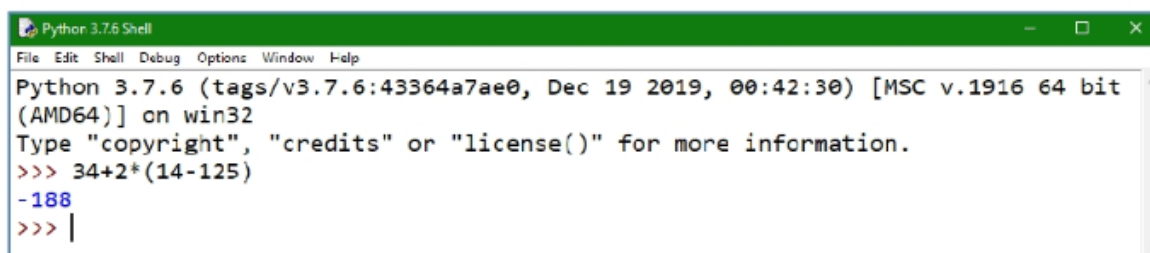


Figure 1.1. Python's traditional programming environment IQI: IDLE (Integrated Development Environment)

The Python programming environment has its own (that is, in the same IDLE IQI) special Python editor. If you need to call that editor to compile the program, you need to use IDLE's File! the New File command is selected from the menu (or by pressing the Ctrl+N keys from the keyboard). In the window that opens, it is possible to compile the program code, test it, and use ready-made programs, fig. 1.1.2.

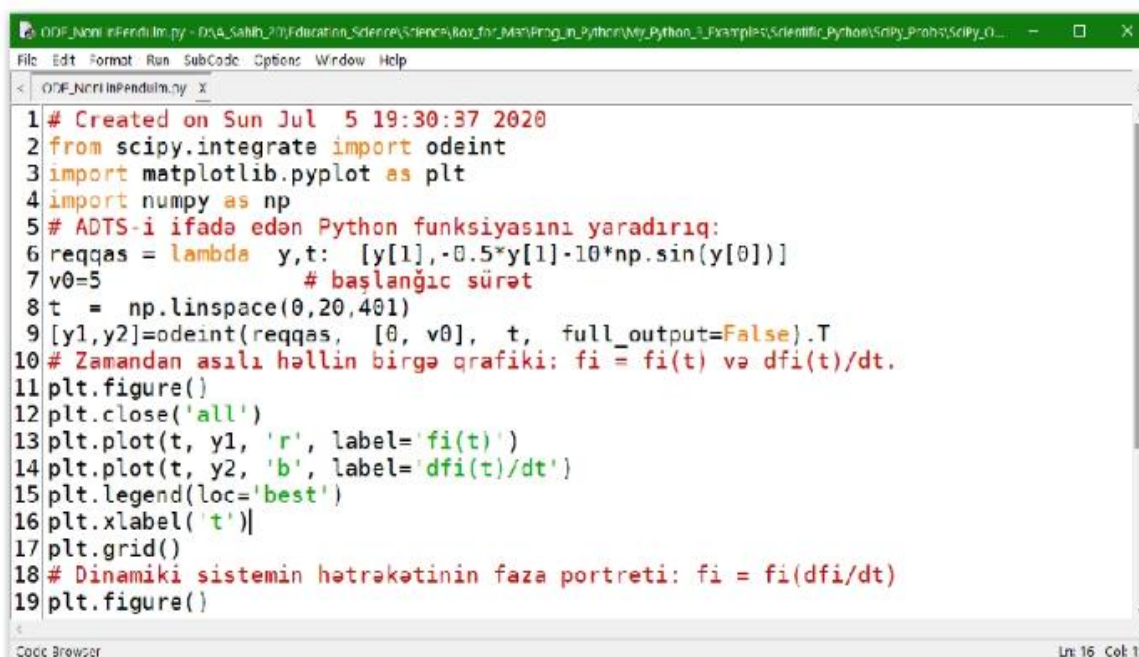
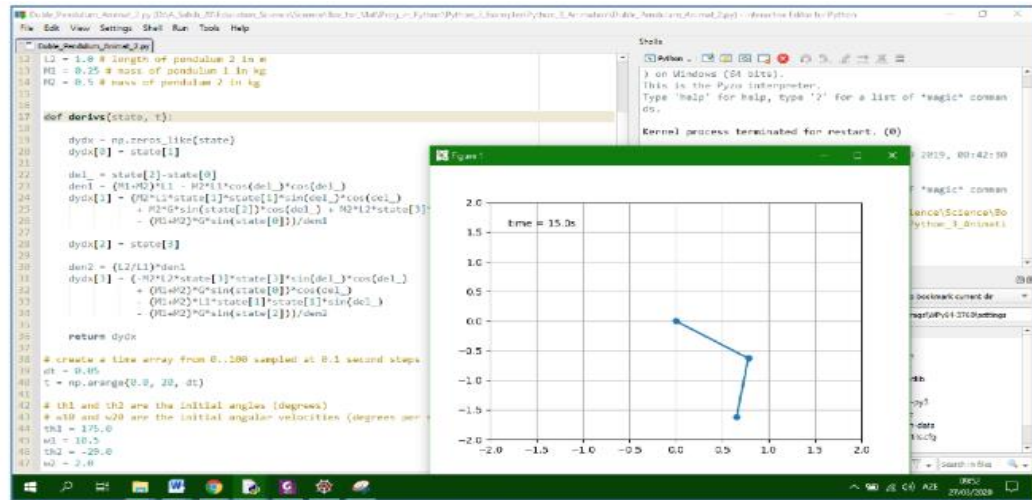


