

## METHODOLOGY FOR EMPLOYING STATISTICAL DATA IN TEACHING GERMAN FOR SPECIFIC PURPOSES

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### Summary

This study explores the integration of statistical data into the content of foreign language professional education as a means of enhancing senior students' communicative competence. Engaging learners in tasks that involve interpreting and producing statistical information enables them to acquire essential meta-disciplinary knowledge and skills that foster autonomy, cognitive activity, and analytical thinking. The use of German-language statistical materials provides a valuable context for developing both logical reasoning and linguistic proficiency.

Within the framework of the research, a methodology was designed to incorporate statistical data into foreign language instruction, aimed at fostering the speech production skills and mental operations of students. This methodology is distinguished by its conceptual coherence, systematic approach, pedagogical manageability, efficiency, and reproducibility. It is grounded in the principles of interconnection between subject-specific and meta-subject learning, the guided formation of utterances containing statistical content, and the alignment of educational organization with the goals of developing students' cognitive and speech abilities. The key instrument ensuring the integration of linguistic and cognitive development is the use of exercises based on texts, diagrams, and other forms of statistical representation.

An experimental study confirmed the efficiency of the proposed methodology and its consistency with the intended objectives. The findings demonstrate its applicability across different learning environments and its potential for achieving high learning outcomes. The results also open new perspectives for applying statistical data exercises in other languages and educational levels, as well as for refining the approach through cross-linguistic and psycholinguistic research.

**Key words:** foreign language education, LSP, statistical data, speech skills, meta-disciplinary competence, methodology, educational experiment.

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<sup>1</sup> The author expresses heartfelt gratitude for the support and productive suggestions regarding the design of the specialized dictionary to her academic supervisor Prof. Dr. Thorsten Roelcke (Technical University of Berlin). Special thanks are due to the Einstein Foundation (<https://www.einsteinfoundation.de>) for the financial support of this LSP project.

DOI <https://doi.org/10.23856/7203>

## 1. Introduction

Statistical data is a collection of numerical information that quantitatively characterizes various aspects of public life. In foreign language teaching methodology, it acts as a conditional carrier of foreign language education content, the application of which in the process of developing students' speech skills activates the foreign language picture of the world. Due to linguistic, structural, semiotic, meta-subject, and other characteristics, statistical data can be considered as a semiotically complex text. The enormous significance of statistics in the life of modern society, the presentation of statistical data in textual, tabular, graphical, and mixed forms, the structure of statistical materials that correlates with mental operations, and the visual nature of statistical information presentation formats allow us to assume that with proper organization of foreign language speech skills acquisition, statistical data provides great opportunities for implementing the general educational orientation of the modern school education system, primarily for achieving meta-subject results of the educational program.

Methodological literature indicates the need to improve the quality of LSP acquisition and the simultaneous absence of technology for using statistical data in the educational process, as well as insufficient development of corresponding exercises (*Baumann 1992; Buhlmann, Fearn 2018; Guariento, Morley 2001; Roelcke, Kniffka 2016*). Although statistical materials are quite actively included in modern educational and methodological complexes, their use is rarely aimed at intensifying foreign language speech instruction. In methodological literature, statistical components are mentioned mainly incidentally: as a reflection of actual reality in the cognitive aspect or as supporting material at the stage of speech skills development (*Buhlmann, Fearn 2018*). However, works that purposefully investigate texts and other educational materials containing statistical data are currently absent. It is precisely the need for theoretical understanding and practical development of technology for using conditional content carriers in the form of statistical materials in LSP education for the purpose of teaching foreign language speech and simultaneously achieving other results of mastering the educational program that determines the relevance of our research.

The **object of the research** is the process of developing foreign language speech of senior students in general education schools. The **subject of the research** is the strategies and technologies for using statistical data in the process of developing LSP skills. The **aim of the research** is the scientific substantiation and resolution of the problem of using statistical data in teaching LSP as well as foreign language speech. The **research hypothesis** is that it is possible to develop senior students' speech competence and achieve desired educational results on the condition of organizing instruction through methodology for using statistical data that involve creating utterances based on statistical material by means of step-by-step solution of cognitive tasks correlated with corresponding mental operations.

The research sets the following **tasks**: 1) to substantiate the necessity of including statistical data in the process of teaching professional foreign language speech; 2) to examine the properties and structure of statistical data as a basis for creating technology for teaching professional speech in German; 3) to develop technology for using statistical data in teaching professional German language to students of humanities faculties; 4) to conduct experimental instruction based on the methodology we developed and evaluate its effectiveness.

Statistical data can be presented in three formats: textual, tabular, and graphical. None of the methods of presenting statistical information is homogeneous, that is, completely verbal

or visual. Even statistical graphs, in addition to the graphic image, graph field, spatial and scale reference points, contain an explication of the graph, that is, a verbal description of its content, which includes the graph title, labels along the scale axes, and explanations for individual parts of the graph. Graphic language belongs to language systems, as it is a means of conveying information about observed facts and their interpretation. In semiotics, graphic language is perceived as an artificial linguistic sign system; therefore, it can be stated that materials with statistical data are semiotically complex texts formed by combining natural language with elements of other sign systems. For such texts, there is still no single universally accepted terminological designation; authors use the terms *polycode text*, *linguovisual complex*, *isoverbal complex*, *isoverb*, *videoverbal text*, and so on. Within the framework of this research, we will use the term *creolized text*, as well as the phrase *semiotic complexity*, which describes the essence of the phenomenon.

The semiotic complexity of statistical materials creates advantages for developing foreign language speech, as it facilitates the perception and understanding of information based on which an utterance is created. Creolized text is the most convenient and natural form of information perception for humans due to its unique ability to perceive and record information in two ways – verbally (through words) and non-verbally (through sensory and visual images). Semiotic complexity contributes to quick orientation in the textual space and deep understanding of content through the simultaneous activation and synchronous coordinated work of the right and left hemisphere systems of the human brain.

