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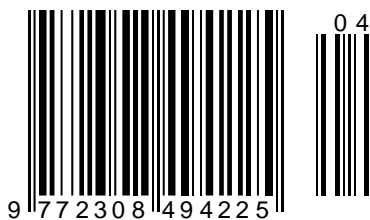
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Iwan Nauli Daulay
University of Riau
Jl. Binawidya Km 12.5, 28291,
Pekanbaru Riau, Indonesia
Faculty of Economics and Business

Husnul Khotimah
University of Riau
Jl. Binawidya Km 12.5, 28291,
Pekanbaru Riau, Indonesia
Faculty of Economics and Business

Fanni O. Kasmir
University of Riau
Jl. Binawidya Km 12.5, 28291,
Pekanbaru Riau, Indonesia
Faculty of Economics and Business

THE EFFECT OF TRUST, INFORMATION SHARING, COLLABORATION, AND AGILITY ON SUPPLY CHAIN MANAGEMENT PERFORMANCE MEDIATED BY RELATIONSHIP COMMITMENT AMONG BUILDING MATERIAL RETAILERS IN PEKANBARU

Abstract: Involving building material retailers, this study was carried out in Pekanbaru. The dependent variable under investigation is supply chain management performance,whichis theoretically affected by the independent variables that include trust, information sharing, collaboration, and agility. In this study, the relationship commitment is used as a mediation of the effect of each independent variable on the dependent variable.

The results of the study expound that all independent variables on structure 1 have a positive and insignificant direct effect on supply chain management performance,butthe relationship commitment significantly affects supply chain management performance.In structure 2, two independent variables significantly affect relationship commitment, which is trust and collaboration. Despite having an indirect effect, the relationship commitment has not been able to mediate the effect of information sharing and agility on supply chain management performance.

Key words: trust, information sharing, collaboration, agility, relationship commitment, supply chain management performance.

Language: English

Introduction
Background of the Study
Red The building materials industry in

Indonesia is expanding rapidly in line with the improvement in the national economy. Community welfare is a major contributor to the development of

the building materials industry because building materials are the key component in physical development in the form of infrastructure and facilities (www.kemenperin.go.en).

One of the reasons for the development of the building materials industry is various infrastructure projects from the government and the private sector. Building materials,like clothing and food, are basic needs, thus as the community's economy grows, so does the demand for building materials. If economic growth on a macro and micro scale continues to expand in both the business market and the consumer market, demand for building materials will continue to rise.

Government projects, from small scale to megaprojects, are the main target market in the business market, and they present enormous potential for the building materials market.Then, private projects have also become a big market opportunity in increasing the demand for building materials. Similarly, to the consumer market, the increasing need for housing has prompted development companies to recognize the rising demand for housing among consumers.

In Indonesia, the need for housing continues to increase along with the increase in population. The One Million Houses Programis a housing development program that began in 2015 and continues to grow to address the community's housing needs. In 2015, the program built approximately 700,000 units and in 2016 it reached more than 800,000 units. Seeing the program's progress, it was decided to continue it in 2017 with a result of 765,120 units, and in 2018, it was able to reach the target of 1,091,255 units (finance.detik.com). This rise demonstrates that the human need for housing remains significant. The high demand for housing and infrastructure development are good opportunities for the building materials industry. According to the data, sales of building materials climbed by 16.5% from 2016 to 2017 when compared to the previous year (Rzk, 2017).

To compete and succeed in business, a solid relationship between suppliers, internal business process and customers is required. The building materials retail industry must prioritize aspects of strong relations with suppliers and consumers. These business actors recognize that the use of supply chain management (SCM) is believed to be correctly managed to boost competitiveness in the corporate sector and to meet and even satisfy consumer demand.

To implement supply chain management effectively, a good cooperation system is needed between sellers (trading partners) and suppliers. Smoothness and enhanced intensity insupply chain managementhave an automatic impact on demand for commodities(Lee, Kwon, & Severance, 2007).

Supply chain integration is one of the main strategies to improve supply chain performance (Lee et al., 2007). Effective integration can increase the value shared by all members in a supply chain system. Interconnected business processes can improve supply chain performance through lower operating costs, shorter delivery times, lower inventory levels, and improved reliability (Heizer & Render, 2010).

Supply chain management is an extension and development of the concept of logistics management (Indrajit &Djokopranoto, 2005). A supply chain management system involves the processes of producing, shipping, storing, distributing, and selling products to meet the demand for these products. The supply chain includes all processes and activities involved in delivering the product to consumers (Mentzer et al., 2001).

The goal of supply chain management is to coordinate operations throughout the supply chain to maximize the competitive advantage and benefits to the end consumer. A successful supply chain, like a championship team, is defined by its members behaving in the team's best interests(supply chain) (Heizer&Render,2015; 499). Supply Chain Management is a strategy that can help the company improve its performance to survive and excel in the market. Several factors affecting the supply chain management performance are trust, information sharing, agility, and relationship commitment.

Sudden swings in market demand are a frequent thing in the building materials market, and when there is a dramatic shift in demand, retailers scramble to deliver services to customers.This, however, can be overcome with a flexible supply chain system, such as a business application system that aids communication and administration of buying and selling, as well as an effective warehouse and transportation management system supported by optimal inventory control, which will result in a fast reply or agility. The following problem was formulated in light of the research's background:(1) How do trust, information sharing, collaboration, and agility affect supply chain management performance? (2)How does relationship commitment affect supply chain management performance? (3)How do trust, information sharing, collaboration, and agility affect relationship commitment?

Literature Review
Trust

Trust is the foundation of business. Customer loyalty is based on the development of trust in long-term relationships with customers. Other parties/business partners will not automatically recognize this trust; it must be created from the ground up and proven. According to Swanetal (1998 in Ahmadi, 2009) trust that a cooperative relationship will bring benefits as expected by both sides, assessed by indicators of open communication, sharing of important information, trustworthiness,

accountability, and experience is a type of excellence in being dedicated to an organizational cooperative relationship. Kwon and Taewon (2004) mention that the success of the operation performedin the supply chain also comes from the high trust and strong commitment between partners in the supply chain. In a supply chain system, the partnership process is defined as the interaction between commitment, trust, and collaboration between companies.

Information Sharing

Data that has been processed and is helpful is referred to as information. As a result, information may be used as a basis for decision-making, and companies that can effectively use it can benefit. Information is needed to make supply chain management because this information is the basis of the supply chain process. Apart from the flow of goods from upstream to downstream, supply chain management also involves the flow of information.

Collaboration

Collaboration is a business process in which two organizations collaborate to develop, implement, and build an effective and efficient supply chain to accomplish mutual goals and advantages(Cao & Zhang, 2011). Collaboration is another significant factor in boosting company productivity; it can take the shape of information sharing, product development, and other activities. Collaboration is the combining of views and ideas from all supply chain partners to create added value and achieve a common goal of addressing consumer needs, which can result in cost savings and improved customer service. A high level of collaboration can encourage the improvement of the company's supply chain management performance. A previous study conducted by Kurniawan and Kusumawardhani (2017) elucidates that collaboration has a significant influence on the performance of SMEs of Batik in Pekalongan.

Agility

Supply Chain Agility is the ability or agility of the supply chain process to adapt to disruption, market changes, customer desires to improve competitiveness with similar products, and so on. The current business environment is characterized by shorter product life cycles and a high level of uncertainty in customer demand. Supply Chain Agility is an important concept for organizations in dealing with uncertainty and constantly changing business environment.

Relationship Commitment

Supplier commitment is a promise, pledge, or determination of the supplier to establish a sustainable relationship with the buyer (Morgan & Hunt, 1994). Supplier commitment demonstrates that

the supplier views the continuation of his buyer's relationship as something that must be properly maintained. Moore (1998) argues that a supplier that exhibits his dedication to a long-term relationship with his buyer demonstrates that he is not an opportunistic supplier.Commitment, like trust, expresses directly and frankly about company secrets, beyond the interest of planning the relationship, but commitment implies trust that the partner will act with integrity.

Supply Chain Management

Russell and Taylor (2016) define supply chain management as a scientific focus that integrates and regulates the movement of goods and services and information throughout the supply chain to be responsive to customer needs while reducing total costs. Another definition was put forward by Li Ling (2007: 5) who defines supply chain management as the integration of suppliers, manufacturers, warehouses, transportation services, and consumers efficiently in a set of interrelated activities and decisions. The concept of supply chain management is the arrangement of operational activities from suppliers to end-users without any significant stumbling blocks. Information is transparently shared between departments. The main principle is the sharing of information from all organizations involved in the supply chain. Supply chain management is the expansion and development of the concept of logistics management (Indrajit &Djokopranoto, 2015). A supply chain management system involves the processes of producing, shipping, storing, distributing, and selling products to meet the demand for these products. The supply chain includes all processes and activities involved in delivering the product to consumers (Mentzer, et al., 2001).

Hypothesis Development

Based on the problem definition and analysis of the available data, several hypotheses were established:

H1 : Trust has a significant effect on supply chain management performance.

H2 : Information sharing has a significant effect on supply chain management performance.

H3 : Collaboration has a significant effect on supply chain management performance.

H4 : Agility has a significant effect on supply chain management performance.

H5 : Relationship commitment has a significant effect on supply chain management performance.

H6 : Trust has a significant effect on relationship commitment.

H7 : Information sharing has a significant effect on relationship commitment.

H8 : Collaboration has a significant effect on relationship commitment.

H9 : Agility has a significant effect on

relationship commitment.

H10 :There is an indirect effect of trust on supply chain management performance mediated byrelationship commitment.

H11 :There is an indirect effect of information sharing on supply chain management performance mediated by relationship commitment.

H12 :There is an indirect effect of collaboration on supply chain management performance mediated by relationship commitment.

H13 :There is an indirect effect of agility on supply chain management performance mediated by relationship commitment.

Method
Research Site
This study was carried out in Pekanbaru, Riau, Indonesia. The object of this research is the building materials retailers in Pekanbaru.

Populationand Sample
The sample is part of the number and characteristics of the population. If a researcher cannot investigate the entire population owing to a lack of funding, manpower, or time, the researcher can use samples taken from the population. Slovin's formula was utilized for the research sampling.

Sample size calculation:

$n = N / (1 + (N \times e2))$
$= 171 / (1 + (171 \times 0,052))$
$= 171 / (1 + 0,42)$
$= 171 / 1,42$
$= 120,4 \approx 120$

From the calculation, the samples taken by the researchers were 120 building material shops in Pekanbaru. However, there were only 102 shops that were willing to become objects of the study.

Data Analysis
1. Descriptive Analysis of Respondents' Responses

Descriptive analysis aims to describe and explain the study data that has been collected. The data is usually presented in tabular form, and the analysis is carried out following the data in the tables. Descriptive analysis is a technique for analyzing data one by one based on responses obtained during the research by describing the object under investigation through the sample as it is and drawing generally accepted conclusions (Sugiyono, 2009).

2. Validity and Reliability Test
- Validity Test

A validity test is used to measure the validity or validity of a questionnaire. A questionnaire is said to be valid if the items on the questionnaire can reveal something that is measured by the questionnaire. The statement item is valid if the rcount is greater than the rtable (rcount>rtable) and if the rcount is smaller than the rtable (rcount<rtable), the statement item is invalid (Ghozali, 2011: 52).

- Reliability Test

The reliability test is used to assess the questionnaire's reliability as a predictor of a variable. A questionnaire is said to be reliable if a person's answer to the statement is consistent or stable from time to time. A construct or variable is said to be reliable if it gives a Cronbach's Alpha is greater than 0.60 (Ghozali, 2011: 38).

3. Classical Assumption Test

The classical assumption test intends to find out whether the regression model made can be used as a good predictor. In the classical assumption test, tests that must be carried out, among others, are the normality test, multicollinearity test, and heteroscedasticity test.

4. Hypothesis Test
• Linear Regression

According to Sekaran (2006), linear regression is conducted to examine the effect of the independent variable on one dependent variable on an interval scale. Multiple linear regression is used to determine the effect of the independent variable on the dependent variable. Both analyses reveal the relationship between the independent variable (x) and the dependent variable (y).

• F-test (Overal)

According to Ghozali (2013: 98), the F-test shows whether all independent variables included in the model have a simultaneouseffect on the dependent variable.

• T-test (Partial)

According to Ghozali (2013), the T-test shows how far the effect of each independent variable in explaining the dependent variable. The test was carried out using a 0.05 level of significance (α=5%).

5. Path Analysis

Path analysis is used to analyze causal relationships in multiple regression if theindependent variables have a direct and indirect effect on the dependent variable and the independent and dependent variables are analyzed in stages. Path analysis is an extension of multiple regression analysis, or in other word, path analysis is the use of regression analysis to estimate causality between variables that have been previously determined in theories (Baihaqi, 2010).

Overview Of Research Object
Pekanbaru
Geographically, Pekanbaru is located between 101014'- 101034'E and 0025'- 0045' Nwith regional boundaries of:

1. In the north, it is bordered by Siak Regency and Kampar Regency

2. In the south, it is bordered by Kampar Regency and Pelalawan Regency

3. In the east, it is bordered by Siak Regency and Pelalawan Regency

4. In the west, it is bordered by Kampar Regency

Pekanbaru is under the administrative area and the capital city of Riau Province. The area of Pekanbaru covers 632.26 Km2. Tenayan Raya, RumbaiPesisir, and Rumbai districts are the three largest districts in Pekanbaru. Pekanbaru was formerly known by the name "Senapelan" which at that time was led by a tribal chief called Batin.

Continuing to grow, PayungSekaki or Senapelan plays an important role in trade traffic. The strategic location and the calm and deep Siak River make this village hold a cross position from the remote areas ofTapung, Minangkabau, and Kampar. This stimulates the development of road facilities through TeratakBuluh (Sungai Kelulut) route, Tangkerang to Senapelan as a strategic area, and becomes a fairly important trade gateway. Table 1 presents the population of the city of Pekanbaru.

Table 1. The Population of Each District in Pekanbaru

No.	District	Population (thousand)		
		2018	2019	2020
1	Tampan	171,232	181,910	203.238
2	PayungSekaki	91,072	94,965	96.296
3	Bukit Raya	91,197	93,337	93.478
4	Marpoyan Damai	126,112	130,303	127.600
5	Tenayan Raya	129,650	136,448	154.261
6	Limapuluh	42,365	43,461	38.613
7	Sail	22,736	23,285	20.384
8	Pekanbaru Kota	25,835	26,645	22.604
9	Sukajadi	46,317	47,672	42.852
10	Senapelan	37,623	38,292	35.357
11	Rumbai	63,970	68,451	78.185
12	Rumbaipesisir	67,757	69,604	70.488
	Total	915,866	954,373	983,356

Source: BPS ofPekanbaru

From 2018 to 2020, the population growth rate in Pekanbaru is constantly increasing, especially in urban areas which are developed into residential areas. Tampan and Tenayan Raya Districts show the largest population growth from 2018 to 2020, which is supported by their vast areas as well as a good geographical location.

Building Materials Retailer

According to Kotler and Keller (2006), a retail or retail marketing mix is a set of marketing tools that companies use to pursue their marketing goals. Retail consists of all actions made by a company to affect demand for its product and all possible actions taken by the company can be represented as a set of variables,which include product, location, price, and promotion. Retailing is a business venture that seeks to market goods and services to end consumers who use them for personal and household purposes. Products sold in the retail business are goods, services, or a combination of the two (Berman & Evans, in Utami, 2018).

The retail industry in Indonesia has been stated in several regulations, ranging from presidential regulations toministerial regulations such as Minister of Trade Regulation number 70 of 2013 concerning Guidelines for Structuring and Fostering Traditional Markets, Shopping Centers, and Modern Stores.

According to the Great Indonesian Dictionary, building materials are goods that serve as the basis for building a house or building. Building materials have an important role in building construction such as determining the strength, security, safety, and durability of a building. Natural materials such as clay, sand, wood, and stone are used to make buildings. Apart from natural materials, artificial products are also widely used such as ceramics, gypsum, and paint. The development of the building materials industry in recent years is growing rapidly, supported by adequate equipment and resources for creating high-performance building materials. Population growth and increasingly dense settlements open up business opportunities for the business to enter the existing market.

The building materials retailer is a business in the trading, buying, and selling building materials such as iron, nails, cement, zinc, and other building materials. With the development of the property business making the building materials business one of the most sought-after enterprises, the building materials business also promises a decent profit while the risk of loss is low. Based on data from the formal industry of Pekanbaruin 2018, there are 171 building material retailers in Pekanbaru.

Results And Discussion
Respondents Overview
The samples in this study were all shops or retailers of building materials in Pekanbaru. Purposive sampling was done by determining the respondents' criteria of store owners or managers with experience in doing the retail business. 102 respondents were filling out the questionnaire with the assistance of the researcher.

Descriptive Results of the Responses
The following scale is used for the assessment (Sugiyono, 2013: 58):

$$Rs = \frac{(m-1)}{5} = \frac{(5-1)=4}{5} = 0.8$$

Table 2 specifies the range of the response rating scales:

Table 2. Measurement Scale

Scale	Description
4.21 – 5	Strongly Agree
3.41 – 4.2	Agree
2.61 - 3.4	Neutral
1.81 – 2.6	Disagree
1 – 1.8	Strongly Disagree

Source: Processed Data, 2022

The descriptive results in this study are the results of the calculation of the mean from the responses of each variable, which is illustrated in Figure 1.
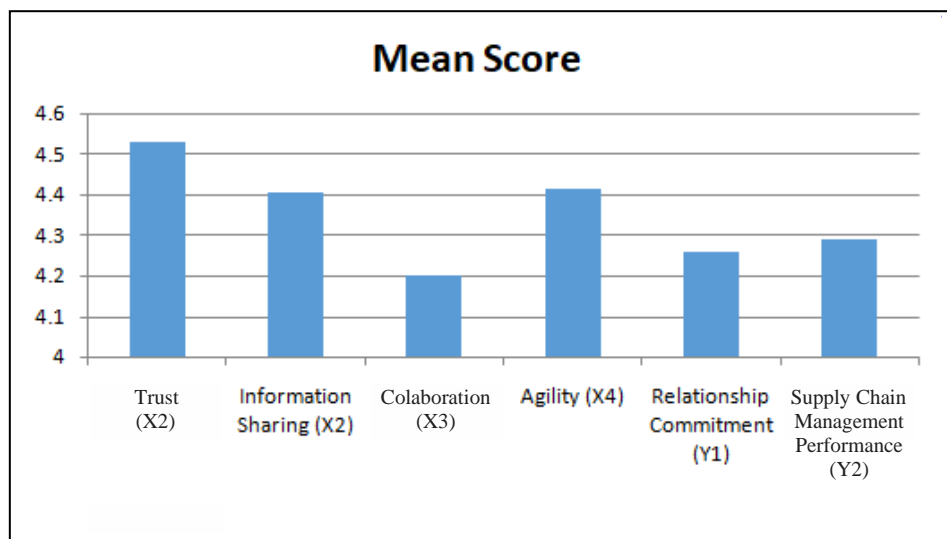
Figure 1 - Descriptive Results of the Responses

Based on Figure 1, the mean score of each variable is above 4. Therefore, all variables are involved in the Good and Very Good categories. Confidence (X1) has the highest value of 4.527 and is categorized as Strongly Agree or Very Good. Successful Information sharing (X2) is 4.405 in the Good category, Collaboration (X3) is 4.2 in the Good category, Agility (X4) is 4.413 in the Very Good category, Relationship Commitment (Y1) is 4.26 in the Very Good category, and Supply Chain Management Performance (Y2) is 4.289 in the category of Very Good. The variable Confidence has the highest mean score compared to other variables.

Results and Discussion
Validity Test

The correlation coefficient of each statement item is compared with the rtable of 0.192.It is declared valid if the rcountis greater thanthe rtable. The validity test results are described in Table 3.

Table 3. Validity Test Results

Item	Variable	Indicator	r_{count}	r_{table}	Description
1.	*Trust*(X1)	T1	0.695	0.192	Valid
		T2	0.821	0.192	Valid
		T3	0.784	0.192	Valid
		T4	0.529	0.192	Valid
		T5	0.661	0.192	Valid
2.	*Information Sharing (X2)*	IS1	0.582	0.192	Valid
		IS2	0.730	0.192	Valid
		IS3	0.478	0.192	Valid
		IS4	0.367	0.192	Valid
		IS5	0.664	0.192	Valid
		IS6	0.665	0.192	Valid
		IS7	0.364	0.192	Valid
3.	*Collaboration*(X3)	Co1	0.498	0.192	Valid
		Co2	0.490	0.192	Valid
		Co3	0.649	0.192	Valid
		Co4	0.385	0.192	Valid
		Ko5	0.481	0.192	Valid
4.	*Agility (X4)*	A1	0.435	0.192	Valid
		A2	0.668	0.192	Valid
		A3	0.247	0.192	Valid
		A4	0.297	0.192	Valid
		A5	0.456	0.192	Valid
5.	*Relationship Commitment* (Y1)	RC1	0.278	0.192	Valid
		RC2	0.622	0.192	Valid
		RC3	0.536	0.192	Valid
		RC4	0.729	0.192	Valid
		RC5	0.486	0.192	Valid
6.	*Supply Chain Management Performance* (Y2)	SCMP1	0.654	0.192	Valid
		SCMP2	0.510	0.192	Valid
		SCMP3	0.714	0.192	Valid
		SCMP4	0.495	0.192	Valid
		SCMP5	0.529	0.192	Valid
		SCMP6	0.653	0.192	Valid

Source: Processed Data, 2022

Table 3 shows that all indicators used to measure the variables in this study have a correlation coefficient greater than the rtable. Therefore, all of these indicators are declared valid. Valid means that all items in the questionnaire can be stated as relevant and accurate.

Reliability Test

To produce reliable data, a reliability test was carried out. SPSS Statistics 21.0 for Windows provides a facility to measure reliability with the Cronbach Alpha. An item is reliable if it has a Cronbach's Alphaequal to or more than 0.60.

Table 4. Reliability Test Results

No.	Variable	Alpha	Description
1.	*Trust*(X1)	0.865	Reliable
2.	*Information Sharing*(X2)	0.808	Reliable
3.	Collaboration (Y)	0.733	Reliable
4.	*Agility* (X4)	0.656	Reliable
5.	*Relationship Commitment* (Y1)	0.760	Reliable
6.	*Supply Chain Management Performance* (Y2)	0.821	Reliable

Source: Processed Data, 2022

Table 4 shows that all variables have acoefficientgreater than 0.6.Therefore, the questionnaire can be declared reliable.

Structure 1, All X Variables on Supply Chain Management Performance (Y2)

A good regression model has normal or close to normal data, no multicollinearity between independent variables, and no heteroscedasticity. Figure 2 displaysthe results of the normality test using a plot or diagram which shows that the data is normal because it forms a normal distribution diagram.
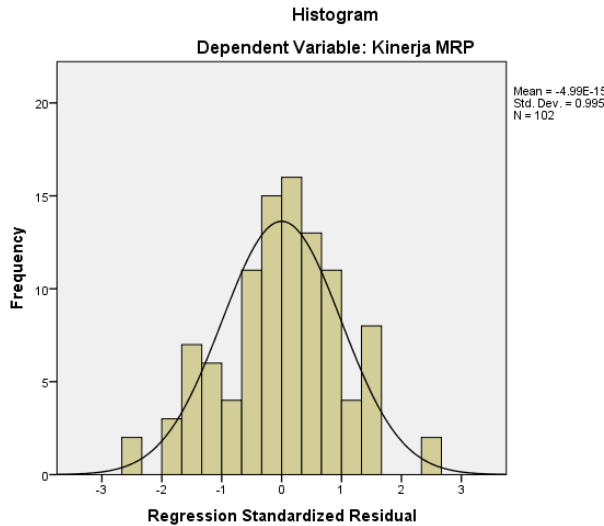
Figure 2 - The Histogram

Based on Figure 2, the data is normally distributed so that it can be used in linear regression. Figure 3 displays a P-P Plot of the regression to determine the linearity of the independent variable to the dependent variable.
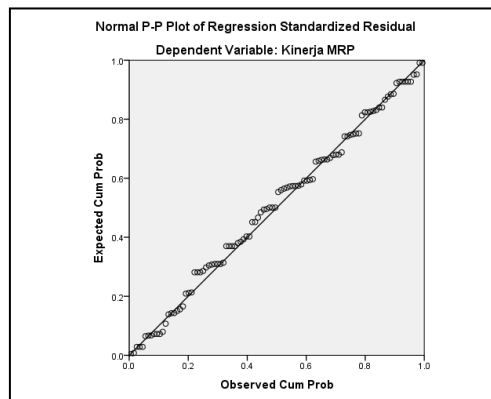
Figure 3 - The P-P Plot

Multiple Linear Regression

Linear regression is used to determine whether there is an effect of the independent variable on the dependent variable by looking for the effect of the independent variable on the dependent variable. Table 5 details the results of multiple linear regression of all independent variables on Supply Chain management Performance (Y2).