Figure 1.2. Programming editor of Python IDLE IQI (in this environment it is also possible to get graphs of obtained numerical results)

However, the reader should be aware that the same WinPython complex package also has other IQI-type wrappers for working comfortably in the Python language. For example, IQIs such as the more popular Pyzo and Spyder make it very convenient and convenient to write, test, and operate Python programs. fig. 1.1.2. shown in a and b.

a)



b)

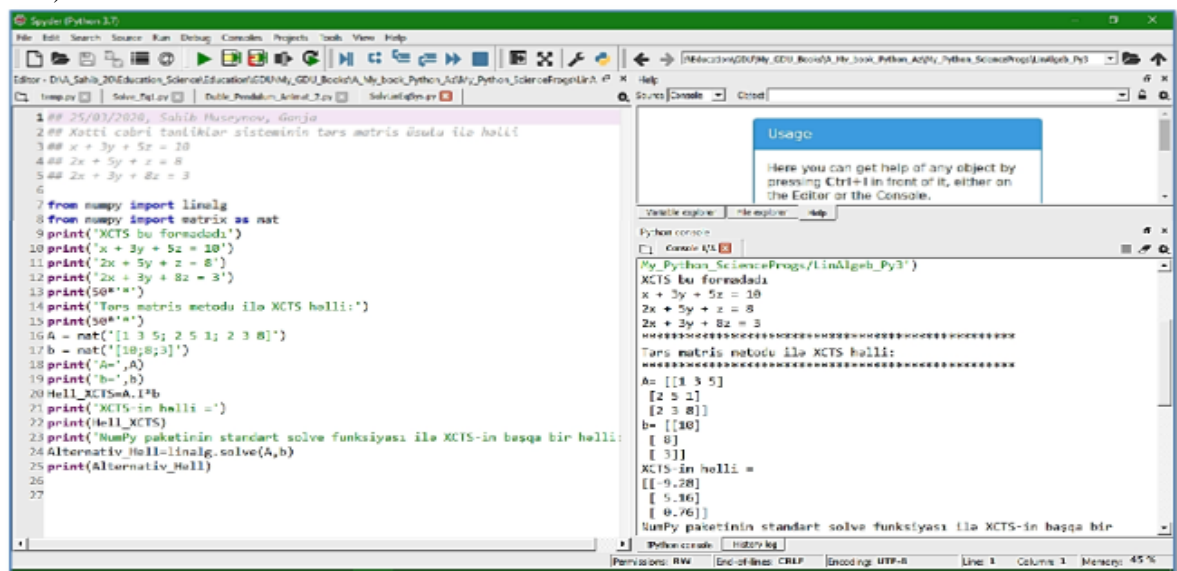


Figure 1.1.2. Additional IQIs of the Python programming language:

a) Spyder programming environment;

b) Piezo programming environment.

So, where is the best place for the user (that is, the reader of the book) to download the Python programming language itself and the scientific application programs (TPPs) written in Python used in this book? First of all, of course, you can visit the website of the Python language developers <https://www.python.org/downloads/>. In the new Python versions, there is a special small program utility for downloading the desired TPP from the Internet, and its name is PIP. So, it is important to have that PIP utility in the first place. In the second step, this method mainly applies to readers working with Windows OS, in the command line of the Windows CMD or Windows Power Shell command line window available in Windows 10 OS, it is enough to type such a command (for example, the name TPP in the example is written), the user should write here the

name of the TPP he is interested in, for example matplotlib, mayavi kuni, etc.)» `pip install TPP_name`

So, in automatic mode, you can download the necessary TPP from the Internet. But a more convenient way is to use the Python 3 version of the programming environment, especially considering that most readers' PCs are running Microsoft Windows. On the other hand, if you are interested in the application of Python in scientific computing, then this is the better way. To download Python itself, its TPPs more commonly used in scientific computing, plus 101s like Pyzo, Spyder, on computers running Windows OS, visit this site: <http://winpython.sourceforge.net/>. The name of that application package is WinPython. If the user needs additional TPP for some reason (for example, you need to use astropy TPP to perform astronomical calculations), then you can easily use the method I showed above. The