The meta-subject aspect involves students acquiring "supra-subject", universal knowledge and methods of activity that are applied both within the framework of further education and in solving problems in real-life situations. The academic discipline "Foreign Language for Specific Purposes" has great potential for students to master the meta-subject content of education through the inclusion of a statistical component, which will allow students to develop the ability to navigate sources of statistical information, use a foreign language to obtain information from foreign language sources for educational and self-educational purposes, and to expand their knowledge in other subject areas. The prevalence, accessibility, high informativeness, and relevance of statistical data leave no doubt that students, even without being specialists in this field of activity, should be able to obtain, interpret, and use information from various sources containing statistical data.

By verbalizing statistical data, students improve another important meta-subject skill – carrying out the transition from one form of information representation to another. In addition, working with numerical information creates opportunities for developing the ability to concentrate, for training memory, and helps develop intellectual meta-subject skills. This work requires the speaker to perform various mental operations. Thus, familiarization with statistical content begins with its perception and comprehension (primary synthesis). Having obtained a general understanding of the phenomenon characterized by statistics, the student examines it more carefully, identifies structural components, elements of quantitative-qualitative characteristics, studies each part separately and in combination with others, correlating it with the whole, etc. (analysis). Then the student returns to the whole (secondary synthesis). By correlating the material's information with the language exercise instruction, the student performs analysis through synthesis. The student makes conclusions of a hypothetical nature, for example, conclusions by analogy, considering comparison. By abstracting from non-essential features (abstraction) and identifying essential data (concretization), the student determines the trend of development of the analyzed phenomenon and draws a conclusion (generalization). The need to provide a qualitative and quantitative characteristic of the phenomenon during communication also requires performing operations of comparison and classification.

## 2. Linguistic Aspects of Using Statistical Data in LSP Teaching

When compiling the linguistic characteristics of German-language statistical materials, we analyzed professional texts in German, selected through continuous sampling on the topic of “Youth” from sociological works (*Handbuch ... 2018; Hoffmann, Mansel 2010; Liebsch 2012; Quenzel, Hurrelmann 2022; Scherr 2009*) with a total volume of over 1,560 pages.

The topic of “Youth” and its numerous aspects – appearance, character, interests, dreams of young people, parent-child relationships, generation conflict, youth problems, first love, family, the impact of divorce on children's lives, the image of an ideal family, international youth projects, travel, etc. – serves as material for problem-based discussion in upper courses. The conducted analysis made it possible to identify the means of expressing semantics in German-language materials containing statistical data, as well as to reveal their structure and functional-stylistic features.

The main purpose of statistical data is to provide information for needs at any level (national, regional, municipal, down to the level of individual corporations and small firms) at a scientific level. An example is the online publication of materials from the University of Konstanz on youth crime in Germany: *Konstanzer Inventar Kriminalitätsentwicklung* (<http://www.ki.uni-konstanz.de/kik/>). Features of the scientific functional style can manifest themselves in creolized texts with statistical data with varying degrees of representation. This depends on the subject matter and the level of competence of the consumer. In addition to the purely scientific style, there is a popular science substyle designed for readers with a minimal degree of competence. An example is the joint publication by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth and the Federal Statistical Office “Die Familie im Spiegel der amtlichen Statistik” (The Family in the Mirror of Official Statistics): <http://www.dza.de/forschung/abgeschlossene-projekte/familie-i-spiegel-amtl-statistik.html> Statistical data often become part of journalistic texts, such as: the article “Jugendliche hängen nicht im Netz ab” by Nielsen company (Young People Don't Hang Out Online): <http://it20.eu/news/jugendliche-haengen-nicht-im-netz-ab> Below we present typical structural components of German-language statistical materials:

1) indication of the time period within which a certain phenomenon is observed: *seit 2004, seit vorigem Jahr;*

2) name/description of the location where the phenomenon manifests: *bundesweit in Großstädten;*

3) indication of units of measurement: *Angaben in Prozent;*

4) definition of the scope of phenomena for statistical analysis, the angle of their consideration: *Als Kinder gelten gesetzlich neben leiblichen Kindern auch Adoptiv-, Stief- und Pflegekinder;*

5) information about the conducted research (when, by whom, in what form, on what basis the research was carried out): *Die folgenden Grafiken veranschaulichen eine Anfang der zwanziger Jahre durchgeführte Befragung;*

6) description of the current state of the phenomenon: *Bei den jugendlichen Teilnehmern 16+ stellen wir fest, dass die Option „Eltern“ abrupt sinkt;*

7) comparison of phenomena with different parameters: *Die Jugenderwerbslosenquote zeigt jedoch gravierende Unterschiede in den Bundesländern;*

8) indication of comparison parameters: *Ein weiterer wichtiger Faktor ist der Bildungsstand: Jugendliche aus sozial schwächeren Verhältnissen besitzen eine vier Mal kleinere Wahrscheinlichkeit..., als in höheren Bildungsschichten;*

9) identification of main development trends of the presented phenomenon: *Es gibt im letzten Jahrzehnt mehr Alleinerziehende ...;*

10) confirmation of the phenomenon's development trend with facts: *Am deutlichsten schlägt sich dies in dem seit Jahrzehnten anhaltenden Geburtenrückgang nieder;*

11) explanation of the reasons for such development of the phenomenon: *Die Gründe für eine solche Unfallgefährdung dürften nach wie vor in der steigenden Risikobereitschaft liegen;*

12) indication of the degree of prominence of the trend: *Bei den jugendlichen Azubis fällt gleich die Verringerung der Zahl der arbeitsbedingten Unfälle gegenüber dem Vorjahr ins Auge;*

13) indication of the degree of expectedness of the trend: *Wie erwartet, ist die Zahl der Studierenden gestiegen. Erwartungsgemäß hat sich die Jugendarbeitslosigkeit verringert.*