Table 5. Multiple Linear Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6.753	3.143		2.149	.034		
	Trust	.096	.110	.085	.871	.386	.639	1.566
	Information Sharing	.111	.077	.136	1.440	.153	.676	1.479
	Collaboration	.025	.116	.023	.220	.827	.561	1.782
	Agility	.140	.116	.116	1.204	.232	.655	1.528
	Relationship Commitment	.611	.124	.493	4.937	.000	.607	1.648

a. Dependent Variable: Supply Chain Management Performance
Source: Processed data of SPSS Statistics21.0, 2022

Table 5 depicts that the structure does not show multicollinearity because the value of VIF is smaller than 10 and tolerance isgreater than 0.01, then there is only one independent variable which is also a mediating variable, namely relationship commitment (Y1) which has a significant effect on supply chain management (Y2) as indicated by the sig. value of 0.000 is smaller than 0.05.

Table 6. Structure 1 Modelling ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	490.302	5	98.060	13.865	.000[b]
	Residual	678.953	96	7.072		
	Total	1169.255	101			

a. Dependent Variable: Supply Chain Management Performance
b. Predictors: (Constant), Relationship Commitment, Information Sharing, Agility, Trust, Collaboration
Source: Processed data of SPSS Statistics21.0, 2022

Based on Table 6, the structural model shows that all independent variables have a significant effecton the dependent variable with the sig.is smaller than 0.05. The results of the coefficient of determination test are presented in Table 7.

Table 7. Coefficient of Determination Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.648[a]	.419	.389	2.65940	2.157

a. Predictors: (Constant), Relationship Commitment, Information Sharing, Agility, Trust,Collaboration
b. Dependent Variable: Supply Chain Management Performance
Source: Processed data of SPSS Statistics21.0, 2022

The magnitude of the coefficient of determination is 0.419 implying that the effect of all independent variables on the Supply Chain Management Performance(Y2) is 41.9%, while the remaining 58.1% are affected by other factors not examined in this study. The error value from the results of the coefficient of determination is:

$$e2 = \sqrt{1 - R^2}$$

$$e2 = \sqrt{1 - 0.419} = \sqrt{0.581} = 0.762$$

Structure 2, All X Variables on Relationship Commitment (Y1)

A good regression model has normal or close to normal data, no multicollinearity between independent variables, and no heteroscedasticity. Figure 4 presents the results of the plot of the normality test t using a plot showing that the data is normal.

Figure 4 - Histogram

Based on Figure 4,data is normally distributed so that it can be used in linear regression. Figure 5 is a P-P Plot of the regression to determine the linearity of the independent variable to the dependent variable.
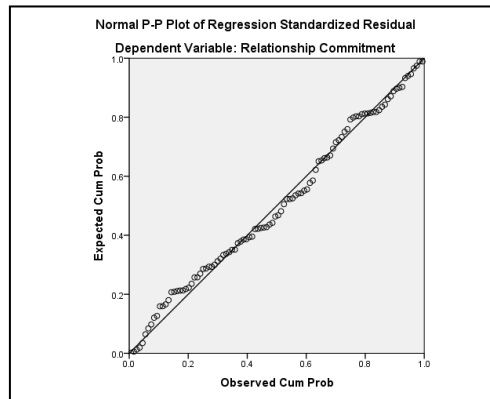
Figure 5 - The P-P Plot

Multiple Linear Regression

Table 8 portray the results of multiple linear regression of all independent variables on Relationship Commitment (Y2).

Tabel 8. Multiple Linear Analysis
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6.769	2.485		2.724	.008		
	Trust	.189	.088	.207	2.138	.035	.669	1.495
	Information Sharing	.028	.063	.042	.436	.664	.677	1.476
	Collaboration	.378	.087	.419	4.339	.000	.670	1.492
	Agility	.172	.094	.176	1.827	.071	.677	1.477

a. Dependent Variable: Relationship Commitment
Source: Processed data of SPSS Statistics21.0, 2022

The structure does not show multicollinearity because the VIF value is smaller than 10 and tolerance is greater than 0.01. There are two independent variables, namely Trust (X1) and Collaboration (X3), which have a significant effect on Relationship Commitment (Y1) as seen from the sig 0.000, whichis smaller than 0.05.

Tabel 9. Structure 2 Modelling

ANOVAᵃ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	299.303	4	74.826	15.725	.000ᵇ
	Residual	461.566	97	4.758		
	Total	760.869	101			

a. Dependent Variable: Relationship Commitment
b. Predictors: (Constant), Agility, Information Sharing, Collaboration, Trust
Source: Processed data of SPSS Statistics21.0, 2022

The structural model shows that all independent variables have a significant effect on the dependent variable with a sig.smaller than 0.05. Thus, the coefficient of determination test is presented in Table 9.

Tabel 10. Coefficient of Determination

Model Summaryᵇ

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.627ᵃ	.393	.368	2.18138	1.875

a. Predictors: (Constant), Agility, Information Sharing, Collaboration, Trust
b. Dependent Variable: Relationship Commitment
Source: Processed data of SPSS Statistics21.0, 2022

The magnitude of the coefficient of determination is 0.393, which means that the effect of all independent variables on relationship commitment (Y1) is 39.3%, while the remaining 60.7% there are other factors not examined in this study. Then the error value from the results of the coefficient of determination is:
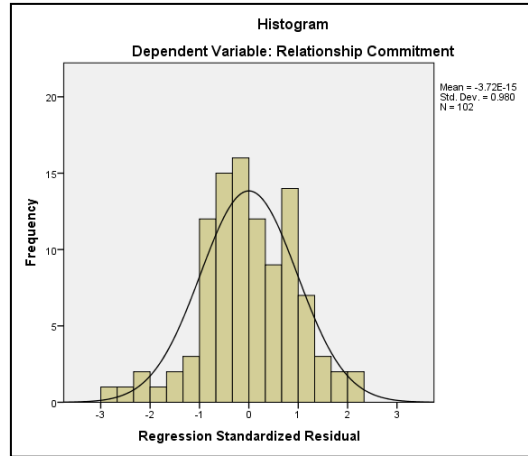
$$e1 = \sqrt{1 - R^2}$$
$$e1 = \sqrt{1 - 0{,}393} = \sqrt{0{,}607} = 0{,}779$$

Conclusion And Suggestion
Conclusion
The results of the research and discussion can be used to discuss the problems raised in this study, allowing it to be concluded that:

1. Trust has a positive and insignificant impact on Supply Chain Management Performance.
2. Information sharing has a positive and insignificant effect on Supply Chain Management Performance.
3. Collaboration has a positive and insignificant effect on Supply Chain Management Performance.
4. Agility has a positive and insignificant effect on Supply Chain Management Performance.
5. Relationship commitment has a positive and significant effect on Supply Chain Management Performance.
6. Trust has a positive and significant effect on relationship commitment.
7. Information sharing has a positive and insignificant effect on Relationship Commitment.
8. Collaboration has a positive and significant effect on Relationship Commitment.
9. Agility has a positive and insignificant effect on relationship commitment.
10. The indirect effect of Trust (X1) on Supply Chain Management Performance(Y2) mediated by Relationship Commitment (Y1) has a total effect of 0.187 which is quite weak, but relationship commitment can be a full mediation because the magnitude of the indirect effect is 0.102, which is greater than 0.085, the direct effect.
11. The indirect effect of Information Sharing (X2) on Supply Chain Management Performance(Y2) mediated by Relationship Commitment (Y1) has a total effect of 0.157 which is quite weak, but relationship commitment cannot be a full mediation because the magnitude of the indirect effect is 0.020, which is smaller than 0.136, the direct effect.
12. The indirect effect of Collaboration (X3) on Supply Chain Management Performance(Y2) mediated by Relationship Commitment (Y1) has a total effect of 0.207 which is quite strong, and relationship commitment can be a full mediation

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because the magnitude of the indirect effect is 0.207, which is greater than 0.023 the direct effect.

13. The indirect effect of Agility (X4) on Supply Chain Management Performance(Y2) mediated by Relationship Commitment (Y1) with a total effect of 0.203 is quite strong, and relationship commitment cannot be a full mediation because the magnitude of the indirect effect is 0.087, which is smaller than0.116, the direct effect.

Suggestion

The following are some suggestions that can be made based on the findings and literature research in this study.

1. It is necessary to improve the relationship between distributors and retailers, especially concerning trust, information sharing, collaboration, and agility to create a significant effect on supply chain management performance.

2. A relationship should be maintained and improved since it exhibitsa significant effect on supply chain management performance, particularly commitment to material availability or readiness, including payment commitments and on-time delivery. This variable is very important because it can mediate the effect of trust and collaboration on supply chain management performance.

3. Building and maintaining trust through integrity, keeping promises, attention to the problems, and sincerity in cooperation between retailers and distributors will improve the company's supply chain management performance.

4. It is necessary to improve more adequate information and communication systems to provide agile ordering as well as providing data and information in forecasting future needs.

5. Establishing intensive collaboration through promotional support from factories and distributors as well as appropriate and strategic transportation and warehouse facilities can increase the effectiveness and efficiency of the company.

6. Future researchers are expected to improve this research by trying other variables related to supply chain management.

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K.S. Tattibekov
Dulaty university
Candidate of Physical and Mathematical Sciences,
Associate Professor.
Taraz c., Republic of Kazakhstan.

SUPER EXTENSION OF THE NONLINEAR SCHRODINGER EQUATION, ITS HIGHER SYMMETRIES

Abstract: One of the ways to integrate nonlinear models is connected with the calculation of the Lie-Backlund algebra, which includes a set of higher symmetries of the equation. This approach allows us to systematically find partial solutions, and the higher symmetries are associated with solutions of the soliton type. In this paper we describe the symmetry groups of the superextension of the nonlinear Schrodinger equation.

Key words: Schrodinger, higher symmetries, transformation groups, soliton solutions, invariance, integrals of motion, Lie-Backlund, symmetry group.

Language: Russian

СУПЕРРАСШИРЕНИЕ НЕЛИНЕЙНОГО УРАВНЕНИЯ ШРЕДИНГЕРА, ЕГО ВЫСШИЕ СИММЕТРИИ

Аннотация: Один из способов интегрирования нелинейных моделей связан с вычислением алгебры Ли-Бэклунда, включающий в себя множество высших симметрий уравнения. Этот подход позволяет систематический находит частные решения, причем высшие симметрии связаны с решениями солитонного типа. В этой работе опишем групп симметрии суперрасширения нелинейного уравнения Шредингера.

Ключевые слова: Шредингер, высшие симметрии, группы преобразований, солитонные решения, инвариантность, интегралы движения, Ли-Бэклунда, группа симметрии.

Введение

Интерес к супер симметричным моделям в физике привел к широкому развитию математики функций от антикоммутирующих переменных. Ее теперь часто называют суперматематикой, поскольку для пространства, в котором координаты могут как коммутировать так и антикоммутировать, принято название суперпространство, а для алгебр и групп Ли с антикоммутирующими параметрами - название алгебра и супергруппа Ли [7,8,9].

Суперalgeброй Ли, называется вещественное или комплексное Z_2 - градуированное линейное пространство с фиксированной четностью
$$g = {}^\circ g \oplus^1 g,$$

в котором определена билинейная операция [*x,y*], причем для однородных элементов справедливы тождества
$$\alpha([x, y]) = \alpha(x) + \alpha(y),$$
$$[x, y] = (-1)^{\alpha(x)\alpha(y)+1}[y, x],$$
$$[x, [y, \mathbf{z}]](-1)^{\alpha(x)\alpha(z)} + [\mathbf{z}, [x, y]]$$
$$- (-1)^{\alpha(z)\alpha(y)} + [y, [\mathbf{z}, x]]$$
$$- (-1)^{\alpha(y)\alpha(x)} = 0.$$

В случае [*x,y*] = 0 супералгебра *g* называется коммутативной.

Супералгебры Ли связаны с Z_2 - градуированными ассоциативными алгебрами подобно тому, как обычные алгебры Ли связаны с обычными ассоциативными алгебрами. Каждая из операции

$$[x, y] = xy - (-1)^{\alpha(x)\cdot\alpha(y)} yx,$$
$$[x, y] = (-1)^{\alpha(x)\cdot\alpha(y)} xy - yx,$$

где x, y - однородные элементы Z_2-градуированной ассоциативной алгебры U, превращает ее в супералгебру Ли [10].

Алгебра состоящая из матриц, удовлетворяющих условию

$$AJ + JA^{st} = 0, \quad \text{где } J = \begin{pmatrix} 0 & I_p & 0 \\ -I_p & 0 & 0 \\ 0 & 0 & I_q \end{pmatrix},$$

называется ортогонально - симплектической супералгеброй Ли и обозначается $osp(2p/q)$.

Структура таких матриц A имеет вид:

$$A = \begin{pmatrix} A & B & 0 \\ C & -A' & 0 \\ 0 & 0 & F \end{pmatrix} + \begin{pmatrix} 0 & 0 & \mu \\ 0 & 0 & V \\ V' & -\mu' & 0 \end{pmatrix}.$$

Алгебра $osp(2p/q)$ тесно связана с линейными суперкононическими преобразованиями.

OSP(2/1) – нелинейное уравнение Шредингера

Развитие теоретической физики привело к необходимости исследования градуированных и супер симметричных расширений солитонных уравнений. В исследованиях авторов [1,2] были построены Z_2- градуированное суперобобщение нелинейного уравнения Шредингера OSP(2/1) - S3:

$$\begin{cases} iq_t + q_{xx} - 2r^2q^2 - 4q\beta\varepsilon - 4\varepsilon\varepsilon_x = 0, \\ ir_t - r_{xx} + 2qr^2 + 4r\beta\varepsilon - 4\beta\beta_x = 0, \\ i\varepsilon_t + 2\varepsilon_{xx} + 2q\beta_x + q_x\beta - \varepsilon rq = 0, \\ i\beta_t - 2\beta_{xx} - 2r\varepsilon_x - r_x\varepsilon + \beta rq = 0, \end{cases} \quad (1)$$

где $\alpha(q) = \alpha(r) = 0$, $\alpha(\beta) = \alpha(\varepsilon) = 1$, α - функция четности, т.е $q(x,t)$, $r(x,t)$ – коммутирующие (бозонные), $\beta(x,t)$, $\varepsilon(x,t)$ – антикоммутирующие(фермионные) искомые функции.

Система уравнений (2.1) является условием совместности линейной системы

$$\varphi_x = U(x,t,\lambda)\cdot\varphi, \quad \varphi_t = V(x,t,\lambda)\cdot\varphi,$$

где $U, V \in osp(2/1)$, $\varphi \in OSP(2/1)$,

$$U = i\lambda\, e_0 + re_1 + qe_2 + \beta q_1 + \varepsilon q_2$$
$$V = 2\lambda U + V_0.$$

Здесь

$$-iV_0 = (rq + 2\beta\varepsilon)e_0 - r_x e_1 + q_x e_2 - 2\beta_x q_1 + 2\varepsilon_x q_2,$$

где e_k, q_k - генераторы супергруппы OSP(2/1):

$$e_0 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 0 \end{pmatrix}, e_1 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix},$$

$$e_2 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -1 & 0 \end{pmatrix},$$

$$e_2 = e_1^{st}, \quad q_2 = -q_1^{st},$$

удовлетворяющие коммутационным соотношениям

$$[e_0, e_1] = 2e_1, \quad [e_1, e_2] = e_0, \quad [e_2, q_2] = 0,$$

$$[e_0, e_2] = -2e_2, \quad [e_1, q_1] = 0, \quad \{q_1, q_1\} = -2e_1,$$
$$[e_0, q_1] = q_1, \quad [e_1, q_2] = q_1, \quad \{q_1, q_2\} = e_0,$$
$$[e_0, q_2] = -q_2, \quad [e_2, q_1] = q_2, \quad \{q_2, q_2\} = 2e_2,$$

где st - операция супертранспонирования, [,] - коммутатор, {,}- антикоммутатор.

Непосредственной проверкой нетрудно установить следующие равенства

$$U^{st} = -HUH^{-1}, \quad V^{st} = -HVH^{-1},$$
$$\varphi^{st} = H\varphi^{-1}H^{-1},$$

где $H = diag(-i\sigma_2, 1)$ – ортосимплектическая матрица супергруппы OSP(2/1),

$$\sigma_2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}.$$

Система уравнений OSP(2/1)-S3 (1) как интегрируемое уравнение обладает N - солитонным решением, бесконечным числом интегралов движения и т.д.

Пусть функции q, r, β, ε исчезают при $|x| = \infty$. Тогда плотности P_n локальных интегралов движения

$$I_n = \int_{-\infty}^{\infty} P_n(q, r, \beta, \varepsilon)\, dx$$

определяются по рекуррентным формулам

$$P_n = -\frac{1}{i}(r\, q_n + \beta\alpha_n),$$

где $q_{n+1} = \frac{i}{2}[q_{nx} + \sum_{k=1}^{n-1} q_k(r\, q_{n-k} + \beta\, \alpha_{n-k}) - \varepsilon\, \alpha_n]$

$$\alpha_{n+1} = i\, \alpha_{nx} + i\sum_{k=1}^{n-1}\alpha_k(rq_{n-k} + \beta\alpha_{n-k}) + i\,\beta q_n,$$

$$n = 1,2,,\ldots; \quad q_1 = \frac{1}{2}q, \alpha_1 = -i\,\varepsilon.$$

Первые несколько интегралов сохранения

$$I_1 = \int_{-\infty}^{+\infty}(\frac{1}{2}r\, q + \beta\varepsilon)dx,$$

$$I_2 = i\int_{-\infty}^{+\infty}(\frac{1}{4}rq_x + \beta\varepsilon_x)dx,$$

$$I_3 = \int_{-\infty}^{+\infty}(\frac{1}{4}rq_{xx} + \frac{1}{4}r^2q^2 + r\varepsilon\varepsilon_x - 2\beta\varepsilon_{xx} - q\beta\beta_x + rq\beta\varepsilon)dx.$$

Симметрии уравнения

Выявление симметрии нелинейных моделей вызывает особый интерес, поскольку служит одним из немногих способов исследования их точных свойств. Один из способов интегрирования связан с вычислением алгебры Ли-Бэклунда, включающий в себя множество высших симметрий уравнения. Этот подход позволяет систематический находит частные решения, причем высшие симметрии связаны с решениями солитонного типа [3, 4]. В этом пункте опишем групп симметрии уравнений OSP(2/1)-S3 [5, 11].

Для анализа дифференциальных уравнений методами теории групп, произвольная система уравнений

$$u_t = F(u, u_x, u_{xx}, \dots),\qquad (2)$$

и ее различные производные рассматриваются как бесконечномерное многообразие [F] в пространстве переменных

$$x, t, u, u_1 \equiv u_x, u_2 \equiv u_{xx}, \dots .$$

Тогда условие инвариантности многообразия [F] по отношению группы преобразований записывается в виде следующего дифференциального уравнения [3]

$$\frac{\partial G}{\partial t} = G\frac{\partial F}{\partial u} + D(G)\frac{\partial F}{\partial u_1} + \cdots + D^m(G)\frac{\partial F}{\partial u_m},\qquad (3)$$

где $\frac{\partial}{\partial t}$, D -операторы полного дифференцирования по t и x соответственно, $\frac{\partial}{\partial t}G$ - вычисляется с помощью уравнений (2). Решения дифференциального уравнения (3) образуют алгебру Ли-Бэклунда, соответствующей системе эволюционных уравнений (2).

Тогда соответствующие определяющие уравнения для операторов Ли-Бэклунда

$$X = \varphi\frac{\partial}{\partial q} + \psi\frac{\partial}{\partial r} + \delta\frac{\partial}{\partial \varepsilon} + \gamma\frac{\partial}{\partial \beta} + \cdots,$$

допускаемой суперрасширением нелинейного уравнения Шредингера (1) имеет вид

$$(iD_t + D^2 - 4rq + 4\varepsilon\beta)\varphi - 2q^2\psi + (-4q\beta + 4\varepsilon_x - 4\varepsilon D)\delta + 4q\varepsilon\gamma = 0,$$
$$(-iD_t + D^2 - 4qr + 4\varepsilon\beta)\psi - 2r^2\varphi + (4r\varepsilon - 4\beta_x + 4\beta D)\gamma + 4q\varepsilon\delta = 0,$$
$$(iD_t + 2D^2 - rq)\delta + (2\beta_x + \beta D - \varepsilon r)\varphi + (2qD + q_x)\gamma - \varepsilon q\psi = 0,$$
$$(-iD_t + 2D^2 - rq)\gamma + (2\varepsilon_x + \varepsilon D - \beta q)\psi + (2rD + r_x)\delta - \beta r\varphi = 0.$$

Решение определяющего уравнения (3), зависящего от $u, u_1, \dots, u_m$ вида

$$G(x, t, u, u_1, \dots, u_m)$$

будем называть решением m - порядка и обозначим через $G^{(m)}$.

В дальнейшем рассмотрим решение определяющих уравнений (4) явно независящих от x, t.

ЛЕММА. Решение m- порядка системы определяющих уравнений (4) имеет вид

$$\varphi^{(m)} = aq_m + \varphi',\quad \psi^{(m)} = br_m + \psi',$$
$$\delta^{(m)} = c\varepsilon_m + \delta',\quad \gamma^{(m)} = d\beta_m + \gamma'.\qquad (5)$$

где a, b, c, d - постоянные числа, функций $\varphi', \psi', \delta', \gamma'$ - зависят от переменных ($q, r, \varepsilon, \beta, \dots, q_{m-1}, r_{m-1}, \varepsilon_{m-1}, \beta_{m-1}$).

Доказательство. Подставляя функции

$$\varphi^{(m)}, \psi^{(m)}, \delta^{(m)}, \gamma^{(m)}$$

зависящие только от q, r, ε, β и их производных по x до m - го порядка включительно в (4а) получаем

$$(iD_t + D^2 - 4rq + 4\varepsilon\beta)\varphi^{(m)} - 2q^2\psi^{(m)} + (-4q\beta + 4\varepsilon_x - 4\varepsilon D)\delta^{(m)} + 4q\varepsilon\,\gamma^{(m)} = 2r_{m+2}\varphi_{r_m} + \varepsilon_{m+2}\varphi_{\varepsilon_m} - 3\beta_{m+2}\varphi_{\beta_m} + \dots,\qquad (6)$$

где многоточием отмечены слагаемые меньшего порядка. Отсюда получаем, что должно быть

$$\varphi_{r_m} = 0,\quad \varphi_{\varepsilon_m} = 0,\quad \varphi_{\beta_m} = 0.\qquad (7)$$

Тогда, учитывая равенств (7), уравнение (6) перепишется в виде

$$(iD_t + D^2 - 4rq + 4\varepsilon\beta)\varphi^{(m)} - 2q^2\psi^{(m)} + (-4q\beta + 4\varepsilon_x - 4\varepsilon D)\delta^{(m)} + 4q\varepsilon\,\gamma^{(m)} = 2D\varphi_{q_m}q_{m+1} + h^{(m)}.$$

Следовательно,

$$D\varphi_{q_m} = 0,\quad \text{т. е.}\quad \varphi_{q_m} = const.\qquad (8)$$

В силу этих равенств, из (7), (8) следует справедливость первого равенства в (5).