user (ie, specifically, the reader of this book) should take into account that the version of Python 3 that he downloads will be one of the last stable versions. The downloaded program and TPPs will be in portable form (that is, the user can place the program anywhere on his computer, even transfer it to his personal flash card if he wants). It is better to download Python version 3.7.6 and higher TPPs from that site on Windows 10 OS computer.

*SciPy is the most important TPP library for performing scientific calculations in the Python programming environment*

Currently, the Python programming language is used as the core language in the SciPy application program package (TPP), which is known as the most fundamental tool in scientific computing.

SciPy is a library of open-source application packages that includes high-quality scientific tools based on the Python programming language. SciPy actually stores the optimization, integration, special functions, flexible Fourier transforms, signal processing, image processing, ordinary differential equation solving, genetic algorithms used in science and engineering computing in the form of modules, like MATLAB and Scilab.

The main modules (or TPPs) of the SciPy library are:

- constants - stores physical and fundamental mathematical constants;
- is a set of procedures that perform cluster-vector quantization;
- fftpack is a collection of routines that perform discrete Fourier transform;
- integrate-tools for integration;
- interpolate are tools for interpolation;
- io - data input-output;
- lib - Python wrappers for external libraries,
- linalg - consists of procedures that perform the numerical solution of linear algebra problems;
- misc - includes various utilities;
- optimize - is a set of procedures that execute optimization procedures;
- sandbox - is a collection of experimental codes;
- signal - contains procedures intended for signal processing;
- sparse is a set of procedures for performing numerical operations on sparse matrices;
- special - is a set of special functions;
- stats - is a set of procedures that perform statistical calculations;
- weave- consists of procedures that perform the numerical solution of wave propagation problems;

Additional functionality of the SciPy library includes the following capabilities:

Scientific graphics. 2D scientific graphics from the Matplotlib package is currently the most recommended method. But HippoDraw, Chaco, and Biggles do can be used to create 2D graphics. For 3D scientific visualization iso Python Imaging Library vo MayaVi is very popular.