14) indication of the degree of prevalence of the trend: *In Familien mit Migrationshintergrund ist Kinderlosigkeit weitaus weniger verbreitet als bei deutschen Paaren;*

15) indication of opposite trends: *Im Gegensatz zu neuen Bundesländern leben minderjährige Kinder im Westen Deutschlands viel seltener in dieser Lebensform;*

16) indication of similar development trends: *Diese Grundtendenzen betreffen gleichermaßen Ost- und Westdeutschland;*

17) indication of the involvement of several phenomena in the development process: *Eine derartige Überrepräsentation junger Menschen sowohl unter den Tatverdächtigen als auch unter den Verurteilten ist seit langem zu verzeichnen;*

18) assumption about the further development of a certain phenomenon: *Angesichts der steigenden Bildungsbeteiligung junger Frauen ist in den kommenden Jahren mit einer weiteren Erhöhung des Akademikeranteils zu rechnen;*

19) indication of the uncertainty/incompleteness of the trend or the impossibility for this reason to draw a conclusion about the development of the phenomenon: *Es ist eine Entwicklung zu beobachten, die sich noch nicht abgeschlossen hat und deshalb einer eindeutigen Beurteilung entzieht;*

20) indication of the stability, unchangeability of the trend: *Die Zahl (11,2 Millionen) hat sich nicht bedeutend verändert;*

21) indication of the frequency of occurrence of the analyzed phenomenon: *In jeder vierten Lebensgemeinschaft;*

22) information about the impact of quantitative indicators on the overall development trend: *Mit ansteigenden Geburtenzahlen beobachten wir die Abschwächung dieser Entwicklung;*

23) indication of variability: *Mehrfachnennungen sind zu beachten;*

24) indication of the source of more detailed information: *Gedruckte Ausgaben können per E-Mail ([vertrieb@statistik.berlin.de](mailto:vertrieb@statistik.berlin.de)), Fax (Fax-Nr. 030 1274-327) oder Post bestellt werden.*

After analyzing materials containing statistical data and statements created on their basis by native speakers, we identified means of expressing the semantics of comparison through statistical data. Comparison is a concept of equality, inequality, greater or lesser degree of quality, which is expressed at different linguistic levels; therefore, this category can be considered as functional-semantic. The core of the functional-semantic field of comparison consists of morphological means, primarily the comparative degree of adjectives and adverbs, such as: *Mehr als die Hälfte (62%) der Alleinerziehenden; Ein geringerer Anteil kommt durch die 12 bis 16 Jährigen zustande.* If the analyzed phenomenon exceeds others according to the selected criterion, the superlative degree of adjectives or adverbs may be used, such as:

*Die deutschsprachige Schweiz zeigt den höchsten prozentualen Anteil dieser besonders leistungsschwachen Jugendlichen.*

The periphery includes syntactic, lexical, word-formation and phraseological means. Among lexical means predominate:

(1) adjectives in attributive or predicative forms predominate: *ähnlich, identisch, gleich, niedrig, vergleichbar, verschieden*;

(2) verbs: *ähneln, differenzieren, entsprechen, folgen, führen, gleichen, gleichsetzen, sich erhöhen, unterscheiden, vergleichen, vorlegen, zunehmen*;

(3) nouns: *die Ähnlichkeit, die Gleichheit, der Vergleich, die Verschiedenheit*;

(4) adverbs: *anders, beinahe, ebenfalls, fast, genau, genug, gleichsam, halb, kaum, nahezu, ungefähr*;

(5) conjunctions: *wie, als, als ob, je ... um so, je desto, während*;

(6) participles: *wachsend, gravierend, vergleichend, abgerundet*, etc.

Word-formation means include word-formation elements *quasi-, super-, semi-, über-, -lang, -artig, -kurz*, for example: *übergroß, superkurz*.

Among syntactic means, the following predominate:

– complex sentences with comparative clauses with conjunctions *wie, sowie, als, je länger, um so, je ... desto*, such as: *Das sind 49 Prozent mehr, als es fünf Jahre zuvor gab*;

– complex sentences with temporal clauses with conjunctions *während, indessen, solange, als, wenn*, such as: *Während im Osten ..., ist es im Westen ...*;

– comparative constructions that have a three-component logical structure of comparison (subject, object and feature of comparison) with conjunctions *wie, als, als ob*, such as: *Die Arbeitslosenquote ausländischer Jugendlicher ist erheblich höher als die der deutschen Gleichaltrigen*.

Phraseological units are used rarely in the analyzed sources, mostly in journalistic texts. Phraseological comparisons consist of two parts: one part names an action, characteristic or feature of an action, while the other creates a comparative image. The phenomenon examined through statistics is compared across different territories. In Germany, comparisons are made between:

– the western and eastern parts (former Federal Republic of Germany and German Democratic Republic): *Diese Tendenzen betreffen gleichermaßen Ost- und Westdeutschland*;

– individual federal states: *Dieser Trend zeigt sich deutlich in vielen Bundesländern*.

In Austria and Switzerland, individual states, cantons or linguistic regions are compared: *Die drei Sprachregionen weisen fast ähnliche Anteile leistungsschwacher Jugendlicher auf, und zwar die deutsche Schweiz 12%, die französische Schweiz 11% und die italienische Schweiz 8%*. A comparison of the analyzed phenomenon across different countries of the European Union is possible, such as: *in den Mitgliedstaaten, EU-weit, im EU-Durchschnitt*. When comparing, it is possible to indicate coincidence, similarity of the analyzed phenomenon in different territories, or their difference: *Dieser Trend zeigt sich auch in anderen europäischen Ländern, es gibt allerdings Unterschiede in der Dynamik der Entwicklung*.