Поступая аналогично со всеми остальными определяющими уравнениями (4б-г), можно окончательно убедится в справедливости утверждения леммы.

Используя схему, указанную в доказательстве леммы, найдем решения определяющих уравнений первых нескольких порядков в следующем виде:

0) $\varphi^{(0)} = q,\ \psi^{(0)} = -r,\ \delta^{(0)} = \varepsilon/2,\ \gamma^{(0)} = -\beta/2$
1) $\varphi^{(1)} = q_x,\ \psi^{(1)} = r_x,\ \delta^{(1)} = \varepsilon_x,\ \gamma^{(1)} = \beta_x$
2) $\varphi^{(2)} = q_{xx} - 2q^2r - 4q\beta\varepsilon - 4\varepsilon\,\varepsilon_x,$
   $\psi^{(2)} = -r_{xx} + 2r^2q + 4r\beta\varepsilon - 4\beta\beta_x,$
   $\delta^{(2)} = 2\varepsilon_{xx} + 2q\beta_x + q_x\beta - rq\varepsilon,$
   $\gamma^{(2)} = -2\beta_{xx} - 2r\varepsilon_x - r_x\varepsilon + \beta rq,\quad$ и т.д.

Легко показать, что по шаговое уточнение алгебры (5) для любого m приведет к следующим равенствам

$$\varphi^{(m)} = q_m + \cdots,\quad \psi^{(m)} = (-1)^{m-1}r_m + \cdots,$$
$$\delta^{(m)} = 2^{m-1}\varepsilon_m + \dots,$$
$$\gamma^{(m)} = (-2)^{m-1}\beta_m + \dots, m = 1, 2, \dots.$$

В этих равенствах многоточием отмечены слагаемые меньшего порядка, представляющие собой сумму однородных многочленов относительно q, r, β, ε и их производных по x до порядка $m - 1,\ m \geq 2$.

Теорема. Алгебра Ли - Бэклунда системы нелинейных уравнений (1) коммутативна, ее элементы порядка $m \geq 1$ вычисляются по слудующим рекурентным формулам

$$\varphi^{(k+1)} = D\varphi^{(k)} - 2qD^{-1}(r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon) - 4\varepsilon\delta^{(k)},$$
$$\psi^{(k+1)} = -D\psi^{(k)} - 2rD^{-1}(r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon) - 4\beta\gamma^{(k)},\qquad (9)$$

$$\delta^{(k+1)} = 2D\delta^{(k)} - \varepsilon D^{-1}(r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon) + 2q\gamma^{(k)}\beta\,\varphi^{(k)},$$
$$\gamma^{(k+1)} = -2D\gamma^{(k)} + \beta D^{-1}(r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon) - 2r\delta^{(k)}\varepsilon\psi^{(k)},$$

где k принимает $0, 1, 2, \dots$,
начальные значения определяются равенствами:
$$\varphi^{(0)} = q, \ \psi^{(0)} = -r, \ \delta^{(0)} = \frac{\varepsilon}{2}, \ \gamma^{(0)} = -\frac{\beta}{\alpha}.$$

Доказательство. В начале определим, что оператор D^{-1} в (9) имеет смысл, т.е.

$$r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon = D\tilde{F}[u],$$

где $\tilde{F}[u]$ - некоторая дифференциальная функция.
Для семейства
$$r_{t_k} = \psi^{(k)}, \quad q_{t_k} = \varphi^{(k)}, \quad \beta_{t_k} = \gamma^{(k)},$$
$$\varepsilon_{t_k} = \delta^{(k)}, \quad k = 0, 1, 2, \dots,$$
уравнений (1) имеет место равенства

$$r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon = (rq + 2\beta\varepsilon)_{t_k},$$

в которых t_k означает производную по времени соответствующей потоку k. С другой стороны известно, что $rq + 2\beta\varepsilon$ - плотность закона сохранения, поэтому
$$(rq + 2\beta\varepsilon)_{t_k} = D\tilde{F}(u, u_1, \dots),$$
т.е. выражение
$$r\varphi^{(k)} + q\psi^{(k)} + 2\beta\delta^{(k)} + 2\gamma^{(k)}\varepsilon$$

является полной производной.
Далее подставляем (9) в (4):

$$(iD_t + D^2 - 4rq + 4\varepsilon\beta)\varphi^{(k+1)} - 2q^2\psi^{(k+1)} + (-4q\beta + 4\varepsilon_x - 4\varepsilon D)\delta^{(k+1)} + 4q\varepsilon\,\gamma^{(k+1)} = D\{(iD_t + D^2 - 4rq + 4\varepsilon\beta)\varphi^{(k)} - 2q^2\psi^{(k)} + (-4q\beta + 4\varepsilon_x - 4\varepsilon D)\delta^{(k)} + 4\varepsilon\,\gamma^{(k)}\}$$

$$(-iD_t + D^2 - 4rq + 4\varepsilon\beta)\psi^{(k+1)} - 2r^2\varphi^{(k+1)} + (4r\varepsilon - 4\beta_x + 4\beta D)\gamma^{(k+1)} - 4r\beta\,\delta^{(k+1)} = -D\{(-iD_t + D^2 - 4rq + 4\varepsilon\beta)\psi^{(k)} - 2r^2\varphi^{(k)} + (4r\varepsilon - 4\beta_x + 4\beta D)\gamma^{(k)} - 4r\beta\,\delta^{(k)}\}$$

$$(iD_t + 2D^2 - rq)\delta^{(k+1)} + (2\beta_x + \beta D - \varepsilon r)\varphi^{(k+1)} + (2qD + q_x)\gamma^{(k+1)} - \varepsilon q\psi^{(k+1)} = 2D\{(iD_t + 2D^2 - rq)\delta^{(k)} + (2\beta_x + \beta D - \varepsilon r)\varphi^{(k)} + (2qD + q_x)\gamma^{(k)} - \varepsilon q\,\psi^{(k)}\}$$

$$(-iD_t + 2D^2 - rq)\gamma^{(k+1)} + (2\varepsilon_x + \varepsilon D - \beta q)\psi^{(k+1)} + (2rD + r_x)\delta^{(k+1)} -$$

$$-\beta r\varphi^{(k+1)} = -2D\{(-iD_t + 2D^2 - rq)\gamma^{(k)} + (2\varepsilon_x + \varepsilon D - \beta q)\psi^{(k)} + (2rD + r_x)\delta^{(k)} - \beta r\varphi^{(k)}\}.$$

Из этих равенств следует справедливость рекурентных формул (9).

Далее, произведение в алгебре Ли-Бэклунда определим по формуле

$$[x, y] = x \cdot y - (-1)^{\alpha(x)\alpha(y)} y \cdot x,$$

где $\alpha(x)$ - функция четности. Тогда доказательство коммутативности построенной алгебры сводится к установлению следующих равенств
$$X^{(k)}(\varphi^{(l)}) - X^{(l)}(\varphi^{(k)}) = 0,$$
$$X^{(k)}(\psi^{(l)}) - X^{(l)}(\psi^{(k)}) = 0,$$
$$X^{(k)}(\delta^{(l)}) - X^{(l)}(\delta^{(k)}) = 0,$$
$$X^{(k)}(\gamma^{(l)}) - X^{(l)}(\gamma^{(k)}) = 0,$$
для операторов Ли-Бэклунда

$$X^{(k)} = \varphi^{(k)}\frac{\partial}{\partial q} + \psi^{(k)}\frac{\partial}{\partial r} + \delta^{(k)}\frac{\partial}{\partial \varepsilon} + \gamma^{(k)}\frac{\partial}{\partial \beta} + \cdots,$$
$$l, k = 0, 1, 2, \dots.$$

Непосредственной проверкой устанавливается справедливость этих равенств.
Теорема доказана

В бозонном случае, т.е. когда отсутствуют антикоммутирующие элементы $(\varepsilon = \beta = 0)$, полное описание алгебры Ли-Бэклунда проведено в [6].

В заключении этой работы опишем точечную группу симметрии OSP(2/1)-S3. Используя стандартную технику вычисления групп симметрии дифференциальных уравнений [4] можно доказать, что система (1) допускает пятипараметрическую группу преобразований, базис в которой определяется следующими инфинитезимальными образующими
$$X_1 = \frac{\partial}{\partial x}, \qquad X_2 = \frac{\partial}{\partial t},$$
$$X_3 = t\frac{\partial}{\partial x} + \frac{i}{2}xq\frac{\partial}{\partial q} - \frac{i}{2}xr\frac{\partial}{\partial r} + \frac{i}{4}x\varepsilon\frac{\partial}{\partial \varepsilon} - \frac{i}{4}x\beta\frac{\partial}{\partial \beta},$$

$$X_4 = \frac{1}{2}x\frac{\partial}{\partial x} + t\frac{\partial}{\partial t} - q\frac{\partial}{\partial q} - \frac{3}{4}\varepsilon\frac{\partial}{\partial \varepsilon} - \frac{1}{4}\beta\frac{\partial}{\partial \beta},$$

$$X_5 = xq\frac{\partial}{\partial q} - r\frac{\partial}{\partial r} + \frac{1}{2}\varepsilon\frac{\partial}{\partial \varepsilon} - \frac{1}{2}\beta\frac{\partial}{\partial \beta}$$

Заметим, что генераторы точечных симметрии X_5, X_1, X_2 эквивалентны, соответственно, к операторам $X^{(0)}, X^{(1)}, X^{(2)}$ Ли-Бэклунда.

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Issue   **Article**

Berdiyar Baltabaevich Saparov
Chirchik high tank Command engineering knowledge institution
Associate Professor, (PhD)
Department of Humanities

Larisa Sunnatovna Khaydarova
Tashkent State Agrarian University
senior lecturer
Department of Humanitarian science

THE IMPORTANCE OF UNIVERSAL DEMOCRATIC PRINTS IN NATIONAL IDENTITY AWARENESS

Abstract: *In the article of B.B.Saparov on the theme: "The significance of human democratic principles in national self-awareness" the thought that human values and democratic principles form the basis of democracy was stated. It is also elucidated that human democratic principles manifest themselves in human values; human values in turn are generalized expression of national and regional values. The analysis of human democratic principles being an important structure in national self-awareness is given by the example of independent Uzbekistan.*

Key words: *democracy, common to all mankind democratic principles, values, national, human, regional, international understanding, religious tolerance, national self-awareness.*

Language: *English*

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Introduction

It is important to understand the national identity, relying on universal democratic prints. This is an important condition of democratic development.

As it is written in Article 13 of the Constitution of the Republic of Uzbekistan: "Democracy in the Republic of Uzbekistan is based on universal human rights, according to them the highest value is a person, his life, land, honor, dignity and other inviolable rights.

Democratic rights and freedoms are protected by Constitution and laws"[1] defined as. It is also a structural structure of national self-awareness.

Universal values and principles form the basis of democracy. In the perception of national identity, nationality and universality are required to be harmonious, and therefore universal democratic prints are of defining importance in the perception of national identity. In the perception of national self-

consciousness, universal democratic prints are manifested through universal values.

Universal democratic prints are the criteria that concern the life of mankind, guarantee democratic progress, serve to correctly express the essence of national self-awareness.

They also serve the development of the convergence, development of all national values, the understanding of the national identity of peoples.

The greatest invaluable wealth that we have achieved in the years of independence, - said President Shavkat Mirziyoyev, - is the ability of our multinational people to overcome any difficulties and challenges, its modern outlook, political consciousness and increasing social activity, a sense of belonging to the events around us, an atmosphere of mutual kindness and harmony in our society.[2]

In fact, in today's globalizing world there is a complex situation, the threat of terrorism, extremism and radicalism, the ideological struggle is constantly

being vigilant and alert in the current conditions, the universal democratic printsips play an important role in strengthening independence, ensuring the peaceful life of our people, such factors as nation-wide harmony, cooperation, tolerance to religion.

Loyalty to the ideas of humanism, democracy, social justice, striving to be stable all over the world, to prevent violations of human rights, to protect the struggle of all peoples and nations for national independence, to respect national customs and values, not to interfere with the development of their understanding of national identity, justice, to help to introduce the rule of law into life, to, trying to find a peaceful resolution is an important aspect of universal values, which is based on the principles of universal democracy, in today's globalist conditions.

These values consist of new aspects of the development of relations of science, technology, culture, social production obtained by mankind, achievements in the field of democracy, legislation, the stabilization of justice, rational use of which will help our country to enter into the ranks of developed countries and our people's deeper understanding of national identity. It should be remembered that not recognizing the universal democratic printouts in this regard, allowing for any retreat, national restriction and caliphate will lead to huge losses.

One of the important requirements of democracy is the need for universal democratic prints to be widely used by young people in their understanding of the national identity, the following points of our President Shavkat Mirziyoyev are notable: "Today the times are changing rapidly. Who will feel these changes more than anyone else-young people. Okay, let the youth be in harmony with the requirements of their time. But at the same time do not forget about himself. Who we are, what a generation of magnates, let their hearts constantly reflect and encourage them to remain faithful to themselves"[3].

Democracy is a concept with wide coverage, associated with various political, socio-economic, spiritual spheres, the way of life of a person, his thinking, his search for a cosmos.[4] He is a reality associated with social progress, therefore, people regard him as a socio-political value, a value that is respected, appreciated, protected from external repression. Mankind, the history of thought, in fact, is the history of the creation of democratic values, there is no stage of development or nation, whether it did not dream of them, did not fight for them[5].

Democracy cannot be formed from a historical-cultural paradigm, beyond or contrary to the traditions, norms and values that people, nation, have created and revered for centuries, as a positive reality. It is for this reason that universal democratic printouts fall into an important structure of national self-awareness.

National self-awareness must be consistent with universal democratic printouts. Partridge:

1) to recognize the inviolability of national self-awareness human life;

2) it is necessary to respect human freedom, rights and interests;

3) an important criterion in the perception of national self is that a person is the highest value;

4) the achievement of universal common interests in the understanding of the national identity of different nations form and strengthen mutual common feelings;

5) democracy is important to have equal opportunity (conditions), rule of law in the understanding of the national identity of representatives of different nationalities;

Humanization (humanism) is a universal value. In essence, it means humanization of society, life, socio-political existence.

In the essence of all the socio-political and spiritual reforms carried out in Uzbekistan, it implies the direction of social relations in the interests of man, the formation of high moral and moral qualities in it. Humanism as universal democratic printing system and a high spiritual value carries humanistic traditions, views and norms to social-political processes, state and society management. In this way, it enriches the socio-political sphere with humanistic values and acts as an important structure of national self-awareness.

The rule of law is the norm-the socio – political and legal value that applies to all in a democratic legal state. Indeed, the transformation of the rule of law into all valid socio-political and legal values encourages the implementation of many tasks, overcoming many obstacles to objectivity and sub-objectivity. However, today it cannot be denied that in the spirituality of our society, the concept of "rule of law", value is formed. As noted by President Shavkat Mirziyoyev , "in our Constitution and laws, regardless of nationality, language and religion, all our citizens are guaranteed equal rights and freedoms. They have all the opportunities for the comprehensive development and preservation of their national culture, traditions and customs."[6]

The spiritual renewal of society, the changes that occur in the consciousness and imagination of people, has always been associated with the decision-making of social justice. Special studies show that wherever justice is established, where the management of the affairs of the state and society is carried out in accordance with the print of justice, equality and moral and moral norms are decided in that place. This means that the role of social justice in the spiritual renewal of society is great, it is impossible to form pure human, spiritual-moral relations, values in society without finding a solution to it.

In the national consciousness of each people there are some basic aspects that are characteristic and compatible with this people, historically formed, it expresses the spirit, mentality, character, originality of

this people, and they leave their traces in the social system of the country. Important features of national identity is manifested.

It is our vision that democracy in the development of the world as a universal value is a management style that is integrated, recognized and compatible with different peoples, nations' thinking and lifestyle. At the same time, the second side of this legislation is also connected with the existence of the peculiarity of the way of life, mentality, perception, understanding and observance of democracy of each people. No matter how universal democracy, universal democratic prints, do not acquire universal meaning and value, the basis of which is the "national", "national spirit", "national originality", which gives him spiritual power, enriches him, provides him with color and harmony are national spiritual values. Democracy is contrary to its essence, if one does not take into account the National, the national self-realization, the national spirit, if one does not rely on it. For this reason, universal democratic prints are an important structure of national self-awareness.

In the understanding of the national identity of the peoples, along with national originality, the unity of the nation plays an important role in the vital link between the universal democratic printouts. Work is being carried out in Uzbekistan on the implementation of the national unity and tolerance into life. As President Shavkat Mirziyoyev said about this, "the fifth priority direction of the strategy of actions we are implementing today has also defined the most important tasks for ensuring the harmony and religious tolerance of the nation.

138 national cultural centers play a big role in the development of ethnic originality and further harmonization of ethnic relations in our country " [7].

Universal democratic prints serve to find common interests in the culture, language, consciousness and worldview of peoples of different nationalities in the rise of national self-awareness. Changes in the spheres of social life create the necessary space for this legality to follow. The democratic changes that take place today, the assistance rendered through the centers of public service, the mutual integration about people of different nationalities.

As the president of our country Shavkat Mirziyoyev noted in his speech at the meeting dedicated to the 25th anniversary of the establishment of the Republican International Cultural Center, "It is known that representatives of different nationalities, cultures and religions have lived peacefully for many centuries on our ancient and generous grounds. Hospitality, kindness, heart and literal tolerance are always characteristic of our people and constitute the basis of their mentality"[8].

Currently, almost all countries in the world are multinational country. The Republic of Uzbekistan is also one of the countries with such a multicultural identity as representatives of more than 130 nationalities. Touching upon this issue, the first president of our country Islam Karimov noted that "such national diversity and at the same time, a sense of unity inherent in a single nation is a tremendous value that cannot be measured and assessed by anything, not only a unique feature, but also a vital impact for each of us and its importance in mutual enrichment"[9]. In ensuring it in practice, national self-awareness serves the interaction of different nations.

The rising awareness of national identity increases the general perception of different nationalities. It will further strengthen tolerance.

There are problems that contradict the democratic printouts of national self-consciousness, which include: missionary, religious extremism and fundamentalism, equalization of religion with "false Islamic ideas"; nationalism; chauvinism and others. Each of these listed, along with the fact that the security of the country poses a certain threat to the stability of our country, to the understanding of the national identity of our people, does not serve the effective formation of the national idea in our country and its transformation into a necessary spiritual factor that directs society to the future.

In the hearts of our citizens today, where ideological struggles have taken place, it is necessary to find a healthy attitude to our mother-Homeland, our rich history, our national values, our native language, which is the immortal spirit of the nation, democratic universal prints, to form their ideological immunity. After all, as President Shavkat Mirziyoyev said, the human body before the treatment of any disease, first of all, the immune system against it is formed. If we can also form an ideological immunity against harmful ideas in the hearts and minds of different strata of the population, can we educate people who do not fly into the scams of various "invitators", who are self-sacrificing for their Homeland and people[10]?.

"What is called emptiness in the field of ideology will never happen to itself. Because the soul, brain, consciousness, thinking of a person never ceases to receive information, thinking, exposure. So he always needs spiritual food. What will happen if he does not get the same food from the environment in which he lives, or this environment does not satisfy him, say. Such a diet he is gradually looking for from another side. We should not let that happen[11].

For this, people who consider themselves responsible for society, the spirituality of our youth, ideological upbringing-whether it is neighborhood or religious organizations, employees of law enforcement agencies or creative intellectuals with great influence – should all be particularly active"[12].

Contrary to the universal democratic printouts of national self-consciousness, there are also some more

problems, especially the national separatism (separatism) encountered in some countries, unhealthy ideas that undermine national harmony, some problems with the prevention of life, value and culture, unpleasant interpretation cases, national selfishness (egoism) chauvinism and aggressive nationalism.

Based on the analysis of the above points, the following conclusions can be drawn:

First, national self-awareness in the construction of a democratic society creates the necessary conditions for it to be based on the Universal printouts of democracy;

Secondly, the experience of Uzbekistan confirms that it is possible to build a democratic, secular, civil society, taking into account the national values and traditions of the people of Uzbekistan;

Thirdly, in a democratic society, different nations, religions and confessions, religious associations and organizations can operate in harmony, which is consistent with universal and universal democratic principles;

Fourthly, the atmosphere of democracy and transparency in society creates conditions for the increasing need for national self-awareness;

Fifthly, nation-wide printouts in the understanding of harmony, national identity fully correspond to the universal democratic principles of the understanding of the national identity of the people of multinational Uzbekistan and serve the purpose of building a democratic society in the country.

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Clarivate
Analytics indexed

Makhmuda Abdulloevna Mahkamova
Uzbek State World Languages University
teacher, Uzbekistan, Tashkent

SOME QUESTIONS OF THE METHODOLOGY OF TEACHING ENGLISH AT THE UNIVERSITY

Abstract: *The author examines a number of so-called "inconvenient questions" concerning the problems of learning English at the university. This is the time required for a good mastery of the language, the volume of active and passive vocabulary of students, the levels of proficiency in conversational techniques and grammar of the English language, the division of students into groups for language teaching and the most important criteria for this division.*

Key words: *methodology, teaching, English language, education system, training course, knowledge, innovative approach, communication technology, modern methods.*

Language: *English*

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Introduction

The spread of English as the language of international communication and the growing number of English language learners have led to the emergence of various methods of teaching and monitoring the effectiveness of the learning process. The use of such authentic materials as cinema, radio and television as additional means of teaching foreign languages has long proved its effectiveness. The emergence of innovative information technologies has radically changed the nature of teaching, providing numerous opportunities to make the learning process more exciting and productive.

Naturally, there are always a lot of problems in teaching, but the specifics associated with foreign language subjects, namely, with the theory and practice of a foreign language, in particular, English, is a wide variety of training levels in secondary school. First-year students have recently graduated from school, and with this knowledge (and sometimes ignorance) they came to a higher educational institution where there is a different approach to the learning system, a more extensive, rich and complex program, more serious control of the assimilation of the acquired knowledge. In addition, students find themselves in a new communication environment, a new team. Sometimes they get lost from this novelty.

Perhaps the most difficult for both them and teachers is the first semester, when students do not yet know how to study at a university, how to take tests and exams now, in new conditions. In addition, the university has an intermediate (in the middle of the semester) control of students' knowledge, where it is required to show their theoretical knowledge of grammar, the ability to read and translate written texts on various topics.

In the conditions of a university, it is very difficult to select students of at least approximately the same level of school knowledge in one subgroup, which can lead to difficulties in their education without loss of understanding on the part of poorly prepared, and loss of interest on the part of more thoroughly prepared students. In such difficult conditions, it is necessary to select a diverse two-level material so that all students of the subgroup are involved in the learning process.

The main elements of learning, as you know, are: phonetics, grammar, reading and translating texts, performing exercises for them, and learning vocabulary.

Regarding grammar: it is impossible to divide it into two levels of presentation in one subgroup with two levels of knowledge: weak and sufficiently high or medium. Therefore, when preparing grammatical

material, the teacher selects it in double volume: most fully for groups where more than half of them have a level not lower than average, and in a simplified version for groups where half or more than half of the students have a low level of school knowledge.

However, according to the author, it is necessary not only to present the material, but also to encourage students to be creative in one way or another in the study of this material. For example, when presenting cases of using different grammatical tenses for each case, the teacher gives an example, offering students as homework, and sometimes classroom work to come up with their own example for this case.

Now let's turn to the question of the amount of time required to learn English. Naturally, this is a difficult question, and the answer to it cannot be unambiguous and too specific. It is always strange to hear arguments about this without specifying what level of knowledge is meant. It is also strange to hear that someone knows English "perfectly". It is known that the British themselves do not know it perfectly, just as we Uzbek do not know our language "perfectly".