Optimization. SciPy has its own elements for optimization, but OpenOpt provides a large number of optimization packages.

With the help of state-of-the-art data analysis RPy, SciPy R's statistical package interface was designed for complex data analysis.

Database. SciPy can interact with PyTables, designed to efficiently manage large volumes of hierarchical data stored in HDFS files.

It should be noted that there is still a large number of standard libraries (TPP) based on the Python language. They are used all over the world, to one degree or another, as the most important tools for conducting computer modeling. Many of them may not be included in TPP SciPy. In this case, the user should download the scientific TPPs that interest him by the rules recommended above. Below is a list of all TPPs that work with the Python core, with explanations:

Interactive shell. IPython provides a MATLAB-like style of code generation and processing in an interactive environment.

Symbolic mathematics (performing analytical calculations). There are several libraries available for Python. Like PyDSTool, Symbolic, and SymPy

SciPy is a freely licensed library of open source TPPs for mathematics, natural sciences, and engineering (scientific TPPs are a repository).

It should be noted that there is still a large number of standard libraries (TPP) based on the Python language. They are used all over the world, to one degree or another, as the most important tools for conducting computer modeling. Many of them may not be included in TPP SciPy. In this case, the user should download the scientific TPPs that interest him by the rules recommended above. Below is a list of all TPPs that work with the Python core, with explanations:

CherryPy ("CerriPayin" [teri pai], pun: ing cherry pie is "cherry pie"), is an object-oriented Web-framework written in the Python programming language. It is designed for rapid development of Web-applications (programs) for the Internet network. HTTP is a super-structure on top of the protocol, but remains low-level and does not go beyond the scope of RFC 2616 requirements. CherryPy acts as a standalone Web server or can run under the control of another server plugin that supports the WSGI protocol.

Django - (Django, ['dʒæŋɡoo]) - is a loose framework for Web applications in Python that uses the MVC scheduling pattern. The project is supported by the Django Software Foundation. In Django, a site is created from one or more plugins (or programs), which are recommended to be removed and connected. One of the main principles of the framework - DRY (ing Don't repeat yourself). Also, unlike other frameworks, URL handlers in Django are explicitly configured using regular expressions, not automatically inferred from the controller's model structure.

GAE framework is a free framework for web-applications. Initially, the project was created as a Django analogue, fully integrated with Google App Engine and written in Python. In the GAE framework, a site is built from several plugins (or programs). It is recommended to do independent and connected. The GAE framework

uses an ORM from Google App Engine to work with the data store.

Genshi is a Python library that provides a unified set of components for parsing, preparing, and processing HTML, XML, or other textual content on the WEB. Genshi uses some web frameworks, such as CherryPy, TurboGears, Pylons and web2py. Genshi TPP replaces Kid in TurboGears 2.x.

Jinja (pronounced dzindzya) is a templater for the Python programming language. The textual language of these templates, and thus may have been used to create any icon, as well as the source code, is licensed under the BSD. The Jinja templater allows you to set up tags, filters, tests and global variables. Filters are very simple to use by the system (brought to the Unix pipeline).

JPyype is an extension to the Python programming language that gives programs full access to Java class libraries. Unlike Jython, it allows Python extensions to work at the greatest speed.

Matplotlib is a TPP in the Python programming environment for two-dimensional (2D) and three-dimensional (3D) data visualization with clmi graphics. Received images may be used as illustrations in publications.

The Natural Language Toolkit is the NLTK Library, or NTLK, a package of libraries and programs for symbolic and statistical natural language processing written in the Python programming language. Contains graphical representations (visualizations) and samples of data. It is accompanied by extensive documentation, including a book explaining key concepts for those natural language processing tasks that can be accomplished with this package. NTLK is free software.