In the category of quantity, we distinguish a number of key oppositions: *singularity – plurality, collectivity – separateness, countability – uncountability, precision – approximation, discreteness – non-discreteness*, such as:

– exact quantity: *... liegt heute bei 285 000; Die absolute Zahl*;

– approximate quantity: *rund 43% der Bevölkerung; etwa; ca. ...; fast 240 junge Menschen*.

Relations of approximate quantity are divided into relations with invariant meanings:

- plurality: *die Mehrzahl, die gnaze Menge*;
- assessment of indefinite quantity: *ein recht großer Prozentsatz der Jugendlichen*;
- approximation in the direction of increase: *fast jedes dritte Kind, mehr als fünf Prozent, über 83%, gut 20%*.
- approximation in the direction of decrease: *nur knapp 18 Prozent der Haushalte, weniger, als jeder sechste, mindestens ein Drittel*;
- total quantity: *insgesamt 15%, die Gesamtquote, die Gesamtausgaben*;
- average quantity: *die durchschnittliche Onlinezeit, im (Durch)schnitt*;
- fractional quantity, parts, percentages: *ein Viertel, immerhin noch 83%, knapp ein Viertel, fast doppelt so viele wie im Vorjahr, ein weiteres Achtel*;
- ratio of quantities: *die Hälfte davon, 506 Euro pro Bürger, ein Großteil, 22% der damals 35 Millionen Jugendlichen*;
- with simultaneous indication of small quantity: *nur sieben Prozent*.

Besides numerals, quantity can be expressed by:

- pronouns indicating reciprocity: *der andere, miteinander, beide*; singularity: *jeder*; totality: *viele, wenige*;
- nouns correlated with groups of living beings: *die Gruppe, die Menge*; objects: *der Satz*.

The linguistic characterization of statistical materials in German presented above serves as the basis for formulating tasks, constructing sentences, determining the range of lexical units and grammatical phenomena to be mastered in the process of developing foreign language speech using statistical data.

### 3. Principles of Compiling Exercises Using Statistical Data

Based on statistical materials, it is possible to create at least three different types of statements, namely: 1) statements containing complete information about the statistically conducted study and its results; 2) statements on the proposed problem with the use of statistical data, when not all statistical information is used, but only that which the student considers necessary to provide for solving the communicative task; 3) statements expressing students' attitudes toward the problem, the existence and relevance of which is evidenced by statistical information.

It is obvious that the most specific in terms of compiling tasks are exercises whose purpose is statements with complete verbalization of all structural components of statistical content. During the analysis of the structure of German statistical materials, 26 possible structural components were identified, which we reduced, taking into account the frequency of use and importance, to 9 language tasks and 18 speech tasks (see Table 1).

Let us illustrate everything said above with examples of exercises. Thus, students are asked to read the following text with statistical data:

*Alleinerziehende sind der Definition der amtlichen Statistik folgend Mütter und Väter, die ohne Ehe- oder Lebenspartner mit Kindern in einem Haushalt zusammenleben. Im Jahr 2023 lebten in Deutschland 1,7 Millionen alleinerziehende Familien mit minderjährigen Kindern, das entspricht einem Anteil von 19,9 Prozent an allen 8,5 Millionen Familien mit Kindern unter 18 Jahren. Darunter sind 1,4 Millionen alleinerziehende Mütter (82,3%) und 301.000 alleinerziehende Väter (17,7%). 71,4 Prozent der alleinerziehenden Mütter und 87,1 Prozent der alleinerziehenden Väter sind erwerbstätig – jeweils etwas seltener als Mütter*

Table 1

**Language and Speech Tasks in Statements with Statistical Data**

Language Tasks		Speech Tasks
1.	Name	the topic of the statistical study; the phenomenon measured by the indicator; the location where the phenomenon occurs; the basis for classification;
2.	Indicate	the time period within which the phenomenon is observed; the units of measurement in which the magnitude of the phenomenon is expressed; the characteristics of the trend (degree of expression, prevalence, predictability, stability, opposition, etc.); the uncertainty/incompleteness of the trend or the impossibility of drawing a conclusion about the development of the phenomenon; the source of more detailed information; the parameters of comparison
3.	Describe	the location where the phenomenon occurs; the current state of the phenomenon
4.	Report	information about the conducted study: when, by whom, in what form, on what basis the study was conducted
5.	Compare	the phenomena examined by statistics from different parameters
6.	Determine	the main trends in the development of the presented phenomenon
7.	Confirm	with facts the trends in the development of the phenomenon
8.	Explain	the reasons for such development of the phenomenon
9.	Express	an assumption about the further development of the phenomenon

*und Väter in Paarfamilien (77 bzw. 93%). Allerdings sind alleinerziehende Mütter deutlich häufiger in Vollzeit erwerbstätig als Mütter in Paarfamilien (41,4% im Vergleich zu 31,1%), alleinerziehende Väter jedoch seltener (86,7%) als Väter in Paarfamilien (92%). Seit 2020 ist ein Rückgang der Erwerbstätigkeit alleinerziehender Mütter zu beobachten. Ein möglicher Grund dafür ist sicherlich die aktuelle Krise des Betreuungssystems für Kinder. Zudem trägt seit 2022 der Zuzug aus der Ukraine geflüchteter alleinerziehender Mütter, die nicht direkt einem Job nachgehen können, zu diesem Effekt bei.*

Language exercises based on this text can be organized with several tasks, for example:

1. *Erzählt den Mitschülern über eine der Studien des Statistischen Bundesamts zum Mikrozensus* (Tell your classmates about one of the Federal Statistical Office's studies based on the microcensus data).