Sometimes students ask if it is possible to learn English in two (option: in one month). I explain to them that, firstly, everything depends on the required level, and secondly- Secondly, I tell them: "You, students, living in Uzbekistan, having been born here, have been listening to fairy tales in Uzbek since childhood, talking to parents and friends, telling various stories yourself, reading books, listening to radio and watching TV in Uzbek, conducting dialogues, singing and so on, teaching at school your native language for 10 years, and then, having come to study at a university, when we study English vocabulary.

Indeed, they are inconvenient, because there is no unambiguous answer to them, and there cannot be. Otherwise they wouldn't be "inconvenient"? However, it is probably useful to listen to the opinions of as many English teachers as possible, both school teachers and teachers of various universities, in order to improve the learning process. at the same time, it should be noted that, unfortunately, there is a noticeable gap between the methodology of teaching at school (even at a school with in-depth knowledge of English), and the methodology of language teaching at a university. This aspect is very important, because if a new teacher comes to the school class, then whatever the level of knowledge received by the students of this class with the previous teacher, it is approximately the same. the range of the level of knowledge of the language by first-year students who have recently come to university (meaning a non-linguistic university where there are no entrance exams in English), as mentioned earlier, is very wide. students of different levels gather in one group, and most often in a subgroup. at the same time, among other difficulties, there are problems with choosing a

textbook. Despite the fact that the university, as a rule, has good methodological manuals developed by the department, it is necessary, of course, a textbook for the first year of the general English language, and for the second year with special content in the chosen direction (economics, law, marketing, etc.).

Of course, in school education, maybe an "Uzbek-English" textbook is needed, but as for the university, then, in light of the upcoming transition of our country to European system of bachelor's and master's degrees, in the university, apparently, such a textbook loses its meaning. There should be textbooks written by native speakers, teachers of the main English-speaking countries (UK, USA, Canada).

Currently, there are a large number of textbooks of different levels written by very qualified authors from these countries, and the only question is to choose one or more of them suitable for this level of students.

Beautifully designed and very suitable textbooks for teaching are, for example, the textbooks published by Oxford University Press "Headway" at various levels, starting with the Beginners level with the name "Headstart", then the ascending levels Elementary, Pre-Intermediate, Intermediate, Upper-Intermediate, Advanced. For these textbooks, there are workbooks, test papers and verification tests, and cassettes with audio materials are attached that fully correspond to the texts given at the end of each textbook. In addition, of course, it is necessary to use, for the acquisition of theoretical and practical knowledge of grammar, for example, the most common textbook published by Cambridge University Press author R. Murphy of the appropriate level (Elementary for beginners and Intermediate for continuing education).

As for vocabulary, there are also good manuals published by Penguin English, in which lexical units are outlined on topics, and various interesting lexical tasks are given. in general, the choice is extensive, and, in addition to the question of preference, there is a question of alternating the presented material and checking its digestibility.

Let's turn to the following "inconvenient" question: regarding the criteria for a student's belonging to one of the groups: Advanced, Upper-Intermediate, Intermediate, etc. for this, there are many tests at all levels, and if one test is not sufficient, you can check the student on several tests and identify statistics in numbers (percentages). It is necessary to take tests of the same level in grammar, vocabulary, phonetics, oral tests for the ability to conduct a conversation, etc.

It has been quite a few years since the computer entered our lives, and we can no longer imagine a modern lesson without the use of information technology. ICT becomes an integral assistant in increasing students' interest in the problems studied and develops visual and imaginative thinking. Everyone has long understood that the use of ICT in

the learning process carries the opportunity to activate the cognitive, mental and independent activity of students. Information technologies make it possible to significantly change the forms and methods of educational work. Today, for all teachers, a computer is an effective assistant that allows improving the quality of training and the effectiveness of control. Currently, the use of a computer in the educational process is very relevant.

The development of productive learning activities, autonomy and creativity of the student requires that the teacher himself be autonomous, creative and capable of flexibility, professional adaptability and constant creative search. Modern productive technologies in the field of foreign language teaching are focused on the "student-researcher", a reflexive user. The main goal of a modern teacher is to choose methods and forms of organizing students' educational activities that optimally correspond to the set goal.

Without the use of ICT in the educational process, it is difficult to imagine modern English lessons. Their use expands the scope of the educational process, increases its practical orientation, as well as the use of ICT and Internet resources in the English lesson allows the teacher to more fully implement a whole range of methodological, pedagogical and psychological principles. The use of computer educational programs in English lessons increases the effectiveness of solving communicative tasks, develops different types of speech activity of students, forms a stable motivation of foreign language activity of students in the classroom.

In the XXI century, society places ever higher demands on the practical command of English in everyday communication and professional sphere. The volume of information is growing, and often routine methods of its transmission, storage and processing are inefficient. The use of information technology reveals the enormous possibilities of the computer as a means of learning. But at the same time, it must be remembered that the use of multimedia technologies cannot provide a significant pedagogical effect without a teacher, since these technologies are only ways of teaching. A computer in the educational process is a means that enhances and expands the possibilities of learning activities. The use of ICT and Internet resources in the English lesson is relevant today, because a teacher should be interesting for his students, keep up with the times, improve his pedagogical skills and level of intelligence.

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Makhmuda Abdulloevna Mahkamova
Uzbek State World Languages University
teacher
Uzbekistan, Tashkent

INNOVATIVE TECHNOLOGIES FOR THE FORMATION OF GENERAL LINGUISTIC COMPETENCE OF STUDENTS

Abstract: *The article discusses the features of the use of innovative technologies for the formation of general linguistic competence of students. As a result of the analysis, the author comes to the conclusion that the use of dialog, game, project, computer and integration educational technologies during the implementation of the discipline makes it possible to increase the level of formation of the desired competence, as well as the motivation of students to study the discipline, to bring the learning process closer to the real conditions of professional activity of the future specialist.*

Key words: *higher professional education, innovative teaching technologies, general linguistic competence, educational and methodological complex, foreign language.*

Language: *English*

Introduction

The high dynamism of the modern labor market requires educational institutions of vocational education to continuously improve the content and educational technologies in the training of specialists. Traditional forms of classes focused on the knowledge paradigm of education are giving way to innovative technologies based on a competence-based approach to learning. According to the developers of the state educational standards of higher education of the new generation, active and interactive forms of classes should account for up to 70% of the total study time, depending on the level, direction and profile of training of students. In this regard, in this paper we have set a goal - to analyze the features of the use of innovative educational technologies for the formation of general linguistic competence of university students.

In the main professional educational programs of higher education based on the state educational standards of higher education of the new generation, general linguistic competence is distinguished as professionally specialized for linguistic areas and training profiles and is interpreted as the ability of the

student to realize the system-structural nature of language as a social phenomenon; knowledge of modern concepts of linguistic science, its term system and basic methods linguistic research; willingness to carry out research in various fields of linguistic science; the ability to use linguistic knowledge, skills and results of linguistic research in their professional activities.

As noted in our earlier works, the formation of general linguistic competence is a multi-level and multicomponent process that includes practical mastery of native and foreign languages, the study of theoretical disciplines of linguistic, humanitarian, social, economic and psychological-pedagogical cycles within the framework of basic general and professional educational programs and in the system of continuing education, independent educational and research work of the student, direct and indirect impact of the social environment. At the same time, a special role in the formation of the general linguistic competence of the future English teacher is assigned, since it is a propaedeutic course in the system of methodological linguistic disciplines studied during the preparation of bachelors in the field of linguistic

education, and its immediate purpose is to form students' general linguistic competence necessary for further study of particular sections of linguistics, and also for the formation of linguistic horizons and linguistic thinking as the basis for practical mastery of a foreign language for solving professional tasks in the field of language teaching and translation. Since the development of the discipline is based on the competencies formed by students in the process of previous education in secondary school, it also serves as a transitional stage between school and university teaching of linguistic disciplines.

Among the modern innovative technologies that activate professionally-oriented educational activities of students, the following can be distinguished:

- dialog technologies based on the principle of educational dialogue between the learner and the teacher, as well as the learner and the learner (heuristic conversations, educational discussions, analysis of specific situations - a case study, a method of problem presentation, etc.);

- game technologies that represent the educational role-playing professional imitation activity of students during the study of the discipline (role-playing and business games, quizzes, etc.);

- project technologies that involve independent performance by students of work aimed at solving a specific educational and professional problem: information and analytical projects (analysis of various sources of information, preparation of a report, presentations, publications, etc.);

- simulation and game projects (preparation of scenarios for business and role-playing games, etc.);

- specialized practice-oriented projects;

- socially significant projects, etc.;

- computer technologies based on the use of various kinds of computer programs for educational purposes (information, control, training, etc.);

- integration technologies that are based on interdisciplinary connections and increase the general cultural and scientific potential of the future specialist.

According to the requirements, the implementation of the discipline takes place during the contact work of the teacher with students, which includes classes of lecture and seminar types, group and individual consultations, including through distance technologies, current and intermediate (credit) attestation, and independent work of students. The lecture-type classes consider theoretical issues of linguistics, such as linguistics as a science, the main stages of the development of the science of language, language as an object of linguistics, the functions of language and speech, the relationship of language and thinking, language and culture, the origin and prerequisites for the development of languages, the formation of individual languages, language and society. Seminar-type classes are devoted to practical issues of linguistics, namely, consideration of the structural levels of language - phonetic, morphemic,

lexical and grammatical. Questions of the theory of writing and classification of the languages of the world are submitted for independent study by students.

In the course of classes and when organizing independent work by a teacher, as a rule, various educational technologies are used in the complex. For example, dialog, computer and integration technologies are used for lecture-type classes. All lectures are multimedia presentations based on PowerPoint or Prezi computer programs, including fragments of educational videos and lectures by leading domestic and foreign linguists on certain topics of the discipline, posted on the website http://youtube.com.

At the same time, educational information is offered to students in the form of a heuristic conversation or a method of problem presentation, when the teacher asks questions of a problematic nature during the lecture, to which it is necessary to give a short answer or asks students to draw their own conclusions on the material presented. For example, when considering the question "The symbolic nature of language" after demonstrating the definition of a linguistic sign, students are asked to conclude which units of language and speech are linguistic signs and which are not, and briefly explain why. In addition, during the lecture, students make a reference summary on the topic using a printed workbook, in which they record the wording of definitions, brief answers to questions, conclusions and generalizations, fill out tables, etc. In the week following the lecture, students undergo computer testing on the lecture material. When preparing for the next lesson, students are encouraged to repeat the material of the previous lecture on the reference summary and familiarize themselves with the tasks in the workbook to be completed during the next lecture.

The seminar-type classes use all the previously mentioned innovative learning technologies: dialog, game, project, computer and integration. Preparation for the seminar session begins with familiarization with my and the lesson plan, as well as a list of recommended literature and sources in the workbook. Next, students study the recommended literature and compile a glossary of basic terms and concepts and a reference summary on the topic, paying special attention to the selection of language units illustrating the main provisions and concepts of the topic being studied. The next stage is the implementation of creative, problematic and situational tasks: preparation of an information message, a presentation report, writing an essay, an abstract, solving a case, conducting a mini-study, etc., and preparing for their discussion in the classroom. During the seminar session, not only the performance of the task itself is evaluated, but also participation in the discussion during its discussion. In preparation for the lesson, the student also repeats the material of the previous lesson

and prepares for a terminological dictation on the previous topic, which is held at the beginning of each seminar lesson. Since seminar-type classes belong to the practical part of the discipline, a significant number of tasks offered to students are related to the linguistic analysis of linguistic phenomena. For example, "Specify the strong and weak positions of vowel phonemes in these words", "Determine what differential features distinguish the first phonemes of the following pairs of words", "Match the words ox, shaft, dam, lot, juice with the corresponding minimal pairs that differ from the named words by the following differential phoneme features:

a) palatalization;

b) involving a nasal resonator;

c) the degree of elevation of the language;

d) the place of articulation;

e) the way of articulation, "What function does stress perform in the following pairs of phrases? Make sentences with these words to illustrate their meaning", "Determine the number of speech bars and phonetic words in a given phrase. With what intonation should it be read?", "Divide the following words into morphemes and give a complete description of each morpheme. Make the division by selecting words containing the same morpheme", "Specify the type of each lexical grouping of Russian words given below and define the corresponding terms", "Break the members of word-formation nests into word-formation chains and word-formation pairs. Specify the direction of derivation", "Distribute the following words of modern English according to their belonging to the corresponding part of speech, select suffixes and prefixes indicating that the word belongs to the corresponding part of speech", "Select from the given word forms those that have a zero index. Justify your decision and indicate which grammatical meanings are expressed by these indicators", "In the following sentences, distribute all the words into parts of speech.

Specify which signs coincide, which do not coincide in identical parts of speech in Uzbek and English. Are there any mismatched parts of speech in the compared languages?", "Find in the text and characterize simple sentences according to their classifications", "Give 2 examples of complex sentences in Uzbek and English and make their syntactic analysis according to the scheme", etc. Also, as in the case of lecture-type classes, computer testing on the studied topic is carried out on the week following the seminar session.

Independent work of students in the discipline is organized and controlled both with the help of a printed workbook and through the tools offered by the electronic textbook "Introduction to Linguistics". The section of the workbook devoted to independent work contains tasks for self-study of the topics "Theory of writing" and "Classification of languages of the world", identical to the tasks offered for lecture and seminar classes. The electronic textbook gives students the opportunity to repeat or independently study the material of lectures if classes were missed, use links to online dictionaries, reference books, textbooks and scientific works of leading linguists, discuss a topic of interest with other students at a thematic forum, practice computer tests, test their knowledge of linguistic terminology with the help of educational games, crosswords, etc. to receive individual and group advice from a teacher during extracurricular time, in particular, when performing research work and preparing for a speech at the annual student scientific conference at the end of the year or a scientific conference of students and young scientists.

All the educational technologies and forms of work presented above are aimed not only at the current control of the level of assimilation of the material offered to students (make a glossary of terms and concepts; make a reference summary on the topic; define concepts; recall terms by their definitions, etc.), but also at systematization of the information received during classes (fill out the table; sign objects on the diagram, etc.), the formation of students' ability to interpret fragments of monographs and articles (tasks with a textbook component), illustrate the basic concepts of the topic being studied with independently selected language material (give examples, etc., to analyze specific situations related to the functioning of the language and requiring a certain decision (solve the case, etc.), to carry out the main types of linguistic analysis (phonemic, morphemic, morphological, syntactic, etc.), which significantly increased the level of formation of general linguistic competence among students.

Thus, having analyzed the features of the use of innovative educational technologies for the formation of general linguistic competence of university students on the example of the above training area, we can conclude that the use of innovative forms, methods and technologies of the educational process organization allows to increase the level of formation of the desired competence, as well as the motivation of students to study the discipline, to bring the learning process closer to the real conditions of professional activity a future specialist.

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Issue   Article

Meyrbek Inkarbekuly Azbergen
M.H.Dulati Taraz Regional University
Candidate of Technical Sciences.sciences, professor,
Kazakhstan

METHODOLOGY FOR DETERMINING THE CHARACTERISTICS OF SOILS UNDER FLAT DEFORMATION

Abstract: *The article presents a method for calculating the transition from the known deformation characteristics of soils obtained during standard triaxial tests along the "crushing" trajectory to the deformability characteristics under flat deformation.*
Key words: *soil, stress, deformation, complex stress state, plane deformation, modulus of deformations.*
Language: *Russian*

МЕТОДИКА ОПРЕДЕЛЕНИЯ ХАРАКТЕРИСТИК ГРУНТОВ ПРИ ПЛОСКОЙ ДЕФОРМАЦИИ

Аннотация: *В статье представлена методика расчетного перехода от известных деформационных характеристик грунтов, получаемых при стандартных трехосных испытаниях по траектории «раздавливания», к характеристикам деформируемости при плоской деформации.*
Ключевые слова: *грунт, напряжение, деформация, сложное напряженное состояние, плоская деформация, модуль деформаций.*

Введение

УДК 624.131

Возможность прогноза осадки зданий и сооружений в каждом конкретном случае обусловлена наличием экспериментальных данных о закономерностях деформирования грунтов их оснований в этих условиях. Важным при этом является и то, чтобы методика описания этих закономерностей позволяла бы наиболее полно учитывать получаемую в экспериментах нелинейную связь между напряжениями и деформациями грунта. Это относится и к случаю работы грунтов оснований при плоской деформации.

Теоретические основы методики

Плоская деформация представляет собой частный случай сложного напряженно-деформированного состояния, когда деформации ε_2 в направлении промежуточного главного напряжения σ_2 равны нулю. Для этого случая, используя соотношения Генки [1,2]

$$\begin{cases} \varepsilon_1 = \dfrac{1}{2G}(\sigma_1 - \sigma) + \dfrac{1}{3K}\sigma; \\ \varepsilon_2 = \dfrac{1}{2G}(\sigma_2 - \sigma) + \dfrac{1}{3K}\sigma; \\ \varepsilon_3 = \dfrac{1}{2G}(\sigma_3 - \sigma) + \dfrac{1}{3K}\sigma. \end{cases} \quad (1)$$

где второе равенство приравнивается нулю, можно легко определить значение промежуточного напряжения σ_2:

$$\sigma_2 = \frac{3K - 2G}{2(3K + G)}(\sigma_3 + \sigma_1). \quad (2)$$

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После подстановки значения σ_2 в первое и третье равенства зависимостей (4) и выполнения несложных преобразований, для плоской деформации можно записать [3,4]:

$$\begin{cases} \varepsilon_{1пл} = \dfrac{3K+4G}{4G(3K+G)}\left[\sigma_1 - \dfrac{3K-2G}{3K+4G}\sigma_3\right]; \\ \varepsilon_{2пл} = 0; \\ \varepsilon_{1пл} = \dfrac{3K+4G}{4G(3K+G)}\left[\sigma_3 - \dfrac{3K-2G}{3K+4G}\sigma_1\right]. \end{cases} \quad (3)$$

откуда

$$E_{пл} = \frac{4G(3K+G)}{3K+4G} \; ; \; \nu_{пл} = \frac{3K-2G}{3K+4G} \quad . \quad (4)$$

где K и G - соответственно модуль объемных деформаций и модуль деформаций сдвига.

При необходимости нетрудно убедиться, что для основных характеристик нелинейной деформируемости при плоской деформации остаются справедливыми соотношения [1,2,4-6]:

$$G_{пл} = \frac{E_{пл}}{2(1+\nu_{пл})}, \quad K_{пл} = \frac{E_{пл}}{3(1-2\nu_{пл})}, \quad (5)$$

где $G_{пл}$ - модуль деформаций сдвига при плоской деформации; $K_{пл}$ - модуль объемных деформаций при плоской деформации.

Соотношения (4), (5) имеют важное практическое значение, поскольку позволяют проводить расчеты для условий плоской деформации при известных по результатам стандартных (по траектории «раздавливания») трехосных испытаний характеристиках деформируемости.

Экспериментальные основы методики

Приборы для испытания грунтов при плоской деформации, несмотря на их привлекательность, достаточно сложны и их использование сопряжено с определенными трудностями технического и методического характера. В связи с этим такие приборы не находят широкого применения. Как правило, характеристики грунтов определяются в стандартных испытаниях на приборах трехосного сжатия. Для адекватного отражения в расчетах реальной работы сооружения, полученные в этих условиях характеристики грунтов должны корректироваться к условиям плоской деформации.

Следовательно, необходимо разработать такую методику, которая позволила бы, используя данные стандартных трехосных испытаний, переходить расчетным путем к определению характеристик грунтов при плоской деформации.

Стандартные трехосные испытания грунтов в условиях сложного напряженного состояния проводятся, как правило, в приборах трехосного сжатия по траектории «раздавливания». В качестве такого прибора может быть использован приборы трехосного сжатия С-62 конструкции Воронцова Э.И.-Азбергена М.И. [8,9], в которых впервые в экспериментальной практике исследования грунтов применена система "противодавление", что позволило устранить недостатки существующих приборов - утечку рабочей жидкости и трение по контакту «шток-втулка». Общий вид прибора трехосного сжатия С-62 представлен на рисунке 1, а схема его приведена на рисунке 2.

Как известно, в условиях сложного напряженного состояния каждый элементарный объем грунта подвергается действию тензора напряжений, который может быть охарактеризован тремя его инвариантами. В экспериментальной практике, как правило, в качестве инвариантов тензора напряжений принимают три их главные напряжения. Поэтому испытание образца, принимаемого за элементарный объем грунта, осуществляется в условиях задания по его граням трех главных напряжений.

Методика трехосных испытаний грунтов, обработки и аналитического описания их результатов основана на многолетнем опыте работы Лаборатории исследования строительных свойств грунтовых материалов Научно-исследовательского сектора института «Гидропроект» имени С.Я.Жука (г.Москва, Россия) и лаборатории «Геотехника» Регионального научного центра «Геомеханика» Национальной инженерной академии Республики Казахстан (г.Тараз, Казахстан).

Рисунок 1. Экспериментальная установка для испытания грунтов в условиях трехосного сжатия конструкции Воронцова Э.И.-Азбергена М.И.
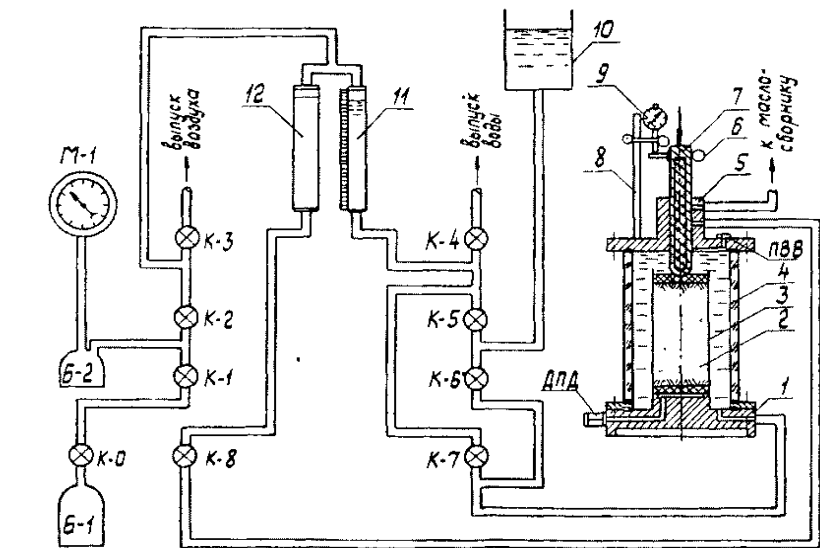

1 - основание прибора; 2 - образец грунта; 3 – оболочка резиновая; 4 – корпус прибора; 5 – крышка корпуса; 6 – консоль индикатора; 7 – шток прибора; 8 – индикатор перемещений; 9 – стойка индикатора; 10 – бачок напорный; 11 – волюмометр; 12 – емкость с маслом; Б – баллон для воздуха; К – кран; М – манометр; ПВВ – пробка выпуска воздуха; ДПД – датчик парового давления.

Рисунок 2. Схема прибора трехосного сжатия С-62 конструкции Воронцова Э.И.-Азбергена М.И.