NumPy is a TPP that adds support for large multi-dimensional arrays and matrices, a collection of high-level mathematical functions and numerical routines for array operations in Python (as in Matlab).

Pygame is a set (assembly) of Python programming language modules designed for writing computer games and multimedia applications (programs). My Pygame multimedia library is SDL-based.

PyGTK is a set of Python bindings for the GTK+ graphical interface library. PyGTK is a self-contained PT.

The main purpose of PyMidas is the TPP designed for the application of the MIDAS package in astronomical calculations. PyNGL is TPP (The University of Illinois/NCSA Open Source license). A module for the Python programming language used for visualization in the geological sciences for high-quality 2D special note scientific data visualization. It is used by the National Center for Atmospheric Research (NCAR), a US scientific organization.

PyObjC is a project that allows sharing libraries and classes of such programming languages. Similar to the structure of the Objective-C language.

PyQi-Python is a set of "bindings" of Qt, a graphical framework for the Python programming language, implemented as an extension. PyQt runs on all Q-t supported platforms: Linux and other UNIX-like S, Mac

OS X and Windows: PyQt realizes Qt capabilities practically completely. Over 600 classes, over 6000 functions and methods, including:

- 1) It is an available set of videos of the graphic interface;
- 2) consolidated widget styles.
- 3) Creates access to databases with the help of SQL-m (ODBC, MySQL, PostgreSQL, Oracle);
- 4) QScintilla, a text editor based on Scintilla: support for internationalization (i18n),
- 5) Maintains SVG support,
- 6) Supports Webkit-lo integration, HTML engine,
- 7) supports video and audio files. It also includes PyQt and Or Designer (Qt Creator) and uses it as a designer of the graphical user interface.

It is for developing web applications with open source code written in Python within the Pylons project.

PySide is an API-level Python wrapper around the Qt toolkit in PyQt.

Python Imaging Library (abbreviated as PIL) is a Python language library designed for working with raster graphics. Features of the library: support of binaries, indexed halftone and CMYK-4 of images; Support for BMP formats, EPS, GIF, JPEG, PDF, PNG, PNM, TIFF, ICO, MPEG, PCX, PSD, WMF and others.

SQLAlchemy is a Python programming library for working with application-relative VBIS of this ORM technology. Serves for synchronization of Python objects and relative database writes.

Tkinter is a cross-platform graphics library based on these Tk tools. The standard library includes Python. Tornado is an extensible, non-blocking Web server (written in Python and used as a server and framework).

Twisted supports events-oriented framework written in Python and distributed under the MIT license.

ZODB is a Python-object database (OOBD) object. It is used to organize more symposia, various types of online conferences and lectures (SERN-db is developed and used there).

The list of TPPs related to the scientific field in the Python programming environment given above could be expanded more, but here the most important points should be touched and the reader should be introduced to the most necessary mathematical or scientific TPPs first. From a practical point of view, as we have already talked about at the beginning of Chapter 1, Windows OS computer users, if they download the WinPython package, will be provided with all the basic packages used in scientific work. However, I would like to note that the most basic scientific package is, of course, the SciPy library itself, which contains the main scientific TPPs. The most important Python-based TPP in the scientific field is Numpy. In this TPP, it can be said that, the most important numerical methods are available, from linear algebra to the numerical solution of differential equations, and the programming environment in Numpy is the same as in Matlab. The second important TPP with the application of mathematical methods is SymPy. This TPP is related to the application of analytical mathematical methods in scientific research and the main analytical methods are represented here. Therefore, when researchers need to perform analytical



calculations, they do not need to resort to popular computer software with a proprietary license (i.e. paid for), SymPy can cope with its problem if it knows the TPP at an adequate level.

Finally, as the reader knows, scientific graphics are widely used in the conduct of every scientific work and in the analysis of results: that is, mainly the construction of various types of 2D and 3D graphics is envisaged. In this field, the most used TPP in the Python programming environment is Matplotlib.

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