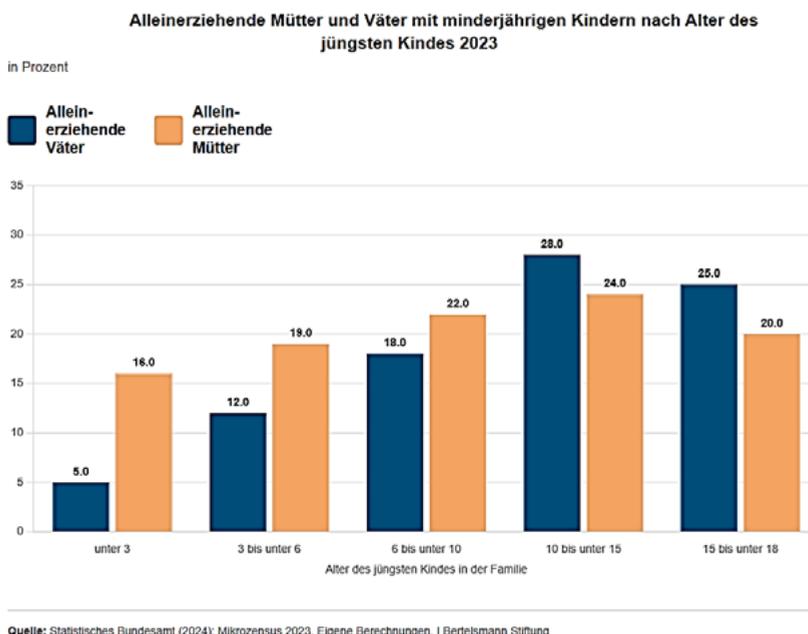
2. *Beweist euren Gesprächspartnern, dass immer mehr Jugendliche in Deutschland auf ein Zusammenleben mit beiden Elternteilen verzichten müssen* (Prove to your conversation partners that more and more young people in Germany have to do without living with both parents).

3. *Warum ist die gesunde Entwicklung von Kindern und Jugendlichen immer häufiger durch Lebensführung der Erwachsenen bedroht? Erklärt eure Meinung.* (Why is the healthy development of children and young people increasingly threatened by the lifestyle of adults? Explain your opinion).

4. *Wie verschiedene Untersuchungen belegen, ist die Entwicklung der betroffenen Kinder besonderen Risiken ausgesetzt. Nennt einige davon* (As various studies confirm, the development of affected children is exposed to particular risks. Name some of them).

The first task requires students to create a statement that contains the most complete information possible about the conducted study and its results. This task encourages students to use linguistic means and clichés necessary for verbalizing the structural components of statistical material. The second task requires students to create a statement that uses not all the information, but only what the student considers necessary to employ for solving a specific communicative task. The text with statistical data combined with the third task can be classified as content-semantic support, however, the text content does not contain a complete answer to the question posed. Single-parent families are only one of the factors affecting a child's development, therefore it is necessary to involve additional information about other social problems. This exercise allows weaker students to express themselves based on the text content, while for stronger students it serves as a stimulus for reflection, promotes the use of information from personal experience and other sources of information. In the fourth task, students are required to present their own reflections on the consequences of the problem, the existence of which is evidenced by the statistical information. Students do not directly use the text content. The text only serves to reveal the meaning of the concept “betroffene Kinder” (“children from single-parent families”) and shows the scale and urgency of the existing problem. This serves as a stimulus for speech and adds emotionality to students' statements.

Instead of a microtext, students can be offered a bar chart as support (see Fig. 1). Extracting information from a chart is a more complex process compared to extracting information from text, therefore it is advisable to use verbal supports – lexical units, language clichés, grammatical constructions.



**Fig. 1. Bar chart**

Supports in tabular and graphic form require a higher level of perception and speech preparation from speakers. Decoding statistical data requires meta-subject knowledge and skills, as well as a higher level of development of mental operations. The chart does not contain conclusions about the main trends in the phenomenon's development. Students themselves must draw such conclusions by analyzing and summarizing the statistical information.

Based on the above, we consider it appropriate to create a hierarchy of exercises with statistical data by increasing the difficulty of various statements according to the following criteria: 1) presence or absence of support; 2) degree of statement elaboration; 3) ratio of productive and reproductive elements in the statement; 4) complexity of supports in terms of extracting the information necessary for the statement; 5) degree of the speaker's knowledge about the subject of the statement. Below are examples of exercise sets for students that were tested in the experiment.

I. Introductory word by the instructor: *Wie ist die heutige Jugend? Lassen Sie uns das moderne Jugendbild bestimmen! Dabei können uns objektive, authentische Daten helfen. Bilden Sie bitte Gruppen. Für jede Gruppe habe ich Informationen mit statistischen Angaben vorbereitet. Lesen Sie diese, um das Wichtigste zu erfassen.*

Task: *Teilt euren Mitschülern mit, welche Vorlieben, Beschäftigungen und Interessen der Jugendlichen in diesen Statistiken erwähnt werden. Welche davon können wir für unser Jugendbild verwenden?* (Tell your classmates which preferences, activities, and interests of young people are mentioned in these statistics. Which of these can we use for our youth portrait?)

To complete the exercise, students are divided into groups. Each group receives micro-texts of 4-5 sentences. All micro-texts are presented visually and serve as meaningful verbal supports. Students exchange information using the content of the micro-texts and language resources in their answers, without providing a complete retelling of the texts. The students' answers contain information about modern youth from German-speaking countries' passion for online shopping, downloading music, using mobile phones and the internet, and traveling. The collected information is briefly recorded on the board as mind maps titled 'Portrait of Modern Youth'.

II. Task: *Beweise deinem Gesprächspartner, dass heutige Teenager aktiv ihre Freizeit gestalten* (Prove to your conversation partner that today's teenagers actively shape their free time) (see Figure 2).