Первичная обработка результатов трехосных испытаний грунтов выполняется на персональном компьютере с использованием составленной для этих целей вычислительной программы "PORTI", которая реализована на языках «Delphi» и «Basik». По результатам расчета строится "Паспорт трехосных испытаний грунта"[2,5-7] (рисунок 3) - форма графического выражения механических свойств материала, где находят отражение три основные зависимости: $\sigma_i^*(\sigma)$ - предельное условие прочности грунта; $\varepsilon_i(\sigma_i, \sigma)$ - зависимость интенсивности сдвиговых деформаций от интенсивности касательных напряжений и среднего напряжения; $\varepsilon_v(\sigma, \sigma_i)$ - зависимость объемных деформаций от среднего напряжения и интенсивности касательных напряжений.
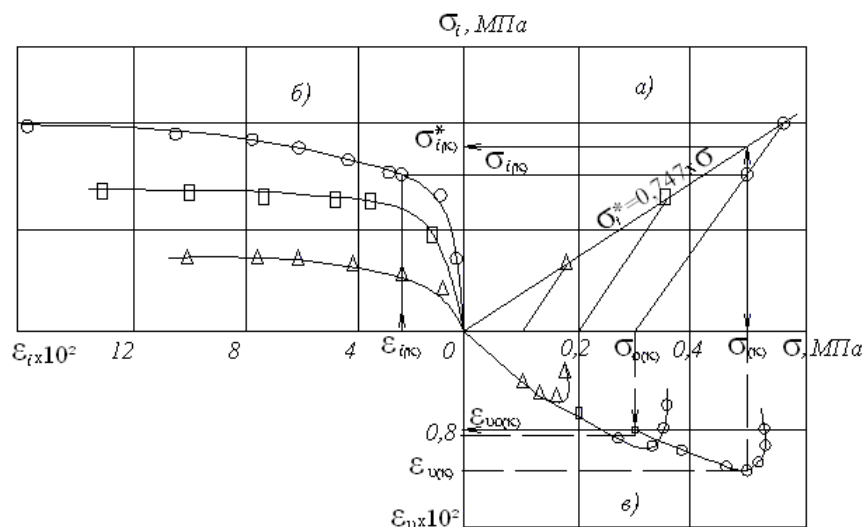
Рисунок 3. Паспорт трехосных испытаний грунта

Модуль объемных деформаций (*K*) и модуль деформаций сдвига (*G*) в выражениях (4)-(7) определяются как [1,2,7]:

$$K = a + в\sigma \; ; \; G = \frac{\sigma^{*}_{i} - B\sigma}{A}, \qquad (8)$$

где *a, в, A, B* – параметры, определяемые экспериментальным путем по результатам стандартных трехосных испытаний.

Более подробное описание экспериментального оборудования, методики испытаний и определения характеристик грунта при трехосном сжатии можно найти в работах [1,2,7].

Выводы

В результате исследований разработана методика определения деформационных характеристик грунтов при плоской деформации по данным стандартных трехосных испытаний. Предлагаемая методика позволяет расчетным путем переходить от известных деформационных характеристик грунтов, определенных при стандартных трехосных испытаниях (по траектории «раздавливания») к характеристикам деформируемости при плоской деформации, что значительно упрощает расчеты сооружений, работающие в этих условиях.

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Issue   **Article**

Ildar Urakovich Khatamov
Karshi Engineering-Economic institute
Russian Language teacher
Department of Uzbek Language and Literature
Karshi, Uzbekistan

MAKING A DIALOGUE BY USING TECHNICAL VOCABULARY

Abstract: In the classes of Russian language for technical subjects such as petroleum engineering, geology engineering, and cadaster one needs a long-standing process in learning technical terminology of these sphere of study. Besides, these terms complicate the learning situation in classes of Russian languages for technical purposes because firstly, it is not easy to pronounce, secondly, it is not easy to find translation of it in L1 and they hamper learners interpret the whole idea of context. Furthermore, we stated some extract from the course-book focused on oil and gas engineering to make an analysis in comprehending terminology of that expertise.
Key words: technical language, Russian language, terminology, petroleum engineering.
Language: English
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Scopus ASCC: 3304.

Introduction

Terminology of a specialty can specify full introduction of professional setting where experts or learners are engaged in working with a great deal of terms and often use them in reluctant. Furthermore, it is difficult to apply every terms in speech for making a dialogue due to misunderstanding of those by other listeners if a speaker does not describe in details of that terminology. In order to be perceived, a word or term should first be recognized by listener or in the process of communication between individuals. Dialogue talks varies according to the topic the learners intend to express, which also involve listeners' interest in joining the talk with their passionate attitude to the issues arisen in classes of Russian language for specific purposes. The talk is more different in in the technical classes of Russian language comparing to a language for general purposes. What's more, the written and spoken contexts are very complex to interpret because of consisting full technical words and word-combinations focusing on the subject to portray in speech utterances. We highlight the ideas of scholars according to the issues concerning main features of talks in technical language in L2. We carried out an experiment which is based on interview with students'

respond regarding to the questionnaire consisting of questions. The result of data analysis indicated in the diagram visually.

The views of researchers according to the talks in the classroom

Mercer & Littleton, 2007; Michaels, O'Connor, & Resnick, 2008; Nystrand, 2006 claimed that learners' dialogue in a wide range of topics in the classroom, but not all talks have equal educational value, consequently, a large body of work, most of which adopts the sociocultural position that discourse is fundamentally social and interactional, has focused on identifying the types of talk that are especially productive for the development of students' thinking and learning.

What's more, Hennessy et al., 2016; Resnick, Asterhan, & Clarke, 2018 stated that there is reasonable agreement regarding the core characteristics of such talk and the nature of the communicative norms from which it is believed to emerge. First and foremost, students take part in productive dialogues collectively. Additionally, Mercer (1995) pointed out the term 'interthinking' to describe the power of thinking together, which is produced when reasoning is evident in talk and when ideas and perspectives are formed into coherent lines

of inquiry through elaboration, justification and constructive critique.

Furthermore, Michaels et al.(2008) stated that in a classroom where ground rules are established, participants share certain obligations and accountability to standards of reason, the value of disciplinary knowledge and the learning community.

Some scholars (Chen, Hand, & Park, 2016; Crowell & Kuhn, 2014; Kuhn & Crowell, 2011; Reznitskaya et al., 2001; Venville & Dawson, 2010; Zohar & Nemet, 2002) revealed that dialogical argumentation has gained terrain in recent years as a learning method, shown to lead to significant improvements in students' oral and written communication, and critical thinking. Extensive research with students of middle and secondary school age has led to the conclusion that the practice of dialogical argumentation helps adolescents to acquire critical thinking skills, most notably argument and counterargument construction, and claim-evidence coordination.

Henning Fjørtoft, Lise Vikan Sandvik (2021) indicated that participatory dialogue processes promote the values and principles of social integration through employing the strategies of inclusion, participation and justice that produce the foundation of the active and meaningful engagement of all citizens in building their common future. Through the dialogue process, diverse persons, groups or peoples find commonalities, similarities and complementarities that can become the basis for mutual understanding and joint action. Whether the diversity is based on ethnicity, gender, age, disability, nationality or any other difference, the process of building mutual understanding and joint action is the manifestation of social integration. The building of mutual understanding and joint action involves communication and, indeed, increasingly frequent, regular and peaceful dialogic conversations—beyond debate, discussion or negotiation (Hemmati & United Nations, (2007: 61–62). The role of dialogue serves as a strategy for ensuring openness and transparency, as well as for increasing the likelihood of implementation by involving stakeholders in decision-making processes (Henning Fjørtoft, Lise Vikan Sandvik , 2021).

Research methods

In teaching a technical terminology to the engineering students requires a long-standing process and broadened knowledge to use. The group of students was invited to be interviewed by a survey consisting of questionnaire describing the needs of learners according to the terminology in L2 and its essentiality in learning the subject matter in L2.

1. Is terminology essential in learning specialty?

2. Is terminology supportive for increasing communicative competence?

3. Does technical terminology enhance writing skill?

4. Do you need technical terminology in working with experts at the hard industry?

A SURVEY

question 1   question 2   question 3   question 4

22%
30%
15%
33%
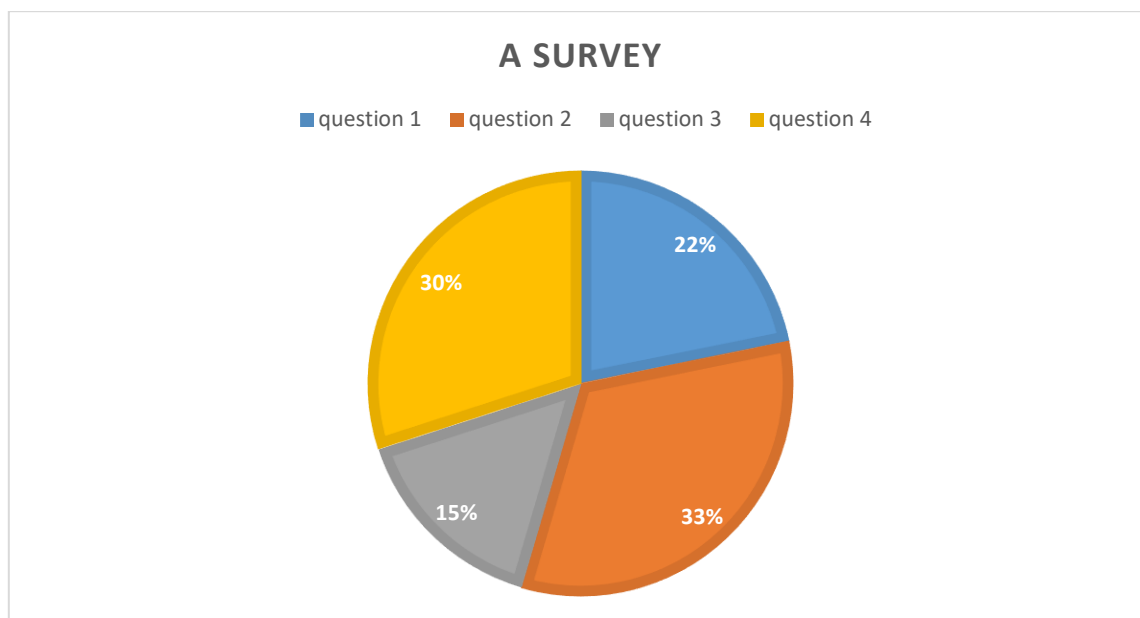
Pic.1.

Data Analysis

After having data collected, we made a needs analysis on data respectively, the respondents were certain for answer to the questions. 33% learners have chosen a positive answer according to the question: terminology which supportive for increasing communicative competence. Furthermore, 30% of learners responded to the question concerning

necessity for technical terminology in working with experts at the hard industry.

Conclusion

In acquisition of technical language, a learner should revise the terms frequently, and use it in talks, in the patterns of communication or in the process of making a dialogue with course-mates. Meanwhile, technical terminology is complicated to obtain and put it into practice in speech because we should know whether listener is aware of that unknown terminology to comprehend or interpret it by speech. Even it is hard to pronounce technical terms in the field of petroleum engineering. We conducted a research on the issues of learning technical terminology in oil and gas engineering and a group of students were chosen to be interviewed by a survey which consisted of some questions to respond respectively. The result was obvious and indicated in the above-mentioned diagram.

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K. S. Yussupova
Taraz Regional University named after Dulati
Master of technical

FACTORS AFFECTING THE PERFORMANCE OF CONCRETE MIXERS

Abstract: *The article analyzes the main factors affecting the performance of self-propelled concrete mixers during the delivery of ready-mixed concrete from the CMP to the construction site. The technological and technical perfection of the ATM is determined by the assessment of the degree of compliance of the principles of operation, parameters of the ATM and equipment with the conditions of the process as a whole and its individual operations, as well as the quality of the performed work. A comparative assessment of various ATM designs according to individual and complex indicators of the efficiency and technical and economic level of ATM in technological schemes of operation, taking into account operating conditions.*

Key words: *concrete mixer truck, mix, concrete, temperature.*

Language: *Russian*

Citation: Yussupova, K. S. (2022). Factors affecting the performance of concrete mixers. *ISJ Theoretical & Applied Science, 04 (108),* 738-745.

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Scopus ASCC: 2200.

ФАКТОРЫ ВЛИЯЮЩИЕ НА ПОКАЗАТЕЛИ РАБОТЫ АВТОБЕТОНОСМЕСИТЕЛЕЙ

Аннотация: *В статье проанализированы основные факторы влияющие на показатели работы самоходных автобетоносмесителей при доставке товарного бетона от БСУ к объекту строительства. Технологическое и техническое совершенство АБС определено оценкой степени соответствия принципов работы, параметров АБС и оборудования условиям выполнения процесса в целом и отдельных его операций, а также качеством выполняемых работ. Дана сравнительная оценка различных конструкций АБС по единичным и комплексным показателям эффективности и технико-экономического уровня АБС в технологических схемах работы с учетом условий эксплуатации.*

Ключевые слова: *автобетоносмеситель, смесь, бетон, температура.*

Введение

Основными факторами влияющими на показатели работы самоходных автобетоносмесителей при доставке товарного бетона от БСУ к объекту строительства являются: условия доставки, бетона к объекту строительства, температурные условия и начальная подвижность бетона, длительность нахождения перевозимой смеси в пути внедорожного покрытия организационно-строительные условия в процессе доставки бетонных смесей [1-15].

При выборе способа и средств доставки необходимо учитывать условия, определяющие процесс доставки, основными из которых являются климатические, дорожные и организационно-строительные [9, 10, 18, 19, 20, 24].

Значительный объем бетонной смеси в странах СНГ и РК доставляется в условиях отрицательных температур, что ведет к существенному переохлаждению смесей и является причиной больших затрат на их разогревание при приготовлении и укладке, а также к дополнительному расходу воды и цемента, вызванному необходимостью обеспечения заданной исходной подвижности смеси при ее повышенном разогреве. Вместе с тем, из технологии бетонов известно, что перегрев

смесей, а также их частичное «пригорание» по мере интенсивного обогрева недопустима, так как приводят к ускоренному гелеобразованию и схватыванию, а также к значительным потерям бетонных смесей и высоким трудозатратам на их выгрузку. В связи с этим назрела необходимость выявить механизм охлаждения бетонной смеси.

С этой целью в производственных условиях при температурах окружающего воздуха – т – от +35 градусов до – 42 были проведены специальные эксперименты по перевозке бетонных смесей. В экспериментах использовались автобетоносмесители с неотогретыми и предварительно подогретыми перед загрузкой, а также с постоянно подогреваемыми кузовами. Эксперименты показали, что процесс охлаждения смеси и общие ее теплопотери могут быть представлены в виде двух слагаемых .

$$\Delta Q = \Delta Q_{\text{гр}} + \Delta Q_k$$

$$\Delta t = \Delta t_{\text{тр}} + \Delta t_k$$

где ΔQ_k и Δt – соответственно абсолютные тепло– и температура потери в результате транспортировки;

$\Delta Q_{\text{гр}_k}$ и $\Delta t_{\text{тр}}$ – соответственно тепло – и температура потери собственно загружаемой в барабан смеси в результате транспортирования;

ΔQ_k и Δt_k – тепло и температурапотери смеси, возникающие от ее первоначального контакта с охлажденным в порожнем рейсе барабаном автобетосмесителя.

Для ликвидации ΔQ_k и Δt_k кузова или смесительные барабаны должны быть разогреты перед их загрузкой бетонной смесью, причем разогрев должен производиться непосредственно перед укладкой.

X, кузова которых не оснащены термоизоляцией, где t – температура бетонной смеси, T – интервал времени замеров, t – температура воздуха при перевозке.

Снижение температуры смеси в зависимости от ее исходных значений и температур воздуха при перевозке

Здесь необходимо сказать, что одной из основных особенностей подбора бетона является необходимость учета существующей пропорциональной зависимости между температурой бетонной смеси и ее начальной подвижностью, которая прямо пропорциональна количеству воды, находящейся в смеси [19, 20].

Ориентировочные величины изменения расходов воды в бетоне, необходимой для получения бетонной смеси одинаковой исходной подвижности в зависимости от температуры смеси приведены в таблице 1.

Таблица 1 – Зависимость изменения расходов воды в бетоне от температуры смеси.

Температура смеси в градусах по Цельсию	10	15	20	25	30	35
Относительный расход воды в процентах	94-97	7-99	100	102-104	103-107	108-110

Увеличение расхода воды приводит к увеличению водоцементного отношения и, следовательно, к понижению прочности бетона. Поэтому для получения заданной марки бетона (при равноконсистентных смесях) в таких условиях требуется прямо пропорционально увеличить расход цемента.

При увеличении температуры смеси на 10 градусов перерасход цемента в зависимости от его вида и марки бетона может составлять от 10-15 до 35-45 кг/м³ перевозимой бетонной смеси.

В связи со сказанным выявляется крупная задача в рыночных условиях – создание специализированных автомобилей с подогреваемыми (термоактивными) кузовами и смесительными барабанами для эксплуатации в условиях низких отрицательных температур и термоизолированными или охлаждаемыми для эксплуатации при незначительных отрицательных и высоких положительных температурах. Конструкции этих машин также должны позволить ликвидировать попадание в них осадков, так как последние по изложенному выше механизму также приводят либо к снижению прочности бетона, либо к перерасходу цемента.

Влияние длительности нахождения перевозимой смеси в пути в вида дорожного покрытия

В связи со схватыванием и расслоением длительность нахождения бетонной смеси в пути в зависимости от ее вида и способа доставки резко ограничена и регламентирована [11, 18, 21, 24].

При этом при перевозке готовых смесей по дорогам с грунтовым покрытием допустимое расстояние примерно в два раза меньше, чем по дорогам с твердым покрытием, а использование в этих случаях автобетоносителей нерационально из-за выхода из строя.

Оптимальным можно считать применение автобетоновозов при доставке смесей без их побуждения на расстояние до 20 км. При доставке смесей на расстояние свыше 20 км необходимо применять другие способы доставки.

Ввиду того, что при доставке готовых смесей их подвижность падает, а обеспечение ее проектного значения связано с перерасходом цемента, в целях его снижения в некоторых случаях возможно применение химических добавок, введение раствора которых в бетонную смесь целесообразно осуществлять во время или после транспортировки, но до момента перемешивания и выгрузки[25]. В связи с этим, должны иметь специально футерованные баки или отсеки для хранения растворов этих добавок, а также устройство для их ввода и перемешивания со смесью[25].

Обычно применяемыми добавками являются противоморозные и пластификаторы [25]. В качестве противоморозных добавок наиболее часто используются CaCL, NaCL, NaNO, CaNO, поташ, мочевина и их соединения [25]. Количество этих добавок в безводном (неразбавленном) состоянии может доходить до 15% от веса цемента[25]. В качестве пластификаторов используются сульфитно-дрожжевая бражка – СДБ, суперпластификатор С – 3, жидкое стекло и т.п. [25]; их количество в безводном состоянии может доходить до 3% от веса цемента, добавки растворяются в воде[25].

Виды дорожного покрытия, по которому осуществляется доставка, должны быть учтены автомобилестроителями при разработке базового шасси[25]. Для снижения влияния вибрации на перевозимую смесь кузов транспортного средства должен быть оснащен дополнительными амортизаторами[25].

Влияние организационно-строительных условий на процесс доставки бетонных смесей [25]

Основными организационно-строительными условиями являются [6, 13, 16, 18, 24], [25]:
– вид строительства[25];
– необходимость крупно и мелкопорционной доставки с возможностью развозки по объектам[25];
– возможность совмещения доставки смеси с ее внутриобъектной подачей или укладкой[25];
– темп бетонирования внутри объектной укладки стен[25];

– сосредоточенность, рассредоточенность строительства и порционность доставки[25];
– необходимость универсализации и унификации средств доставки[25];
– необходимость использования выпускаемых отечественной промышленностью автошасси и параметризации автообетоновозов[25].

При сосредоточенном строительстве применение автобетоновозов эффективно[25]. Если при этом бетонирование ведется с помощью бетононасосов, то эффективно применение бетоновозов со смесителями-перегружателями[25]. При рассредоточенном строительстве возможно применение различных типов бетонотранспортного оборудования, учитывающего характер самого строительства[25]. При массовом применении бетона целесообразно использование автобетоносмесителей[25]. При значительности строительно-монтажных работ и наличии для этих целей подъемного крана целесообразна доставка смесей автобадьевозами[25].

В определенных видах строительства необходима мелкопорционная доставка (развозка) бетонных смесей[25]. К таким объектам относятся сельскохозяйственные постройки, линии ЛЭП и другие виды электропередач [25], коммунальное строительство и т.д. Эти виды строительства на бетонных работах составляют примерно 20-25% от общего объема бетонных работ. Мелко порционная доставка (развозка) осложняется тем, что объекты могут находиться на значительном удалении, а время такой доставки примерно в 1,5-1,7 раза больше, чем однопорционной (обычной) на те же расстояния. Это влечет за собой не только необходимость дозирования мелких порций, но что весьма важно, необходимость перевозки сухих смесей и приготовления из них готовыми этими же автомобилями. В настоящее время таких работоспособных машин в странах СНГ нет. За рубежом для этих целей используются машины для одновременной раздельной доставки составляющих и приготовления смеси.

Выбор критериев оценки технического и технологического совершенства процесса доставки товарного бетона АБС.

Для успешного проведения оптимизационных расчетов необходимы показатели оценки качества эффективности процесса и машины или в общем случае, оптимизируемого объекта[25]. Показатели, выбранные для оценки оптимальности искомых параметров в задачах оптимального проектирования или управления, называют критериями оптимизации или критериями

оптимальности[25]. Понятие оптимальности без определенного критерия не имеет смысла[25].

Целевой функцией (функцией цепи или функцией качества) является функция, выражающая зависимость критерия оптимальности от параметров оптимизируемой системы[25]. В случаях, когда задача требует определения зависимости критерия оптимальности от какого-то аргумента, вместо целевой функции используется целевой функционал[25].

Однокритериальные задачи оптимизации заключаются в поиске из множества допустимых таких параметров систем, обладая которыми, они будут функционировать так, чтобы некоторый (один) критерий оптимальности достиг минимального или максимального значения[25].

В многокритериальных задачах другие требования: стремление к максимуму или минимуму, а также предъявления различных условий к нескольким критериям[25].

При выборе критериев для оптимизации[25]: технологии приготовления бетонной смеси, доставки последней с учетом температуры окружающей среды[25], длительности транспортирования и вида дорожного покрытия самоходными АБС к строительному объекту[25], следует иметь в виду, что каждый АБС или каждый технологический процесс[25], разрабатываемые, внедряемые или уже применяемые должны удовлетворять социальным, экономическим и техническим требованиям[25].

Одним из важных требований являются технические требования к конструкциям АБС и к технологическим процесса доставки бетонной смеси к строительному объекту[25], которые предусматривают при проектировании машин и организации строительных работ использование современных достижений науки и техники[25].

При эксплуатации самоходных АБС о совершенстве их конструкций судят по величине производительности за единицу времени, продолжительности рабочего цикла доставки к строительному объекту готовой бетонной смеси, удельному расходу топлива, уровню механизации и автоматизации строительных работ, универсальности самоходных АБС, безопасности и санитарно-гигиеническим условиям труда.

Имеются показатели и для оценки технического уровня выполняемых процессов строительного производства. К ним следует отнести следующие: выработку и доставку готовой бетонной смеси к строительному объекту (объем готовой бетонной смеси, производительность) в единицу времени; удельные показатели затрат машинного времени; производительность труда на основных и вспомогательных строительных работах;

соотношение численности рабочих на основных и вспомогательных работах; уровень механизации труда и т.д.

Оптимизировать параметры и свойства самоходных АБС по всем выше перечисленным показателям практически невозможно.

Реальным представляется выбор единого обобщенного показателя и принятие его за критерий оптимизации, последовательная оптимизация по наиболее важным из перечисленных показателей и оптимизация по нескольким критериям (многокритериальная оптимизация).

Выбрать или даже специально разработать и использовать один обобщенный критерий в любой задаче оптимального управления невозможно. Для решения ряда задач одного критерия недостаточно. Если мы будем оптимизировать параметры самоходных АБС только по экономическим критериям, то упустим многие конструктивные качества; оптимизируя процесс приготовления бетонной смеси только по объему готового замеса, не сможем учесть производительность труда и т.д. Следовательно, принимая за основу однокритериальную оптимизацию, следует иметь в виду, что оптимальное проектирование совершенных АБС и технологических процессов доставки готовой бетонной смеси к строительному объекту, оптимальное управление ими возможно только при использовании системы критериев путем последовательной оптимизации, выбора более обобщенных критериев, формирования ограниченной по величине показателей, не используемых в качестве критериев.

Смысл определения технологического совершенства самоходных АБС заключается, во-первых, в оценке степени соответствия принципов работы, параметров АБС и оборудования условиям выполнения процессов приготовления бетонной смеси и доставки к строительному объекту в целом и отдельных их операций, во-вторых, в оценке качества выполняемых строительных работ.

Технический и технологический уровень процессов приготовления, доставки и укладки готовой и бетонной смеси тесно связан с совершенством используемых в этих процессах самоходных автобетоносмесителей, поэтому необходимы использовать показатели, которые оценивают как машины, так и процессы. К таким показателям следует отнести следующие [24]:

1. Уровень механизации строительных работ

$$Y_{м.р} = \frac{V_{об.стр.р}}{V_{мех.стр.р}},$$ (1)

где $V_{об.стр.р.}$ – общий объем строительных работ; $V_{мех.стр.р.}$ – объем механизированных строительных работ;

2. Уровень механизации труда на операции (приготовления, доставки бетонной смеси и т.д.)

$$У_{м.т.оп} = \frac{T_{общ.вр.} * N_{раб.оп}}{T_{вр.маш.оп}}, \qquad (2)$$

где $T_{вр.маш.оп.}$ – общие затраты времени рабочими на выполнение операции (приготовления, доставки или укладки готовой бетонной смеси и т.д.); $T_{общ.вр.}$ – затраты времени на выполнение машинных операций одним рабочим (доставка готовой бетонной смеси АБС); $N_{раб.оп.}$– число рабочих (водителей АБС или рабочих обслуживающих операции приготовления БС на БСУ);

3. Коэффициент механизаций операций (приготовления, доставки или укладки готовой БС).

$$К_{мех} = \frac{n_{мех.эл.оп}}{n_{об.эл}}, \qquad (3)$$

где $n_{об.эл.}$ – общее число элементов, составляющих операцию (по приготовлению, доставке или укладке готовой БС); $n_{мех.эл.оп}$ – число механизированных элементов операции;

4. Коэффициент технического использования оборудования (по приготовлению или укладке БС) по времени

$$К_{т.исп.вр} = \frac{T_{раб}}{T_{пр.орг} + T_{пр.рем} + T_{раб}}, \qquad (4)$$

где $T_{раб}$ – время работы агрегатов БСУ или АБС при выполнении операций приготовления доставки и укладки готовой БС на строительном объекте; $T_{прн.орг.}$ – простой по организационным причинам; $T_{пр.рем.}$ - простой в ремонте в обслуживании и при ожидании ремонта и обслуживания.

5. Энерговооруженность труда

$$Э_{тр} = \frac{N_{уст.м.об.}}{n_{раб.приоб}}, \qquad (5)$$

где $N_{уст.м.об.}$ – установленная мощность двигателей АБС и агрегатов БСУ;

6. Энергоемкость процесса (приготовления, доставки или укладки готовой БС)

$$Э_{пр} = \frac{Э_t}{V_t}, \qquad (6)$$

где $Э_t$ – энергия, расходуемая для выпуска готовой БС за время t; V_t – объем выпуска готовой бетонной смеси за время t.

Определенную группу показателей следует использовать для оценки технологических качеств АБС и агрегатов БСУ [12].

Для самоходных АБС: грузоподъемность Q, т; емкость смесительного барабана $V_{см.бар}$, м³; высота машины (высота загрузки материала) $H_м$, мм; мощность привода смесительного барабана $N_{см.б}$, кВт; общая масса порожнего автобетоносмесителя, $M_{об.пор}$, кг; угол наклона барабана в рабочем положении β, град; скорость вращения смесительного барабана $N_{см.б.}$, об/мин; коэффициент заполнения смесительного барабана $K_{зап}$; масса технологического оборудования $M_{техн.об}$, кг; давление в гидроприводе АБС p, Па и т.д.

Сравнительная оценка технико-экономического уровня АБС для доставки товарного бетона

Выше приведенные показатели, а все их перечислить невозможно, их следует назвать главными параметрами АБС или технологическими.

На основе этих параметров в задаче оптимизации следует формировать критерии и целевые функции.

Существенное значение при оценке качества самоходных автобетоносмесителей имеют весовые показатели, а при сравнении различных вариантов АБС удельные весовые показатели. Для оценки качества АБС необходимо выбрать функциональный критерий [12] ($λ$), соответствующий его основному назначению перемещению определенного объема готовой бетонной смеси $V_{гот.см}$ на заданное расстояние L в единицу времени, то есть

$$λ_i = V_{ГОТ.СМ.i} L_i, \qquad (7)$$

где $V_{гот.см.}$ – объем готовой бетонной смеси, м³; $λ$ – расстояние на которое транспортируется готовый товарный бетон, м.

Данный функциональный критерий для АБС позволяет сравнивать их качественные показатели между собой. Наиболее общей и полной оценкой эффективности применение различных средств доставки готовой бетонной смеси к строительному объекту является оценка по удельным величинам, определяемым с учетом функционального критерия [12].

Удельные показатели средств доставки готовой бетонной смеси следует определять отношением абсолютных показателей, принятых к сравнению, к функциональному критерию данного АБС с учетом условий погрузки, доставки, выгрузки и укладки готовой бетонной смеси, то есть специфических условий эксплуатации. Для оценки технико-экономического уровня различных конструкций бетоно – и автобетоносмесителей следует выбрать следующие параметры: $V_{см.бар}$ – емкость смесительного барабана, м³; C_i –стоимость автобетоносмесителя, тг; G_i – общая масса

порожнего АБС, кг; N_i – мощность привода смесительного барабана АБС, кВт; V_i – объем зоны действия АБС, м³; S_i – площадь зоны действия АБС, м². С учетом выбранных абсолютных параметров удельные величины их следует определять соответственно

$$V_{yd.i}^{см.б} = \frac{V_i^{см.б}}{\lambda_i}; \quad C_{yd.i}^{АБС} = \frac{C_i^{АБС}}{\lambda_i}; \quad G_{ydi}^{АБС} = \frac{G_i^{АБС}}{\lambda_i};$$

$$N_{yd.i}^{пр.см.б} = \frac{N^{пр.см.б}}{\lambda_i}; \quad V_{ydi}^{з.д.АБС} = \frac{V^{з.д.АБС}}{\lambda_i};$$

$$S_{yd.i}^{з.д} = \frac{S_i^{з.д}}{\lambda_i}. \quad (8)$$

При этом значения удельных величин сравниваемых параметров необходимо рассматривать по принципу «чем меньше величина, тем выше технико-экономический уровень АБС».

Как известно [13], весовые коэффициенты являются безразмерными величинами, сумма которых равна единице, то для образования целевой функции в виде суммы произведений значений рассматриваемых параметров на соответствующий весовые коэффициенты «минимуму» удельных величин.

Тогда

$$\overline{V}_i^{см.б} = \frac{V_{yd.i}^{см.б}}{V_{yd.i}^{см.б.min}}; \quad \overline{C}_i = \frac{C_{yd.i}}{C_{yd.i}^{min}}; \quad \overline{G}_i = \frac{G_{yd.i}}{G_{yd.i}^{min}};$$

$$\overline{N}_i^{пр.см.б} = \frac{N_{yd.i}^{пр.см.б}}{N_{yd.i}^{пр.см.б.min}}; \quad \overline{V}_i^{з.д.} = \frac{V_{yd.i}^{з.д}}{V_{yd.i}^{з.д.min}};$$

$$\overline{S}_i^{з.д} = \frac{S_{yd.i}^{з.д}}{S_{yd.i}^{з.д.min}}, \quad (9)$$

где $\overline{V}_i^{смб}, \overline{C}_i, \overline{G}_i, \overline{N}_i^{пр.смб}; \overline{V}_i^{зд}, \overline{S}_i^{з.д.}$ – нормированные (безразмерные) величины сравниваемых параметров АБС;

$V_{yd.i}^{см.б\,min}, C_{yd.i}^{min}, G_{yd.i}^{min}, N_{d.ш}^{пр.см.б.min}, V_{yd.i}^{зд.min}, S_{yd.i}^{зд.min}$
– минимальные удельные показатели i–го АБС в сравнении в совокупности.

Оценку технико-экономического уровня сравниваемых средств доставки товарного бетона к строительному объекту необходимо производить по целевой функции (комплексному показателю K) и следует определять по следующей зависимости

$$K_i^{АББ} = \overline{V}_i^{см.б} * m_1 + \overline{C}_i * m_2 + \overline{G}_i * m_3 + $$
$$+ \overline{N}_i^{пр.см.б.} * m_4 + \overline{V}_i^{зд.} * m_5 + \overline{S}_i^{з.д} * m_6, \quad (10)$$

m_1, m_2, ..., m_6 – весовые коэффициенты соответственно принятых к рассмотрению единичных параметров АБС.

Определение весовых коэффициентов

Для определения значимости или весомости m_j единичных показателей в совокупности всех принятых к рассмотрению, как известно, используются различные способы: стоимостный, долевой, вероятностный, ранговый, экспертный, смешанный и др.[12].

Применение этих методов, как известно, часто связано с проведением больших объемов организационных и вычислительных работ, в силу того, что они в той или иной степени зависят от экспертного метода, которому присущи субъективность и большая трудоемкость. Согласно методики «Сравнительной оценки технико-экономического уровня эффективности применения транспортных средств и систем», разработанной Карагандинским политехническим институтом под научным руководством профессора Даниярова А.Н., принят следующий подход к определению значимости или весомости m_j единичных показателей сравниваемых конструкций машин: упорядочения единичных показателей связывается с распределением значений соответствующих весовых коэффициентов по определенному закону [12]. Кроме того, предполагается, что весовые коэффициенты, определяющие значимость сравниваемых параметров транспортных машин, образуют убывающую последовательность чисел, сумма которых должна быть равна единице, т.е.

$$\sum_{\gamma=1}^{n} m_\gamma = 1, \quad (11)$$

где n – количество принятых к рассмотрению параметров транспортных машин; j – порядковый номер параметров транспортных машин из числа сравниваемых.

Рассматривая различные закономерности распределения коэффициентов, основанная на используемых в практике математических функциях, была установлена следующая закономерность распределения коэффициентов в виде [12].

$$m_1; m_2 = \frac{2}{3} m_1;$$
$$m_3 = \frac{2}{3} m_2 = \frac{4}{9} m_1; ...; m_n = \frac{2^{n-1}}{3^{n-1}} m_1 \quad (12)$$

откуда

$$m_1 = \frac{1}{1 + \frac{2}{3} + \frac{4}{9} + ... + \frac{2^{n-1}}{3^{n-1}}} = \frac{1}{3\left[1 - \left(\frac{2}{3}\right)^n\right]}, \quad (13)$$

Для сравнения технико-экономической оценки бетоно– и автобетоносмесителей по нескольким параметрам и получения их комплексной оценки принятые к сравнению параметры были расположены по их значимости:

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наиболее существенный параметр (емкость смесительного барабана – $V_{iсм.бар}$) был вынесен на первое место, а наименее существенный (площадь зоны действия АБС – S_i) – на последнее. Исходя из условия желательности. Количество сравниваемых между собой параметров было принято равным шести [18].

Подставляя количество параметров $n=6$ в формулу (13), определим значение первого весового коэффициента m_1:

$$m_1 = \frac{1}{3\left[1 - \frac{26}{36}\right]} = \frac{1}{2.736625514} = 0,365$$

Далее подставляя значения $m=0,365$ в зависимости формулу (12), получим численные значения других весовых коэффициентов:

$$m_2 = 0,244; \quad m_3 = 0,162; \quad m_4 = 0,108;$$

$$m_5 = 0,072; \text{ и } m_6 = 0,048.$$

Расчеты сравнения между собой конструкций самоходных АБС, были выполнены для условии доставки готовой бетонной смеси (товарного бетона) от БСУ к строительному объекту. К сравнению были приняты перспективные конструкции самоходных АБС, находящиеся на стадиях опытно-промышленной проверки или эксплуатации в строительстве.

На основе проведенных расчетов можно составить эталонную модель совершенной транспортной машины для доставки готовой бетонной смеси от БСУ к строительному объекту.

Эталонную модель необходимо составлять по наилучшим единичным показателям из числа сравниваемых АБС и ее комплексный показатель должен быть равен единице.

При сравнении этих же АБС в реальном технологическом транспорте схеме необходимо учитывать условия погрузки, доставки, выгрузки и укладки готовой бетонной смеси. При транспортировки от БСУ к строительному объекту необходимо учитывать: физико-механические свойства бетона; условия факторы, определяющие процесс доставки бетонных смесей; температуры смеси и воздуха при перевозке; влияние длительности нахождения перевозимой смеси в пути и вида дорожного покрытия на качество товарного бетона, а также внутри объектной укладки БС. Также необходимо рассматривать такой важный параметр для технологических схем транспортировки БС, как стоимость обслуживания установленного оборудования.

С учетом высказанного, оценку технико-экономического уровня сравниваемых технологических схем транспортировки готовой БС необходимо производить по целевой функции (комплексному показателю), определяемому по следующей зависимости

$$K_i^{T.C} = \overline{V}_i^{см.б} * m_1 + \overline{C}_i * m_2 + \overline{G}_i * m_3 +$$
$$+ \overline{N}_i^{см.б} * m_4 + \overline{C}_i^{обсл} * m_5 + \overline{S}_i^{зд} * m_6, \tag{14}$$

где K_i – комплексный показатель i-й технологической схемы.

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Zuhra Nasirdinova Dumaeva
Andijan State University
Associate Professor

Malika Shavkatjon qizi Olimova
Andijan State University
Master

Muattarkhon Shermuhammad qizi Dumaeva
Andijan State University
Master

Sevara Saidolimovna Kuranova
Andijan State Medical Institute
Assistant trainee

EFFECT OF RAT LIVER TISSUE (A AMYLASE) THE EFFECT OF HYPOKINESIS ON AMYLOLITICAL ACTIVITY

Abstract: This paper provides information on the effect of hypokinesia on the amylolytic activity of liver tissue (a amylase) in mature rats. We can see that the amylolytic activity in the blood of mature rats (a amylase) is slightly higher than in young rats.

Key words: amylase amylolytic activity, liver tissue, enzyme, pancreas, homeostasis, hypokinesia, salivary glands, incretion.

Language: English

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Introduction

Comparing the amylolytic activity in the blood and liver tissue (a amylase) of the control group of mature rats, the amylolytic activity in the blood of mature rats (a amylase) is 7-10 times higher than in young people, and in liver tissue, on the contrary, 1.5-2 times lower. This can of course be the result of the improvement of all its processes, including the enzyme secretion of the glands of the digestive system, when the organism is made. According to the well-known Rhotman S. and co-authors, the rate of enzyme protein synthesis in the pancreas is practically impossible, most of the enzyme excreted in the intestine is absorbed into the blood and from there the pancreas secretes it again, ie enteropancreatic circulation of enzymes is observed [1; 45-b.]. Confirming the same opinion and based on the results of many years of work [2; 982-994-p.] This process promotes the idea that it is specific not only to the pancreas, but to all digestive glands, and that there is recirculation of enzymes in the digestive system. This means that the digestive glands are integrated into a specific circulatory system by secreting glandulocytes from the blood and other glandular enzymes.

On day 1 (Fig. 1.1) of the effect of hypokinesia on the body of mature rats, a sharp decrease in amylolytic activity in the blood (a amylase) was observed, which means that hypokinesia initially inhibits incretion. Based on the above considerations, there are several reasons for the decrease in incretion,

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including the permeability of the histogematic barrier and other factors. In addition, a decrease in the amount of enzymes in the blood can be caused by an increase in recretion.
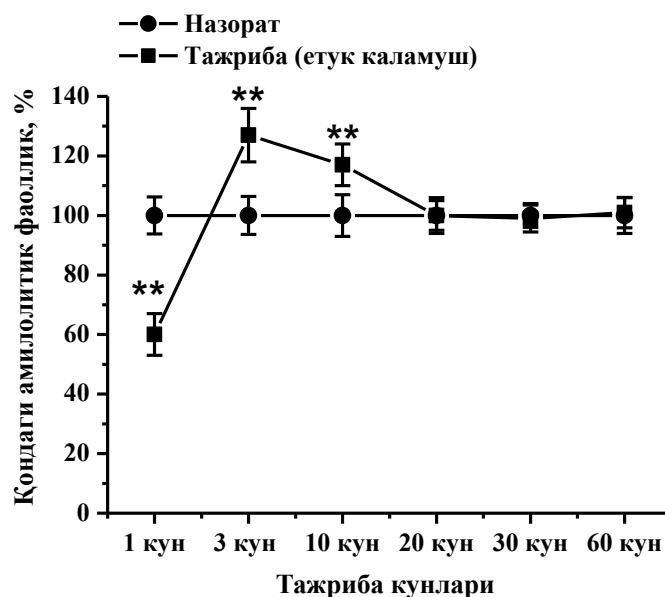

Figure 1.1. Effect of hypokinesia on amylolytic activity in the blood of mature rats (a amylase)
** P <0.01; n = 6.

In our experiment, a one-day exposure to hypokinesia in mature rats resulted in a 2-fold increase in amylolytic activity in liver tissue (α amylase) relative to control (Fig. 1.2) as a result of "deviation" of the amylase enzyme from the blood due to increased their recretion.

On days 3 and 10 of hypokinesia, the amylolytic activity in the blood of mature rats (a amylase) was reliably increased. Day 20 returned to baseline, i.e., control group level, and days 30 and 60 of the experiment remained the same.

Comparing the results obtained in young and mature rats with amylolytic enzymes (a amylase) (Fig. 1.1) shows that the process of adaptation to the stress factor in mature rats is faster, ie the synthesis of enzymes and their amount in the blood returns to normal under the influence of stress factor - hypokinesia. In young rats, the recovery process lasted until the 60th day of hypokinesia.
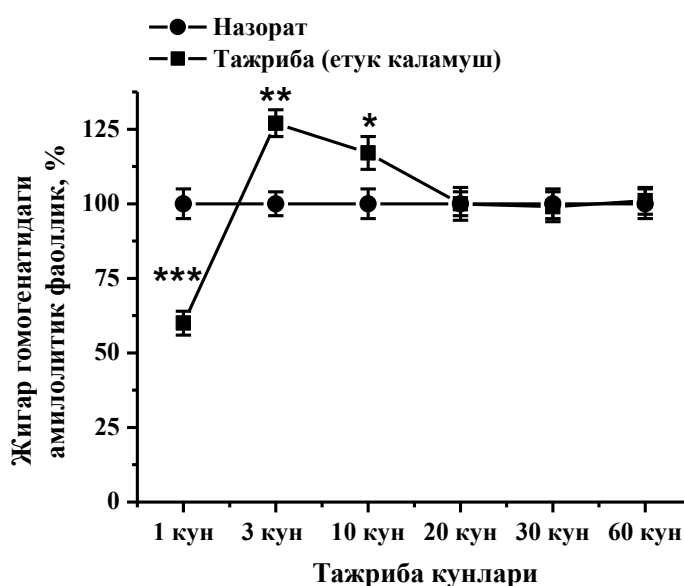
Figure 1.2. Effect of hypokinesia on amyolytic activity in liver homogenates of mature rats * P <0.05;
P <0.01; * P <0.001; n = 6.

Changes in amylolytic activity in liver tissue (a amylase) under the influence of hypokinesia differ from the dynamics of this enzyme in the blood. On days 1, 3, 10, and 20 of hypokinesia, amylolytic activity in liver tissue (a amylase) increased and decreased on days 30 and 60, respectively.

The change in the amount of enzymes in a given organism is the result of adaptation to a given stressor factor. Adaptation, on the other hand, is the sum of the body's specific and nonspecific reactions. The body responds to any demand by altering its energy metabolism. Energy metabolism is directly related to the amount and activity of hydrolytic enzymes.

Changes in the activity of enzymes in the liver are mainly aimed at ensuring the stability of their amount in the blood. The control group confirms our view that the correlation correlation index of amylolytic activity in the blood and liver tissue of mature rats (a amylase) is positive and reliable. Under the influence of hypokinesia, a slight decrease in this correlation indicator, in some cases (20-day hypokinesia), can be understood as a reaction of the organism to this stressor, ie a decrease in rest to ensure enzyme homeostasis in the blood.

Effect of g-radiation on enzyme homeostasis in the blood and liver tissue enzyme activity in adult rats

Liver tissue cells are very sensitive to various endogenous and exogenous factors, the response to which occurs primarily through changes in enzymatic system activity in hepatocytes, which may be due to an increase in the concentration of peroxide oxidation products [3; 79-92-b; 85; 4–1-15-p.]. The following enzymatic changes were detected when rats of different ages were observed for 60 days after exposure to γ-radiation.

The combined effect of hypokinesia and γ-radiation on amylolytic activity in the blood and liver tissue of rats of different ages (a amylase)

The combined effect of both factors reduced the liver homogenate of young rats and the amylolytic activity in the blood (a amylase) from the first day of the experiment. Changes in amylolytic activity in the blood (a amylase) were observed to decrease day by day relative to control. Decreased amylolytic activity in hepatic homogenate (α amylase) In our next experiment, the combined effects of hypokinesia and γ-radiation on amylolytic activity in adult rat blood and liver homogenate (α amylase) were studied. The results were similar to those in young rats. However, in rats, different indicators emerged under the combined influence of two stressors. Under the influence of these factors, changes in amylolytic activity in rat blood and liver tissue homogenate (a amylase) were specific (Fig. 4.29, A and B).
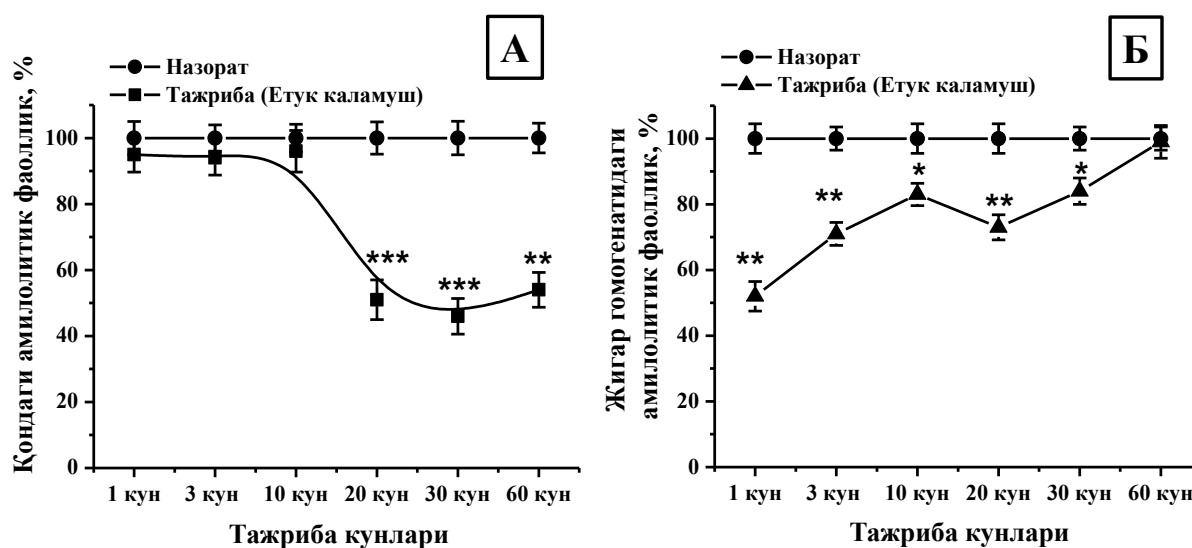

Figure 1.3. The combined effect of hypokinesia and γ-radiation on amylolytic activity in the blood of mature rats (A) and liver homogenate (B) (a amylase) * P <0.05; * P <0.01; * P <0.001; n = 6.

Changes in amylolytic activity in the blood (a amylase) decreased from day to day during the experiment relative to the control, and from 20 days to 60 days of the experiment, this figure remained twice as low as the control. As we know, amylolytic activity in the blood (a amylase) is provided mainly by enzymes encreted from the pancreas, salivary glands. The amylolytic activity in liver tissue (a amylase) decreased almost twice from control on the first day of the experiment, and during the experiment this activity was restored day by day and reached the control level at 60 days of the experiment (Fig. 1.3, A and B). This means that as a result of the combined action of two stressors, the synthesis and incorporation of this enzyme in the pancreas and salivary glands of mature rats is more severely disrupted.