When completing this exercise, students are offered illustrative and verbal supports:

1. Introduction and general description: *Die Grafik/Das Diagramm/Die Statistik zeigt...* (The graph/diagram/statistics shows...); *Die vorliegende Grafik gibt Auskunft über...* (The present

Freizeitaktivitäten 2024 – Vergleich 2023  
– täglich/mehrmals pro Woche –

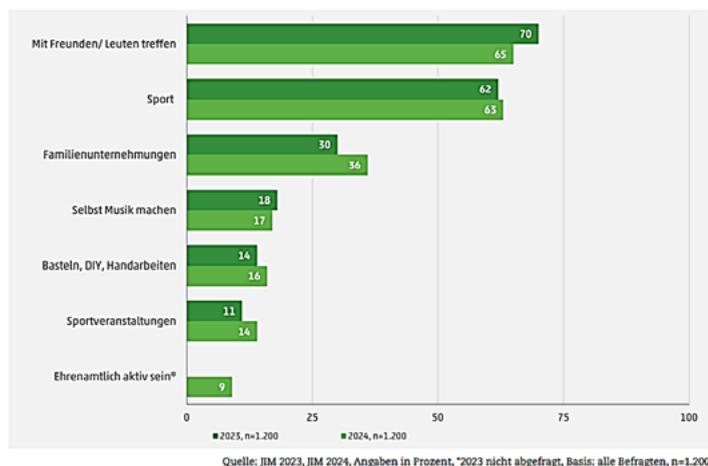


Fig. 2. Free-time activities 2024 (compared with 2023)

graph provides information about...); *Aus der Grafik geht hervor, dass...* (From the graph it becomes clear that...); *Das Schaubild stellt ... dar* (The chart illustrates/depicts...); *Die Daten stammen aus...* (The data comes from...); *Die Umfrage wurde ... durchgeführt* (The survey was conducted...).

2. Data comparison: *Im Vergleich zu 2023...* (In comparison to 2023...); *Verglichen mit dem Vorjahr...* (Compared to the previous year...); *Während 2023... waren, sind 2024...* (While in 2023... were, in 2024... are...); *Im Gegensatz zu...* (In contrast to...); *Sowohl... als auch...* (Both... and...)

3. Description of highest/lowest values: *An erster Stelle steht/liegt... mit...%* (In first place is... with...%); *Den höchsten Wert erreicht...* (The highest value is reached by...); *Am häufigsten/beliebtesten ist...* (Most common/popular is...); *Die Spitzenposition nimmt... ein* (The top position is held by...); *Den niedrigsten Wert hat...* (The lowest value has...); *Am wenigsten verbreitet ist...* (Least common/widespread is...).

4. Description of changes/trends: *Es zeigt sich ein Anstieg/Rückgang von...* (There is an increase/decrease of...); *Der Anteil ist gestiegen/gesunken um... Prozentpunkte* (The share has increased/decreased by... percentage points); *Eine Zunahme/Abnahme ist bei... zu verzeichnen* (An increase/decrease can be observed in...); *Es ist eine steigende/sinkende Tendenz erkennbar* (A rising/falling trend is recognizable); *Der Wert hat sich erhöht/verringert* (The value has increased/decreased); *Deutlich/Leicht gestiegen ist...* (Significantly/Slightly increased is...)

5. Description of stability: *Der Wert bleibt konstant/stabil/unverändert* (The value remains constant/stable/unchanged); *Keine wesentlichen Veränderungen zeigen sich bei...* (No significant changes are shown in...); *Fast gleichbleibend ist...* (Almost constant is...).

6. Specific figures: *Rund/Etwa/Ungefähr... Prozent* (Approximately... percent); *Knapp zwei Drittel/die Hälfte/ein Viertel* (Nearly two thirds/half/a quarter); *Mehr als die Hälfte* (More than half); *Fast drei Viertel* (Almost three quarters); *Genau/Exakt... Prozent* (Exactly ... percent).

7. Conclusions: *Zusammenfassend lässt sich sagen, dass ...* (In summary, it can be said that ...); *Insgesamt ist festzustellen, dass ...* (Overall, it should be noted that ...); *Daraus lässt sich schließen, dass ...* (From this it can be concluded that ...); *Auffällig ist, dass...* (It is striking/notable that...); *Bemerkenswert ist, dass...* (It is remarkable that ...).

Using the example of a diagram, students become familiar with the graphical form of presenting statistical information. In this case, the requirement to alternate different forms of presenting statistical information during the learning process is fulfilled, as well as the requirement for a gradual increase in the complexity of producing statements. The verbal support contains a description of part of the information presented in graphical form. Students are also provided with a list of lexical items that they can use when creating their own statements.

#### 4. Experimental Verification of the Effectiveness of the Methodology of Using Statistical Data in LSP Teaching

The theoretical principles of this study were tested experimentally during the second semester of the 2024–2025 academic year among third- and fourth-year students at the Khmelnytsky National University whose first foreign language was English. We divided the students into control (CG) and experimental (EG) groups, ensuring that the level of German language proficiency was approximately the same in both groups, and conducted two experiments. The experimental groups consisted of 11 third-year and 12 fourth-year students, while the control groups included 12 third-year and 13 fourth-year students.

During the initial (diagnostic) stage of the experiment, we determined the baseline level of development of students' mental operations and speech skills in both the CG and EG. The final (control) experiment was aimed at assessing the effectiveness of developing students' skills in working with exercises based on statistical data and enhancing their cognitive operations. To achieve the objectives of the experiments, we used two diagnostic methodologies, as our goal was to measure both the level of development of students' mental operations and the degree of their speech skill formation in German-language communication.

Each test included five language exercises that were visually presented to the students. The participants' responses were recorded using a voice recorder. The analysis of the utterances was carried out based on the audio files and their transcripts. The distribution of the exercises according to the forms of presenting statistical information and the types of utterances is shown in Table 2 (see Table 2). Table 2 uses the following symbols to indicate the corresponding types of exercises: (\*) – verbalization of all structural components of the statistical material; (\*\*) – students' utterances on a proposed problem involving the use of statistical information; (\*\*\*) – students' expression of their attitude toward the issue described by the statistical information. In the last column of Table 2, when indicating the number of exercises for creating different types of utterances, options in parentheses are used. This is because the distribution of exercises by type of utterance presents certain difficulties and largely depends on the speakers' interpretation of the exercise's purpose.