Blood was sharper, decreased by almost 40% over 20 days of the experiment compared to the control, and gradually increased in the following days, but did not equal the control level even at 60 days of the experiment. In particular, this figure was 18% lower than in the control, at a lower level in the blood, at 60 days of the experiment. In liver homogenate, it was 7% less than in controls (Fig. 1.3, A and B).

Post-irradiation changes in amylolytic activity in the blood and liver homogenate (a amylase) of mature rats were different. This activity in the blood and liver homogenetics of irradiated mature rats decreased from the first day, especially when the amylolytic activity in the blood (a amylase) decreased sharply, almost twice (Fig. 1.4, A).
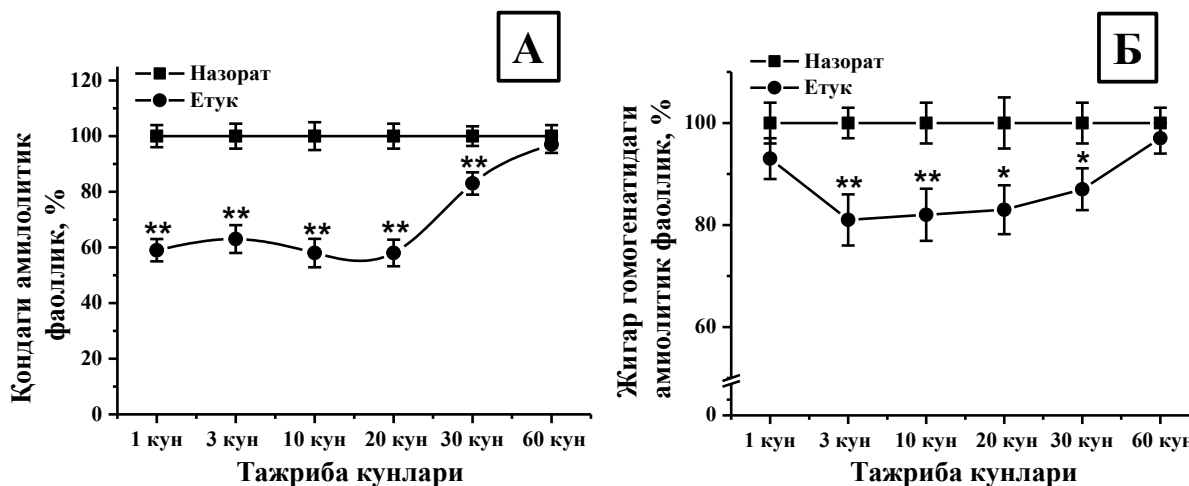
Figure 1.4. Effect of γ-irradiation on amylolytic activity in mature rat blood (A) liver homogenate (B) (a amylase), * P <0.05; ** P <0.01; n = 6.

This indicator in the blood had almost the same magnitude up to 20 days of the experiment, i.e., 58–63% compared to the control, 83% on the 30th day of the experiment, and 97% on the 60th day of the experiment, and remained significantly lower than the control group. The amylolytic activity in liver homogenate (a amylase) was consistently 7–19% lower than that of controls during the experiment, and even at 60 days of the experiment did not reach baseline, remaining below the control group (Fig. 1.4, B).

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S. U. Zhanatauov
Noncommercial joint-stock company «Kazakh national agrarian research university»
Academician of International Academy
of Theoretical and Applied Sciences (USA),
Candidate of physics and mathematical sciences,
Department «Iinformation technologies and automatization»,
Professor, Kazakhstan
sapagtu@mail.ru

CALCULATION OF PARTS OF COGNITIVE INFORMATION IN THE FORMULA OF BIOCHEMICAL REACTIONS

Abstract: A particular method has been developed for reducing the number and increasing the number of dominating eigenvalues for a fixed matrix of eigenvectors of the correlation matrix. Revision of the formulas and meanings of uncorrelated y-variables made it possible to find 2 real independent reactions adequate to the real BOD and COD reactions. When the number of y-variables is reduced to 2, the adequacy of the system of multidimensional equations [5-7] of the cognitive meanings of the variables (taking into account only weighty "weights") to the real reactions of self-purification of the water of rivers and lakes is observed.

Key words: cognitive information, mathematical formula of biochemical reaction.
Language: Russian

ВЫЧИСЛЕНИЕ ЧАСТЕЙ КОГНИТИВНОЙ ИНФОРМАЦИИ В ФОРМУЛАХ БИОХИМИЧЕСКИХ РЕАКЦИЙ

Аннотация: Разработан частный способ уменьшения количества и увеличения лоли доминирующих собственных чисел при фиксированной матрице собственных векторов корреляционной матрицы. Пересмотр формул и смыслов некоррелированных y-переменных позволил найти 2 реальные независимые адекватные реальным БПК- и ХПК-реакции. При сокращении количества y-переменных до 2-х соблюдена адекватность системы многомерных уравнений [5-7] когнитивных смыслов переменных (с учетом только весомых «весов») реальным реакциям самоочищения воды рек и озер.

Ключевые слова: когнитивная информация, математическая формула биохимической реакции.

Введение

Матрица(z_1,z_j)-корреляций $R_{55}=\{r_{ij}\}=(1/m)Z^T_{m6}Z_{m6}$, $r_{ij}=corr(z_i,z_j)$, $i,j=1,\ldots,5$, является функцией, зависящей от матрицы $Z_{m6}=\{z_{ij}\}$ изменчивостей z-переменных. Матрица Z_{m5} (изменчивости z-переменных) влияет на матрицу $Y_{m5}=Z_{m5}C_{55}$ через постоянные «веса» -

матрицу C_{55}. Неизменяемость элементов матрицы C_{55} при изменении элементов матрицы R_{55} [1] вынуждает нас управлять изменчивостями z-переменных (матрицей Z_{m5}) и y-переменных(матрицей Y_{m5}). Начнем управлять величинами дисперсий[1] $\Lambda_{55}=(1/m)Y^T_{m5}Y_{m5}=$ diag(2.3331,1.1802,0.9349,0.3906,0.1613). мы

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[1] Zhanatauov S.U. Computable self-cleaning reactions water of rivers and lakes of eastern kazakhstan. Journal of Computational Technologies, Novosibirsk,(In print).

имеем вычисляемые, а не моделируемые дисперсии [2].

Рассмотрим случай когда известны слагаемые и сумма сложных (когнитивных) знаний, но дисперсии частей смысловой (когнитивной) информации по величине, по количеству не соответствуют неизвестным слагаемым независимых и известных знаний. Необходимо по-новому пересмотреть формулы и смыслы некоррелированные y-переменные и найти реальные независимые y-переменные, моделирующие реальные реакции и вычисляемые нами модельно. Мы проявили интеллектуальную бдительность при когнитивном моделировании смысловых уравнений, хотя соотношение величин доминирующих собственных чисел 2.3331,1.1802, 0.9349 не вызывало вопросов. Мы провели удаление одной y-переменной y_1, оставили 2 y-переменные, наделив их дополнительными дисперсиями. Пересмотр формул и смыслов некоррелированных y-переменных позволил найти 2 реальные независимые БПК- и ХПК-реакции, что адекватно происходящим в природе реакциям. При сокращении количества y-переменных до 2-х мы применили анализ системы многомерных уравнений [3-5] когнитивных смыслов переменных (с учетом только весомых «весов»). Весомые «веса» - компоненты собственных векторов из матрицы C_{55} являются существенными характеристиками биохимических реакций, реакции соответствуют вычисляемым переменным y_2, y_3 и используют числовые значения модельных величин разных реагентов.

Исходные данные

Исходным объектом является матрица собственных векторов C_{55}, вычисленная по корреляционной матрице ((z_i,z_j)-корреляций) $R^{(t)}_{55}=(1/m)Z^{(t)T}_{m5}Z^{(t)}_{m5}$ в стандартизованной матрице $Z_{m5}=\{z_{ij}\}$ значений 5 z-переменных, с именами-смыслами – масса в 1 литре воды 5 физико-химических веществ (мг/(м^3): ионы аммония (z_1), растворенный кислород (z_2), взвешенные вещества (z_3), БПК(z_4), ХПК(z_5). Значениям пяти z-переменных соответствуют матрица значений 5 y–переменных $Y_{m5}=Z_{m5}C_{55}$, где $C_{55}=\{c_{ik}=corr(z_i,y_k)\}$- матрица ($z_l,y_j$)-корреляций (($C_{55}=1/m)[Y_{m5}\Lambda^{-1}_{55}]^TZ_{m5}$). Диагональные элементы матрицы $\Lambda_{55}=diag(\lambda_1,\ldots,\lambda_5)$ являются дисперсиями 5 y–переменных: $\Lambda_{55}=(1/m)Y^T_{m5}Y_{m5}=diag(2.3331, 1.1802, 0.9349, 0.3906,0.1613)$. Матрица ($z_l,y_j$)-корреляций [6] $C_{55}=\{c_{ik}=corr(z_i,y_k)\}$ является матрицей собственных векторов для матрицы (z_i,z_j)-корреляций R_{55} : R_{55} $C_{55}=C_{55}\Lambda_{55}$ совместно с этими соотношениями исходными данными являются матрицы, образующие собственную структуру – пару матриц (C_{55},Λ_{55}) и имена-смыслы вычисляемых переменных y_1,y_2,y_3 и их формулы:

$$y_{i1}=z_{i1}*0.4861+z_{i2}*(0.7214-0.5800)+$$
$$+z_{i3}*0.5292+z_{i4}*(-0.4432)+z_{i5}*0.5169,$$
$$y_{i2}=z_{i2}*(-0.7165)+z_{i3}*(-0.4054)+z_{i4}*(-0.4979),$$
$$y_{i3}=z_{i1}*0.4480 +z_{i2}*0.57\ 13 +z_{i5}*(-622).$$

Таблица 1

z_1	z_2	z_3	z_4	z_5	c_1	c_2	c_3	c_4	c_5
1.0000	0.1096	0.3888	-0.6098	0.3026	0.4861	0.2650	0.4480	0.6563	-0.2491
0.1096	1.0000	0.3285	0.0539	-0.0285	0.1414	-0.7165	0.5713	-0.2937	-0.2325
0.3888	**0.3285**	1.0000	-0.2139	0.7258	0.5292	-0.4054	-0.2630	0.2043	0.6669
-0.6098	0.0539	-0.2139	1.0000	-0.3654	-0.4432	-0.4979	-0.2961	0.6322	-0.2614
0.3026	-0.0285	**0.7258**	**-0.3654**	1.0000	0.5169	-0.0651	-0.5622	-0.2039	-0.6090

Система многомерных уравнений когнитивных смыслов 5 переменных

Имеем систему многомерных уравнений [3-5] когнитивных смыслов переменных (с учетом только весомых «весов»):
смысл(y_{i1})=смысл(z_{i1})*0.4861+смысл(z_{i3})*0.5292+ +смысл(z_{i4})*(-0.4432)+смысл(z_{i5})*0.5169, смысл(y_{i2})=смысл(z_{i2})*(-0.7165)+ +смысл(z_{i3})*(-0.4054)+смысл(z_{i4})*(-0.4979), смысл(y_{i3})=смысл(z_{i1})*0.4480+ +смысл(z_{i2})*(0.5713)+смысл(z_{i5})*(-0.5622).

Имена-смыслы z-переменных позволяют определить смыслы 3 y-переменных y_1,y_2,y_3: смысл(y_{i2})=«БПК-реакция поглощения биологически активным кислородом взвешенных веществ». Приемлемы более короткие фразы для передачи смысла(y_{i2}) - «БПК-реакция поглощения биологически активным кмслородом взвешенных веществ», «БПК-реакция».

Переменная имеет смысл: **смысл(y_{i3})=«ХПК-реакция - реакция химического потребления (окисления) химически активным кислородом реагента ионы аммония и других»**. Короткая

фраза «ХПК-реакция» также передает смысл y-переменной y_3. Эти 2 y-переменные y_2, y_3 своими формулами выявляют 2 реакции: БПК-реакцию, ХПК-реакцию, обусловленные присутствием измеряемых z-показателей z_4 (количество кислорода, израсходованное на аэробное биохимическое окисление под действием микроорганизмов (одних взвешенных веществ) и разложение нестойких органических соединений (других взвешенных веществ в 1 л воды)), z_5 (количество кислорода, израсходованное на для окисления вредных веществ в 1 л воды). Других реакций, кроме БПК- реакции и ХПК-реакции, нет.

Переменная y_1, имея формулу $y_{i1}=z_{i1}*0.4861+z_{i2}*0.1414(0.7214-0.5800)+z_{i3}*0.5292+z_{i4}*(-0.4432)+z_{i5}*0.5169$, имеет когнитивно определяемый смысл , равный сумме смыслов 5 z-переменных: **смысл(y_{i1})**=смысл(z_{i1})*0.4861+смысл(z_{i3})*0.5292+ смысл(z_{i4})*(-0.4432)+смысл(z_{i5})*0.5169= «окисление+ поглощение ионов аммония (z_1), взвешенных веществ (z_3) при присутствии биологически активного растворенного кислорода (БПК, z_4), химически активного кислорода (ХПК, z_5)». Эта фраза имеет смысл смысл(y_{i1})=«БПК-реакция…+ ХПК-реакция…». Если применять короткие фразы для смыслов y-переменных y_1, y_2, y_3, то имеем смысловое равенство смысл (y_1)=смысл(y_2)+ смысл(y_3). Смыслы y-переменных y_1, y_2, y_3 являются знаниями, соответствующие информациям, измеряемых дисперсиям disp(y_1)=λ_1=2.3331, disp(y_2)=λ_2=1.1802, disp(y_3)=λ_3=0.9349. Смысловое равенство вида смысл (y_1)=смысл(y_2)+смысл(y_3) и наличие долей информации disp(y_2)=λ_2=1.1802, disp(y_3)=λ_3=0.9349 служат обоснованием для вычислений долей смысловой информации в формулах БПК- и ХПК-реакций. Смыслы y-переменных y_1, y_2, y_3 являются знаниями, соответствующие информациям, измеряемых дисперсиям disp(y_1)=λ_1=2.3331, disp(y_2)=λ_2=1.1802, disp(y_3)=λ_3= 0.9349 мы найдем объемы 2-х долей смысловой (когнитивной) информации, соответствующие 2 математическим формулам БПК- и ХПК-реакций.

Итак имеем 2 биохимические реакции самоочищения:

1) БПК-реакция поглощения кислорода взвешенных веществ растворенного кислорода **(БПК**, количество кислорода, израсходованное на аэробное биохимическое окисление под действием микроорганизмов (одних взвешенных веществ) и разложение нестойких органических соединений (других взвешенных веществ), содержащихся в исследуемой воде);

2) ХПК-реакция - реакция химического потребления (окисления) кислородом а (ХПК, сколько необходимо O_2 для окисления вредных

частиц) показывают сколько необходимо растворенного кислорода O_2 для окисления вредных частиц (вредных веществ) в 1 л воды.

При БПК-реакции поглощения растворенного (за счет наличия биологически активного) кислорода, имеющего вес (-0.7165) (в формуле y–переменной y_2), взвешенных веществ с весом (-0.4054) соответствует знак минус при обеих весах (происходит одинаковое уменьшение массы кислорода z_2 и массы вещества z_3). При ХПК-реакции окисления вредных частиц происходит химическая реакция окисления (ХПК, с весом -0.5622) за счет наличия *химически активного* поглащаемого кислорода (с весом 0.5713, противоположность знаков весов соответствует быстрому уменьшению массы (*химически активного*) кислорода z_2 и медленному уменьшению массы взвешенных веществ z_3.

Рассмотрим формулы реакций самоочищения воды и их дисперсии λ_1 $disp(y_1)=\lambda_1$=2.3331, λ_2=1.1802, λ_3=0.9349. В формуле $y_{i1}=z_{i1}*0.4861+z_{i2}*(0.7214-0.5800)+$ $+z_{i3}*0.5292+z_{i4}*(-0.4432)+z_{i5}*0.5169$ присутствуют 2 переменные – 1-ая y-переменная по смыслу соответствует БПК-реакции (с ($z_{i3}*\alpha+z_{i4}*\beta$)-переменной), 2-ая y-переменная по смыслу соответствует ХПК-реакции (с ($z_1*\delta+z_5*\gamma$)-переменной). В то же время ранее мы присвоили y-переменной y_2 (смотрите выше) смысл БПК-реакции, а y-переменной y_3 присвоили смысл ХПК-реакции. Для 3-х дисперсий (λ_1, λ_2, λ_3) 3-х некоррелированных y-переменных) имеем 4 пересекающиеся смысла: смысл(y_1)=[смысл(y_2)+смысл(y_3)]; [смысл(y_2)]; [смысл(y_3)]. Преобразуем сумму 3-х смыслов в сумму 2-х смыслов. В соответствие 2 смыслам-знаниям сформируем 2 новые объемы информации и 2 меры информации – 2 дисперсии: new new disp(y_2)=2.2888858, disp(y_3)= 0.9836.

Вычисление долей смысловой информации в формулах БПК- и ХПК-реакций

Количество информации, содержащейся в переменной равно величине ее дисперсии. Имя-смысл переменной является знанием (когнитивным) о переменной. Бывают краткие и подробные имена-смыслы переменной, раскрывающие детали измерения или вычисления сложной по смыслу переменной, в частности - валидной переменной. «Валидное измерение [7] - такое измерение, которое измеряет то, что оно должно измерять (эта узкая трактовка «валидности» является наиболее популярной, по факту она соответствует понятию «конструктная валидность»). То есть, к примеру, при валидном измерении интеллекта измеряется именно интеллект, а не что-то другое. Более прикладное определение понятия «валидность»-мера

соответствия методик и результатов исследования поставленным задачам» [7].

Переменные, соответствующие именам-смыслам БПК-,ХПК-реакций являются валидными, содержащие в имени сумму сложных знаний. Мы рассматриваем случай когда известны слагаемые и сумма сложных (когнитивных) знаний, требуется найти дисперсии частей информации, соответствующих неизвестным слагаемым независимых, известных знаний.

Для этого рассмотрим 2 новые переменные видов $(z_{i3}*\alpha+z_{i4}*\beta)$, $(z_1*\delta+z_5*\gamma)$, имеющие параметры $\alpha,\beta,\delta,\gamma$, не влияющие на известные смыслы валидных y-переменных. В формуле валидной y-переменной y_2 вида $y_{i2}=z_{i2}*(-0.7165)+z_{i3}*(-0.4054)+z_{i4}*(-0.4979)$ присутствует $(z_{i3}*\alpha+z_{i4}*\beta)$-переменная вида $z_{i3}*(-0.4054)+z_{i4}*(-0.4979)$, дисперсия которой дает существенный вклад в дисперсию $\lambda_2=1.1802$ y-переменной y_2. В формуле $y_{i3}=z_{i1}*0.4480+z_{i2})*0.5713+z_{i5}*(-0.5622)$ присутствует $(z_1*\delta+z_5*\gamma)$-переменная вида $z_{i1}*0.4480+z_{i5}*(-0.5622)$, дающая существенный вклад в дисперсию $\lambda_3=0.9349$ y-переменной y_3. Смысл y-переменной y_2 когнитивно совпадает со смыслом $(z_{i3}*\alpha+z_{i4}*\beta)$-переменной. Смысл y-переменной y_3 когнитивно совпадает со смыслом $(z_1*\delta+z_5*\gamma)$-переменной. Смысл y-переменной y_1 равен сумме смыслов y-переменной y_2 и y_3: смысл $(y_1)=$смысл $(y_2)+$смысл (y_3). Дисперсии y-переменных y_2 y_3 известны: disp$(y_2)=\lambda_2=1.1802$, disp$(y_3)=\lambda_3=0.9349$. Найдем дисперсию $(z_1*\delta+z_5*\gamma)$-переменной (хпк-переменную) вида $z_{i1}*0.4861+z_{i5}*0.5169(z_{i1}*0.4480+z_{i5}*(-0.5622)$ и прибавим к дисперсии disp$(y_2)=\lambda_2=1.1802$, получим новую дисперсию new disp(y_2) y-переменной y_2. Дисперсия $(z_1*\delta+z_5*\gamma)$-переменной равна disp$(z_{i1}*0.4861)+$disp$(z_{i5}*0.5169)=$ disp$(z_{i1})*(0.4861)^2+$disp$(z_{i5})*(0.5169)^2+2r_{15}=$ $1*(0.4861)^2+1*(0.5169)^2+2*0.3026=(0.236276002+0.26720980)+0.6052=0.50348580+0.6052=$ 1.10868580. Новая дисперсия равна new disp$(y_2)=\lambda_2+1.10868580=1.1802+1.10868580=$ 2.2888858. Новая дисперсия 2.2888858 суммы новых переменных со смыслом старой переменной y_2 в 2 раза превосходит дисперсию старой переменной y_2. Этой увеличенной дисперсии соответствует увеличенная информация и большая доля извлеченных знаний.

Аналогично найдем дисперсию $(z_{i3}*\alpha+z_{i4}*\beta)$-переменной (бпк-переменной) вида $z_{i3}*0.5292+z_{i4}*(-0.4432)$ и прибавим к дисперсии disp$(y_3)=\lambda_3=0,9349$. получим новую дисперсию new disp(y_3) y-переменной y_3. Дисперсия (z_3,z_4)-переменной равна disp$(z_{i3})*0.5292+z_{i4}*(-0.4432)+2$ cov$(z_{i3})*0.5292$, $z_{i4}*(-0.4432)=$disp$(z_{i3})*0.5292^2+$disp$(z_{i4})*(-0.4432)^2+2$cov$(z_{i3})*0.5292$, $z_{i4}*(-0.4432)=1*0.28005444+1*0.19646702+$

$2*(-0.2139)=0.28005444+0.19646702-2*0.2139=$ $0.47652146-0.4278=0.04872146$. Вторая новая дисперсия равна new disp$(y_3)=\lambda_3+0.04872146=0.9349+0.04872146=$ 0.9836. Новая дисперсия 0.9836 суммы новых переменных со смыслом старой переменной y_3 немного превосходит дисперсию старой переменной y_3.

Эта новая дисперсия количественно измеряет информацию и не добавляет извлеченных знаний. Следовательно, в данной системе показателей извлеченное знание о ХПК-реакции малоинформативна. В процессах самоочищения воды ХПК-реакции устойчивы к изменениям параметров внешней среды. Гораздо более информативны извлеченные знания о БПК-реакции, их информативность количественно измеряется величиной первой новой дисперсии new disp$(y_2)=\lambda_2+1.10868580 =1.1802+1.10868580=$ 2.2888858. Это значение дисперсии показывает 3-кратную важность роли БПК-реакций поглощений биологически активного кислорода, израсходованного на аэробное биохимическое окисление под действием микроорганизмов (одних взвешенных веществ) и разложение нестойких органических соединений (других взвешенных веществ), содержащихся в исследуемой воде).

Общая новая информация о 2-х реакциях самоочищения new disp$(y_2)+$new disp$(y_3)=2.2888858+0.9836=3.2724858$ превосходит старую информацию $(\lambda_2+\lambda_3=1.1802+0.9349=2.1151)$ в 1.547 раза. Новый измеритель информации (new disp$(y_2)=2.2888858+0.9836=3.2724858$) отражает существенную долю 65.45% информации о реакциях. Для реально протекающих и вычисленных нами 2-х реакций самоочищения воды рек и озер. С применением реальных данных, матрицы C_{55} индикаторов [8,10] присутствия извлекаемых знаний, вычислительных методов, когнитивного моделирования и интеллектуального анализа многомерных данных мы показали доминиующую роль БПК-реакции (исключив y-переменную y_1 с $\lambda_1=2.3331$) по сравнению с ХПК- реакцией. Нами вычислено новое значение меры информативности для реакций самоочищения. Из-за этой способности рек, озер ВКО их прибрежные земли – известные курортные места.