Table 2

### Exercises Used in the Experiments

Description of Exercises		Experiments			
		diagnostic		control	
		third-year	fourth-year	third-year	fourth-year
Form of Presenting Statistical Information	Textual	2	2	2	2
	Tabular	1	1	1	1
	Graphical	2	2	2	2
Type of Utterance	*	1	1	1	1
	**	3	4 (3)	3	4 (3)
	***	1	0 (1)	1	0 (1)

During the control experiment, it was necessary to compare the levels of development of mental operations and German language skills in students of the CG and EG. Since a qualitative analysis of the results must be adequately reflected in quantitative indicators, without which it is impossible to compare the results obtained, it became necessary to develop criteria for evaluating the results of the experiment and their quantitative expression.

To establish the level of practical mastery of mental operations, a total of 20 indicators were identified, some of which indicate the level of practical mastery of only one mental operation, while others indicate several at once (see Table 3). To determine the level of practical mastery of mental operations by students based on a specific statement, the list of indicators needs to be specified. Only those indicators that could potentially be reflected in the students' statements in accordance with the task set are selected from it. The description of each indicator includes points awarded to students in brackets. Pluses indicate mental operations, the development of which is evidenced by a specific indicator. The maximum points for indicators are as follows: analysis – 8, synthesis – 8, comparison – 9, generalisation – 7, classification – 5.

Table 3

**Indicators for assessing the level of development of students' mental operations**

Indicators	Mental operations				
	Analysis	Synthesis	Comparison	Generalisation	Classification
1. Ability to identify (+1) meaningful parts of a message with statistical data and establish connections (+1) between them	+	+			
2. Ability to identify statements, determine methods and techniques of proof, evaluate their effectiveness (+1)	+	+			
3. Ability to identify structural components of a message with statistical data (+1)	+	+			
4. Ability to identify problematic issues (+1)	+	+			
5. Ability to recognise implicit statistical information (+1)	+	+			
6. Ability to critically and objectively evaluate statements, evidence or refutations, expressing opinion (+1)	+	+			
7. Ability to relate statistical information to personal experience (+1), to draw on additional information (+1)	+	+			
8. Number and accuracy of identified characteristics of comparable phenomena (all correct answers +1)			+		
9. Significance of identified characteristics (+1)	+	+	+	+	+
10. Hierarchization of characteristics when listing (+1)			+		+
11. Comparison of features with each other (+1)			+		+
12. Ability to find common features (+1)			+	+	+
13. Autonomy of the features found, their 'independence' from each other (+1)			+		
14. Formulation of generalised results of comparison (+1)			+	+	
15. Comparison according to a specific algorithm, presence of a system in the student's work (+1)			+		
16. Correct identification of generic concepts and specific distinctions (+1)			+	+	+
18. Absence of lists of characteristics, descriptions (+1), abstract, contradictory arguments (+1)				+	
19. Ability to distinguish the general from the particular and to summarise the particular under the general (+1)				+	
20. Ability to draw conclusions (+1)				+	

When analysing the results of the experiments, we first separately calculated and processed the data for each of the two diagnostic methods: the method for determining the level of development of students' mental operations and the method for determining the level of German language proficiency. The diagnostic method for determining the level of practical mastery of mental operations of analysis, synthesis, comparison, generalisation, and classification allowed us to obtain the average data presented in Table 4.

Table 4

**Level of development of students' mental operations**

Mental operations	Experiments	
	diagnostic	control
Analysis	32%	100%
Synthesis	32%	100%
Comparison	14%	73%
Generalisation	4%	80%
Classification	2%	61%

The diagnostic method for determining the level of development of German speech made it possible to obtain average data on the indicator of logicity, the coefficient of use of meaningful words, the coefficient of purposefulness, the coefficient of statistical content of speech, the coefficient of words reflecting the structure of statistical materials and the semantics of mental operations, and the productivity coefficient, presented in Table 5 (see Table 5).

Table 5

**Level of development of German speech**

№	Indicators and coefficients	CG		EG	
		diagnostic	control	diagnostic	control
1	Indicator of logicity	0,6	0,7	0,5	0,93
2	Coefficient of use of meaningful words	0,7	0,7	0,7	0,9
3	Coefficient of purposefulness	0,2	0,3	0,2	0,7
4	Coefficient of statistical content of speech	0,5	0,5	0,5	0,6
5	Coefficient of words reflecting the structure of statistical materials and the semantics of mental operations	0,01	0,01	0,02	0,3
6	Productivity coefficient	0,5	0,6	0,6	0,9

Separately processed data from two diagnostic methods at the final stage of analysis were compared, which also provided material for qualitative interpretation of the results of the main experiment.

**5. Conclusions**

The comparative analysis of data from the control and experimental groups confirms the effectiveness of the proposed methodology and leads to the following conclusions:

**1. Level of Practical Mastery of Mental Operations.** The ascertaining experiment revealed a low level of practical mastery of mental operations such as analysis, synthesis, comparison, generalization, and classification across all groups. The numerical data obtained showed that at the beginning of the experiment, most students possessed only rudimentary ideas about the essence of these operations and were practically unable to perform them. Students made errors when identifying essential features of analyzed, compared, and classified objects and phenomena, incorrectly chose the basis for comparison and classification, and performed comparisons based on an insufficient number of similarities or differences. Students' statements lacked or violated the sequence in identifying similarities and differences, and generalized

results of mental operations were absent or incorrectly formulated. Most statements represented reading out or retelling numerical information from texts or diagrams; information selection was conducted haphazardly, without considering the hierarchy of objects and phenomena or their importance for conducting mental operations and implementing speech tasks. Some students, when selecting statistical information from supports, proceeded from the linguistic simplicity of this information. Thus, fragments of statistical information containing internationalisms, simple whole numbers, and lexical units that posed no difficulties in terms of grammar and phonetics enjoyed great popularity.

Comparison of the numerical data from the ascertaining experiment revealed a small gap between the results of third- and fourth-year students. Fourth-year students on average demonstrated a higher level of practical mastery of mental operations. This indicates that experience in performing mental operations accumulates with age. However, the observed gap is not significant enough to conclude that students will eventually achieve a high level of mastery of mental operations over time without targeted work to improve this level.

During the control experiment, the level of practical mastery of mental operations in the experimental group (EG) increased significantly. Students began to approach the selection of information, the sequence of its presentation, and conclusions more thoughtfully. Familiarizing students with samples and algorithms for performing mental operations, sequential practice of individual components of mental operations, and their training based on algorithms and tasks contributed to the fact that by the end of the experiment, most EG students achieved a high level of practical mastery of mental operations. The results of control group (CG) students remained without significant changes.

**2. Level of Development of Students' Speech Skills.** When analyzing the level of German speech development, the position that skills represent an integrative set of many interrelated and mutually conditioning qualities was taken into account. Considering this, the level of development of individual qualities of speech skills does not provide a sufficiently complete and objective assessment of a speaker's speech abilities.

The coefficient of content word usage shows minimal growth tendency. The difference between data obtained at the ascertaining and control experiment stages is insignificant. The overwhelming majority of CG students demonstrated an inability to consistently develop thoughts. Their statements were dominated by incomplete phrases, word repetitions, verbal and intonational incompleteness, and absence of logical emphasis. All this indicates insufficient formation of speech mechanisms, slow pace of speech processes, and low level of speech skill dynamics.

The logic indicator increased due to a reduction in instances of logic violations. EG students developed the ability to develop thoughts smoothly and logically. Their statements showed fewer repetitions and returns to what was said, and illogical conclusions almost disappeared. At the ascertaining experiment stage, CG students demonstrated an inability to logically arrange structural components of statistical material and complete their statements with logical conclusions.

The purposefulness coefficient increased noticeably in the EG. For students to be able to purposefully transfer native language speech skills to German communication situations, it was sufficient to draw their attention to the presence of a speech task and the necessity of subordinating what was said to it. From EG students' statements, it is noticeable that they tried to choose content appropriate to the task and adequate means of expression. Their statements contained fewer intonationally incomplete phrases, and the number of statements without summarizing phrases decreased.

The development of senior students' speech skills through the technology of using statistical data created conditions for students to pay attention to the purpose of their speech actions. This coefficient did not reach the highest level for all students; however, EG students' ability to speak purposefully either underwent further development or remained at the previous level if the coefficient equaled one at the ascertaining experiment stage. Conversely, CG students' statements showed their inability to subordinate statistical data to tasks and speak according to task requirements. CG students' statements contained many non-purposeful phrases; students forgot about the task and at the conclusion formation stage completed statements with illogical conclusions.

The increase in the coefficient of statistical content richness of statements indicates that statements are more persuasive, have better impact on interlocutors, and demonstrate implementation of speech tasks. However, an important role is played not so much by the presence of statistical information as by its relevance and correspondence to the task being solved. Many students during the ascertaining experiment received quite high results for this coefficient; however, this did not ensure high quality of their statements. Phrases through which subjects conveyed statistical content were uniform, completely or partially taken from supports (low statement productivity coefficient), did not contribute to solving the assigned task (low purposefulness coefficient). These phrases were often perceived by interlocutors as superfluous (low logic indicator data). Conversely, some control experiment statements that did not have a high coefficient of statistical content richness were successful because more statistics were not needed for task implementation. Thus, when interpreting data obtained from the coefficient of statistical content richness of statements, we paid attention not only or so much to the numbers as to the correspondence of the specific weight of statistical data necessary for task implementation to ensure optimal impact on the interlocutor. Overall, it can be said that during the experiment in the EG, it was not the number of phrases conveying statistical content that increased, but their "quality".

The coefficient of words reflecting the structure of statistical data and semantics of mental operations increased noticeably in the EG. During the ascertaining experiment, students practically did not possess lexical units of statistical semantics. In phrases conveying statistical content, few words taken from texts and diagrams were present, or they were absent altogether or used inappropriately according to German language norms. Thanks to targeted teaching of speech using statistical data, primarily through familiarization with algorithms for performing mental operations and using lexical units with quantitative meaning that we identified, EG students developed their ability to use these lexical units in speech. EG students' statements at the final stage of the experiment, as before, were characterized by minimal use of words with quantity semantics.

The statement productivity coefficient was difficult to establish because transfer of language material from tasks and supports was observed. In a significant number of statements, students resorted to direct enumeration of statistical material content regardless of the task. When statistical information was presented in textual form, students read out lexical units and even entire sentences from supports. If statistical information was presented in tabular or graphic form, students tried to format the numbers from tables and diagrams into uniform sentences. At the final stage of the experiment, EG students' statements were characterized by a high productivity coefficient. This indicates growth in students' ability to independently combine words according to speech needs.

Analysis of experiment results led to the following conclusions: Regarding the level of development of students' speech skills and the level of practical mastery of mental operations,

the EG shows a growth tendency in analyzed coefficients and indicators. The ability of students in these groups to perform mental operations and express themselves purposefully, logically, productively, operatively, and with statistical content richness received further development. In the CG, analyzed coefficients and indicators on average did not undergo significant changes. This indicates that the technology we developed increases the level of practical mastery of mental operations and the level of speech skill development.

The results achieved in both years (3rd and 4th) are almost identical, meaning the applied technology is effective regardless of the language material on which it was tested. The gap between the highest and lowest control experiment results is smaller compared to the ascertaining experiment.

According to most criteria, students who showed the worst results in the ascertaining experiment made the greatest progress compared to the pre-experimental level. This indicates that the technology we developed creates conditions for activating students' potential speech capabilities. Weak students who require special work to develop their speech have the greatest reserves.

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