Мы получили 2 доминирующие дисперсии вместо 3-х ранее вычисленных дисперсий. Этим мы поправим ПМ ГК, которая формально работала. Мы воспользовались смысловым (когнитивным) равенством: смысл $(y_1)=$смысл $(y_2)+$смысл (y_3) и вычислили для него дисперсионное равенство. Но заменили ее интерпретацию на свою, сократив число имен-смыслов до 2-х, а смысл 1-ой переменной

представили в виде суммы смслов 2-ой и 3-ей переменной. Провели разбивку суммы 3-х дисперсий 3-х переменных на сумму 7 дисперсий.

ПМ ГК всегда на 1-ом шаге находит лин комбинацию с максимальной дисперсией. Мы используем 2-ую и 3-ю лин комбинации, соответствующие 2 реакциям. Третьей и более реакций нет.

Дисперсии 2-х переменных нам известны. В 1-ой переменной содержатся переменные x входящие и в переменную №1 и переменную №2.

Найдем эти дисперсии. Далее прибавим найденные доли дисперсии и добавим каждую долю в свои дисперсии. Тогда получим 2 доминирующие дисперсии вместо 3-х ранее вычисленных дисперсий. Этим мы поправим ПМ ГК , которая формально работала. Но заменили ее интерпретацию на свою, сократив число имен-смыслов до 2-х, а смысл 1-ой переменной представили в виде суммы смслов 2-ой и 3-ей переменной. Провели разбивку суммы 3-х дисперсий 3-х переменных на сумму 5 дисперсий. Дисперсию λ_1 поделили на 2 части, затем найденные части дисперсий прибавили к λ_2 и к λ_3.

Новая собственная структура, появившаяся в результате вычислений долей смысловой информации в формулах БПК- и ХПК-реакций, образует пару матриц (Λ_{55}, C_{55}), где Λ_{55}=diag($\lambda_1,\lambda_2,\lambda_3,\lambda_4,\lambda_5$)=diag(0.1613), 1.1756142, 2.2888858,0.9836,0.3906,0.1613,1.1756142+2.2888858+0.9836+0.3906+0.1613=5. Выше мы перевычислили новые дисперсии 2-х смысловых переменных, вычитая 2 частные бпк-и хпк-дисперсии из модельной дисперсии y-переменной y1 (λ_1=2.3331), содержащей смыслы БПК- и ХПК-реакции (λ_2, λ_3).

Сохранив исходную матрицу индикаторов, мы нашли 2 смысовые переменные, нашли их

доли информации. Моделирование соответствующих новой собственной структуре матриц значений z- и y-изменчивостей будет изложено в другой статье.

Заключение

Наш пересмотр формул и смыслов некоррелированных у-переменных позволил найти 2 реальные независимые БПК- и ХПК-реакции и исключил одну модельную реакцию, которая не должна была быть вычисленной. Мы проявили интеллектуальную бдительность при когнитивном моделировании смысловых уравнений, хотя соотношение величин доминирующих собственных чисел 2.3331,1.1802, 0.9349 не вызывало вопросов. Мы провели удаление одной у-переменной y1, оставили 2 у-переменные, наделив их дополнительными дисперсиями. Пересмотр формул и смыслов некоррелированных у-переменных позволил найти 2 реальные независимые БПК- и ХПК-реакции, что адекватно происходящим в природе реакциям. При сокращении количества у-переменных до 2-х применили анализ системы многомерных уравнений [3-5] когнитивных смыслов переменных (с учетом только весомых «весов»). Весомые «веса» - компоненты собственных векторов из матрицы C_{55} являются существенными характеристиками биохимических реакций, реакции соответствуют вычисляемым переменным y2, y3 и используют числовые значения модельных величин разных реагентов для самоочищения воды рек, озер ВКО: их прибрежные земли известны как курортные места.

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Tulkin Ruzikulovich Allayorov
unemployed
PhD in philological sciences, Uzbekistan

LINGUOPOETIC PROPERTIES OF IMPERATIVE STRUCTURES USED IN POETRY

Abstract: Since the 1960s, interest in the study of literary texts from a linguistic and poetic point of view has been growing in world linguistics. The object of study of linguopoetics, similarities and differences with stylistics, works worthy of linguopoetical analysis and the problem of the language of writers were in the center of attention of linguists. "Fiction literature is a unique type of human speech activity. Linguistic and poetic analysis plays an important role in the study of his language. Linguistic poetics can be understood as a branch of philology that studies the aesthetic features of the artistic context. The subject of linguopoetics is the totality of linguistic means used by the author in a work of art to achieve his ideological and artistic goal. The aesthetic effect of a work does not depend on what the text is about, but on how it is narrated.

Key words: poetics, poetry, fiction, linguopoetical analysis, speech, imperative, functional, linguistic units, artistic speech, aesthetics, linguopoetics.

Language: English

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Introduction

"The question of the interdependence of linguistic means and their aesthetic activation in the context of fiction is extremely important for a full-fledged philological understanding of a literary text. Although units of the semantic, metasemiotic and linguopoetic levels participate in the aesthetic design of the text, the word is the primary language unit; it is surrounded by all other units and other elements interpreted from the point of view of literary criticism. Without completely denying the significance of other linguistic units, it is worth noting the nuclear role of language in the formation of artistic sensitivity. A literary text not only reflects real life, but also forms the core of a creatively created world in a work of art. The word, determined by the artistic task created and uploaded by the author, is aesthetically enriched with content, begins to live by the complex laws of aesthetic integrity. The word with all its colors becomes an instrument of figurative thinking [1].

A complete understanding of the command act in the language of works of art depends, first of all, on the imperative situation - the degree of perfection of the formation of the command situation. When studying the language of works of art, it is observed that the command situation is given openly or covertly based on aesthetic requirements. An imperative situation is when a command situation manifests itself in the form of joy, satisfaction, a strong order, insult, call, approval, approval, expression of surprise. The author uses imperative units only after the word has hit the target and formed a situation conducive to the implementation of the team action. The skill of a writer in the use of imperatives is determined by the degree of attention that he pays to the word.

The problem of the prose text is one of the most frequently touched upon in philology. Experts attribute this to the complex structure of the prose text. It is relatively convenient to study and reveal the artistic and aesthetic aspects of poetic speech, because there are clear rules, ready-made patterns developed over the centuries. But prose is a relatively new and multi-layered field of artistic creativity. Therefore, the problems, interpretations and analyzes on this issue have not yet been completed. For example, literary critic D.Kuronov formulates the problem of a prose

text in the following way: "The art of the prose language is unique, it cannot be approached according to the criteria of poetry. For example, if we confine ourselves to a story about migrations in the language of prose, various stylistic figures, it turns out that we have said almost nothing about it. After all, the magic and charm of the language of fiction lie in the deep layers. Unfortunately, the verbal factors and non-verbal phenomena that turn the language of prose into art have not been studied enough by us. In my opinion, this is the result of a somewhat more dismissive view of prose speech as much simpler speech, closer to the language of everyday communication. However, this is a completely wrong idea. After all, when we read good prose works, isn't it a miracle that we "see" what they depict and "hear" the words of the characters?! Is it not a word, or rather a text, composed of this sacred object, involuntarily takes the reader into the realm of the unreal - artistic reality, and makes him live according to the laws of that universe?! Therefore, literary scholars need to reveal the secrets of this miracle, to begin studying the literary text from the point of view of both the formation and perception of artistic information in the cognitive aspect. The structure of a literary text, the rhythm of prose and its integral connection with the rhythm of the narration or the subject of the image; There are a number of important issues that need to be studied in detail, such as the fact that the construction of sentences is different when describing a process and different when describing things [2]. In fact, the first unit in the formation of any text is the word. Words selected according to the way of expressing thoughts form different combinations and sentences. The text consists of sentences. Depending on the type of text, intonational means are selected (rhythm, assonance, alliteration, repetition).

The Navoi scholar Sh. Sirojiddinov, in his article on literary translation, comments on these two types of literary text in the following way: "Analysis of the text of a literary work is the first task in the translation process. In addition to the above characters, the literary text also has its own characteristics that are difficult to analyze without knowing them. The artistic text (poetic, prose, dramatic) acquires a certain originality due to the aesthetic load and the author's personal ideological intention. This uniqueness testifies to the methodological uniqueness of the author as a creative person. The figurative thinking of the author is an important feature of artistic creativity. His thoughts and feelings serve to make figurative speech figurative through the means of speech. The artistic representation of life is the representation of reality through images. In a literary text, we encounter a system of images, not just one image. In this regard, when analyzing images in a literary text, it is important to study their ideological and aesthetic content and the language of a literary text. In prose,

when a certain figurative statement takes up a lot of space, it is expressed in one line or verse of a poem. A small amount of poetry can give "a lot of meaning and aesthetic appeal" [3]. In this article, the scientist discusses the specifics of each type of text and emphasizes that the nature of these types of text must be taken into account when translating.

And in Russian linguistics, the question of the role of imperatives in artistic creativity attracted the attention of philologists. The direct verbal impact in a literary text is characterized by the fact that language units are aimed at expressing the author's intention, so that the text is not too difficult for the reader to perceive. Among the means aimed at this goal, forms of imperatives are of particular importance, expressing such meanings as command, advice, demand, wish, exhortation, reproach. Imperative units used in a literary text, especially in a prose one, are formed, among other things, in relation to the writer.

"The imperative mood or imperative mood is a form of expression belonging to the category of inclination. The imperative form represents the meaning of interrogation, command, or advice. An important feature of the imperative construction is that it is both a message and an action: in this case, the speaker not only expresses his desire, but also the person to whom the speech is addressed is forced to fulfill the desire. Imperatives are a universal grammatical tool and one of the communicative-pragmatic categories that ensure the formation of sentences in arbitrary semantics. As Yu. M. Malinovich noted, "imperatives are already concerned about sensitivity, and the question of their effectiveness is firmly established". This is one of the strongest paradigmatic forms of speech, built for the purpose of interaction. In addition to Yu. M. Malinovich, one can say that the imperative differs from all forms of expression aimed at other interactions [4]. At the same time, the participants in the appeal situation are organized in the form of imperative sentences "at least two persons, one of which orders another person or group of persons to perform one or more actions" [5]. In a literary text, through such units, poets and writers try to give individual aesthetic goals. The "influential force" of imperatives, emphasized by D.M. Dreeva and I.R. Gigolaeva, is clearly seen in the intonational structure of the poem. It impresses the reader, giving the poem a special pathos, inviting to observation.

In a poetic text, imperatives are used as a "special influencing force" or a powerful linguistic means of expressing a (lyrical) mood. How a team in a poetic style differs from the usual one in terms of its effectiveness has long been at the center of discussions among philologists. This is explained by the Russian linguist E. V. Uryson in connection with thinking [6]. When perceiving a verse in a poem, the mind compares the same information with that taken from prose and fills in the gap or removes unnecessary

information from the text. They say that mental activity is adapted to simulate the perception of a poem or any text. This can be taken as a linguistic hypothesis. The "power of influence" of the poem arises on the basis of certain semantic units. It is well known that in the process of understanding a poetic text is perceived differently than a prose one. Prose, even if it is lyrical, first of all expresses "objective content". Poetry can also express "substantive content", but its unique structure enhances the effectiveness of the bombastic text resulting from the skillful use of language units. The intended purpose of this practice is to inspire the reader (listener) by giving it a "lyrical mood", and specifically to control or direct the reader's (listener's) emotions. Connoisseurs say that the first influence that is transmitted from a poem to the reader (addressee) is the "lyrical mood". You can also say that this is a unique tool aimed at keeping the reader in the sphere of influence. He is also characterized by an intuitive understanding of poetry. "The melody of a poem is an important factor in ensuring the musicality of a literary text. In this sense, the architecture of poetry is the first indicator of the genre of a literary text". Of course, the melody is important for the poetic text, but at the same time, there are so many means that they may well claim to be the "first". For example, in modern and postmodern poetry, visuality, not tone, comes to the fore. That is, the form itself is the first sign. Imperative techniques used in a poetic text enhance the impact of the text, encourage the activity of a speech-oriented person, and serve to ensure the intonational integrity of the poem. The imperatives differ depending on the style of the organization. The main manifestations are intonation, command inflections, graphic indicators. Imperatives may include units that provide intertextual communication - allusive nouns, precedent units, poetonyms.

In conclusion, we can say that a prose text is a type that has its own laws of the literary language. In it, the degree of freedom of language units is extremely wide. When thinking about a prose text, it is necessary to talk not only about movements in the language of a work of art, various stylistic figures, but also about speech factors and non-speech phenomena that make the language of prose work into art. It is especially important to keep in mind that imperative constructions are of particular importance, which are a powerful means of bringing the impact of live speech into a prose text. Although the imperative units used in a literary text, especially in prose, are expressed in the language of characters, they are also shaped by the attitude of the writer.

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Shahnoza Mirzaakhmadovna Mirzarakhmanova
Chirchik State Pedagogical Institute
The teacher of the department of Pedagogy and Management,
The faculty of Pedagogy, Uzbekistan
Tel: +998917766500
m.shaxnoza@cspi.uz

DUAL PROFESSIONAL COMPETENCE AS A DUAL CONENT OF VOCATIONAL EDUCATION THEORETICAL FOUNDATIONS OF SYSTEM DEVELOPMENT

Abstract: The level of renewal of engineering and technical knowledge and competencies is steadily growing. The time between scientific development and the introduction of technology into production is the acceleration of innovation cycles in many areas. Modern engineering and pedagogical education meets the needs of society in vocational education services on the basis of training, retraining and advanced training of highly qualified teachers for the teaching of vocational and general technical sciences, as well as vocational training, vocational education and intended for the implementation of industrial training in enterprises of higher education. The pedagogical activity of the engineer-pedagogue is dual (two-way) and involves the synthesis of professional-pedagogical knowledge and skills: engineering and psychological-pedagogical. In addition, the professional pedagogical skills of an engineer-educator can be generalized [2], so the professional competence of such a specialist should also be generalized (dual), i.e., common to the internship teacher and computer technology professionals. The content of engineering training of a future engineer-teacher does not differ from the content of training an engineer in the relevant field, which leads to a conflict between the technical direction and the engineering-pedagogical activity of graduates.

Key words: duality system, dual content, innovation cycles, technical direction, pedagogical activity, vocational training, educator.

Language: English

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Introduction

Given that the justification and development of the dual content of the professional training of future engineers-educators in the field of computers is a complex systemic problem, it requires careful complex analysis and development. It is possible to base the presentation on the need to develop a dual content of vocational training on the basis of a systematic approach to formalize the presentation of a dual content model to conceptual general scientific principles [2; 3; 4; 5].

According to the classification of content distribution [4; 6] we use the distribution of two subsystems of the system, similar to the internal and external infrastructure, to develop the dual content of

vocational training. In our case, the main component of one of the subsystems of the content of vocational education is included in both components, primarily as an intermediate with respect to external structural elements; second, it serves as one of the external (apical) clearly expressed elements.

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Thus, the first dual corresponds to the structural duality of professional training of future engineer-educators, which deeply combines the content of engineering and psychological-pedagogical training and works as an external subsystem.

The second iduality is functional and is produced first as a result of dualization of the content of professional training of future professionals in the field of education. Such dual educational activity involves the simultaneous activity of future engineers-educators in the role of a student and in the role of a teacher of technical sciences.

Thus, the dual content of vocational education should consist of two dual subsystems: structural and functional.

In his research [7], N. Lazarev confirms that the structure of the content depends on the degree of definition and definition of the basic laws and principles operating in this field. Therefore, the basic laws in the field of professional training of future engineers-teachers allow the specialist to solve specific production, pedagogical, scientific and other tasks. That is, the dual content of vocational education should include information, skills, creative experience, and experience of emotional respect for truth.

N. Drozdov [8], V. Romanov [9], V. Spitsnadel [10] to ensure the development of professional qualities of future engineers-teachers and the development of management dual content to ensure the development of professional training of future engineers-teachers Requirements for the development of dual content creation systems:

1. The content of a dual system should create a set of qualitatively different elements that can be considered as a system that forms hierarchical structures.

2. The content of a dual system should be characterized by the presence of integral connections with the qualitatively different elements of the structural system and their properties. The presence of an integral link in the dual content system distinguishes it from the binary content system, which provides a conglomeration of separate engineering objects and objects of psychological and pedagogical training and activity. The main integrative relationships in the dual content of vocational education should be such as "single-general", "general-general", "general-single", "general-specific".

3. A specific organizational and structure needs to be developed to reduce the level of uncertainty in a dual content system. Linear and hierarchical structures are characteristic for dual-level structural subsystems, and the functional subsystem has a branched, concentric, and methodological structure.

4. The system of dual content of vocational training is determined by the following features: uncertainty and emergence. That is, the impact of system performance does not affect the performance of each subsystem individually, and the primary functions of the activity of each element of the system are incompatible with the functions of the whole system.

5. A dual system must be infinitely structured according to the fragmentation of the subsystems.

6. The dual content of vocational education should be characterized by the presence of the same characteristics and methods of analysis at any level of the system hierarchy.

Results and Discussion

In our opinion, these requirements can be implemented in the development of a system of dual content in the future through the gradual expansion of the system of professional education of the engineer-educator.

In the development of a dual content system, the separation method allows the system to be subdivided into subsystems, which in turn can be divided into components. If the subsystems resulting from decomposition are not elementary, i.e., do not exist at the level of this description for use, they should be separated later. The division of a system into subsystems in the general case can be done indefinitely, and this is determined by the composition of the separation properties and the order of their use [9].

It is the most appropriate semantic network model to express the content of vocational training. However, the ability to implement features that meet the following requirements needs to be improved:

- taking into account mental processes, mechanisms of cognition and perception of knowledge;
- universality of developed hierarchical structures of elements in the structure of vocational education;
- providing systematic links between the objects of vocational education.

The first step in solving this problem is to develop structural models of the system in the dual content of vocational education, representing the interdependence of the engineering and psychological-pedagogical components of the dual didactic process. The science of psychology has developed a sufficient number of models to represent objects. Demonstrative models by F. Klix [11] and N. Lazarev [7] are the most effective.

Let us consider a descriptive model to express concepts in the memory of F. Klks man [11]. The author makes "character" a basic concept, thus understanding the generalization of all memory units. Complex characteristics and complex relationships between memory units should be considered as characteristics. The use of functions allows the separation of the classification of concepts.

The above concepts, based on philosophical, general scientific and psychological-pedagogical methods and models, allow:

- implementation of the logical order of the elements of the content of vocational education using a system of professional dual competence;

- Systematic dualization of the content of engineering and psychological and pedagogical training of future engineers-teachers with the help of appropriate models;

- Implementation of the dual content model through the systematic regulation of the elements of technical and psychological-pedagogical training of future engineers-teachers.

To develop a system of professional dual competencies as a component of dual content theory in vocational education, we will consider existing approaches to defining professional skills.

Training of qualified specialists is one of the main goals of the educational process [7]. Engineering pedagogical education is dual in nature [12, p. 48]. Learning is determined by the structure of the engineering object and the structure of the pedagogical object, the structure of the specialized activity in a particular field of production and the corresponding pedagogical activity. That is, the dual level of vocational training content is observed at both the structural level and the activity level. These philosophical categories correspond to the relationship of 'space' and 'time' and are considered to be their direct reflection in the educational process.

The key to the problem of developing a system with dual professional competence is the distribution of professional activities as the basis for their development.

In order to develop the dual professional competencies of engineers-educators, we will consider the main approaches to the distribution of professional knowledge.

The main idea of dual professional competence is that the main result of professional training of future engineer-pedagogues is the ability and readiness of the specialist to work effectively and creatively in various socially important situations.

The main directions of the formation of professional competence of an engineer-educator can be identified through the analysis of the content and description of their activities, as well as professional activity.

Competence is not abstract, but emerges, opens up, and disclosed in the course of a specific activity. In this regard, it can be said that competence is the ability and culture to carry out a particular activity. This situation corresponds to the position of the Department of International Education, Development and Educational Standards: competent "concept is defined as the ability to carry out professional activities ..." [13, p. 20].

According to scientists [13; 14; 15], the specific features of the main professional competencies are:

- multifunctionality (having competence allows you to solve various problems in everyday life and professional activities);

- Belonging to the field of meta-education (is an interdisciplinary and interdisciplinary competence and can be used in different situations);

- potential capabilities (competencies require the presence of general and professional intellect (potential), abstract and professional thinking, self-reflection, self-determination, self-esteem and requires others);

- multidimensional (includes various mental processes: analytical, communicative, common sense, etc.) [16, p. 43].

The development of knowledge, skills and personal qualities is a final contribution to the formation of the competence of the future specialist, which is the ultimate goal of professional training. The educational process implements a generalized model of the specific profile of the professional activity of the specialist, according to which the student must have knowledge, master certain types of activities, process and develop professionally important qualities. Competence is the collection of information about things, objects, means of activity, subjects that ensure the quality of a particular job. A set of competencies constitutes the solution of a professional task in a particular area.

Analysis of scientific works [15; 17], today focused on the issue of identification and selection of competencies that will allow to determine the lack of a systematic, structured, coordinated and consistent list of professional competencies of future engineers-educators.

However, to develop a dual professional competence system, Dj. Ravenn [17] noted that competent components are in the process of realizing interests in humanity, as well as G.K. According to Selevko [15], competencies should be appropriate to the description of human activities and, therefore, their classification to classify core activities.

As a result of professional activity, any workflow is characterized by technological and organizational operations, as well as management operations. The name of the workflow is determined by the name of the technology.

Thus, the process of engineering-pedagogical work (professional activity) is manifested by dual activity and therefore defines dual professional competencies.

Professional competence is a matter of professional training and work to measure the tasks and responsibilities of the job, the measurement of compliance with the requirements of professional activity and the basic criteria.

Since professional competence implies a sustained ability to perform a particular type of activity, it is appropriate to characterize it with an activity approach. In this context, professional competence can be understood as one of the components of professional training for a particular type of activity.

The proactive approach focuses on the formation of active work ability, working in all forms, including professional fields. The active paradigm of education changes the role of knowledge, the main goal of education becomes its component, its main goal is the means of activity. Thus, the learning process should create the necessary conditions for the acquisition of practical skills and should be focused on the acquisition of specialized knowledge and practical skills to further improve future professional activities.

It is advisable to use round (circular) models to represent a system of dual professional competencies. This suggests that the main problem in the application of structural-logical schemes of traditional presentation of the content of vocational education is the specificity of binary specialties. It implies the existence of a large number of elements of a didactic process that have a similar structure and have similar logical objects, connections, processes, and so on. This transforms the traditional structural-logical scheme into uncontrollable chaos of objects and the relationships between them. One of the directions of solving this problem is the rejection of the traditional form, which represents the structural-logical schemes, and the transition to a circular form with the separation of the dual elements of the system. In general, we talk about the use of the n-layer circular (circular) form of structural-logical models with a combination of dual elements based on dual relationships.

The main advantage of using the n-layer circular shape compared to the traditional structural-logical scheme is the appearance of a description of the objects, processes and events of vocational training in a dual specialization. This can be explained by the fact that in the integrated integration of engineering and psychological-pedagogical objects are used components and processes of preparation for integrated dual blocks. Existing forms of information presentation are characterized by a high degree of differentiation, which makes it difficult to present and display dual relationships. However, this does not mean that only circular forms of information and traditional structural and logical schemes should be abandoned.

CONCLUSION

Based on the results of the development of a model of a system of dual professional competencies of future engineers-educators in the field of information technology, its practical measures will ensure deep integration of engineering-pedagogical components in the teaching of engineering activities in pedagogy. This is done by introducing elements of the methodology of teaching technical sciences.

It should be noted that the change in the structure of professional competence and the distribution of dual systems of professional competencies fully meet the requirements of state educational standards and modern approaches to the professional training of future engineers and teachers of information technology. Thus, the following can contribute to the development of a system of dual professional competencies:

- optimization of the educational process;
- The formation of the professional direction of teaching and personality of students;
- Development of students' self-reflection and, as a result, improving the quality of education in technical sciences.

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