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INTEGRATION OF GERMAN WITH TECHNICAL SCIENCES

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Abstract. This article covers the theoretical and practical foundations of the integration of the German language with technical sciences. It is emphasized that in the current era of globalization, the importance of knowledge of a foreign language, in particular German, is increasing in the fields of technology and engineering. The possibilities of deep mastery of technical terminology through the German language, independent work with scientific sources, and participation in international cooperation were analyzed. Also, the advantages of combining science and language through the CLIL (content and language integration) method, its role in the development of scientific thinking and professional competence of students are highlighted. The article also presents practical proposals for increasing the effectiveness of the integrated education system.

Keywords: German language, technical sciences, integration, CLIL, international education, terminology, interdisciplinary approach, professional competence

In the modern education system, the concept of integration is widely used. Integration is the process of achieving a new level of quality by combining knowledge, skills, and experience in various fields. The integration of language and science is especially important in technical education.

The main goal of this process is to instill in students not only linguistic knowledge, but also the ability for practical communication and scientific thinking in their professional field. Language becomes a means of studying science, and science enriches language in terms of content.

One of the methodological foundations of language and science integration is the CLIL (Content and Language Integrated Learning) method. In this method, science and language are taught simultaneously: students acquire knowledge on technical topics while practically applying German words, expressions, and grammatical structures. For example, when studying the topic "Sources of Energy," students study such terms as "Solarenergie," "Windkraft," "Energieeffizienz" together with their technical meaning.

German is the language in which the third largest volume of scientific literature in the world is published (after English and French). In German scientific centers - for example, in such organizations as the Fraunhofer Gesellschaft, the Max-Planck Institute, and the Siemens AG Research Center, many scientific materials are prepared in German.

For a specialist studying technical sciences, knowledge of this language provides access to original sources. The meaning, term, and scientific style that disappear through translations can only be understood in the original language.

Technical terms in the German language have often become integrated into world science. For example:

Diesel engine - an internal combustion engine operating in a useful environment, named after Rudolf Diesel;

Ohm - unit of resistance (named after Georg Simon Ohm);

Siemens - a unit of electrical conductivity (named after Werner von Siemens).

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These examples show how strong the scientific and technical influence of the German engineering school was. Therefore, students' study of these terms together with their source and scientific context increases their professional potential.

In this method, subjects are taught through language. For example, in the lesson on the topic "Fundamentals of Mechanics," students learn to use such terms as Kraft, Energie, Bewegung, Reibung in German through various practical exercises. This helps them master the language of science, not the grammatical structure.

By organizing courses such as "Technisches Deutsch" or "Deutsch für Ingenieure" in technical universities, students are provided with specialized materials in German. In these courses, practical skills such as professional communication, writing reports, and analyzing patent texts are formed, not language grammar.

Students work in groups and defend projects on technical topics in German. For example, the project "Energie sparen im Haushalt" (saving energy at home). This process develops students' both language and subject skills simultaneously.

As a result of the integration of language and science:

Students will have the ability to think technically in a foreign language;

are able to freely communicate in the international working environment;

expanding opportunities for active participation in the field of scientific research and innovation;

the motivation to learn a language increases because it is connected with practice.

In addition, integrated learning develops students' active, independent thinking skills, skills in working with scientific sources, and methods of teamwork.

The integration of the German language with technical sciences is not only a method of language learning, but also an innovative and interdisciplinary direction of modern education. Today, a specialist is required not only to have knowledge of technology or computer science, but also to have skills in international communication, intercultural relations, and scientific thinking. From this point of view, the harmony of language and science is one of the most effective means of adapting specialists to the conditions of the global market.

First of all, the German language is extremely important as one of the main source languages in the field of technology and scientific innovations. Germany's scientific and technical potential, production culture, and research centers serve as a mature example on a global scale. Therefore, for students of technical specialties, knowledge of the German language is not only a language skill, but also part of professional competence. If a student or engineer can work with German-language sources, they will receive scientific information not through translation, but in its original content. This strengthens the ability to think scientifically and find creative solutions.

Secondly, integration based on the CLIL (Content and Language Integrated Learning) method ensures active student participation. The student learns the subject through language and applies language in practice through science. As a result of this bilateral process, language becomes a means of understanding science, and science becomes the content of language learning. For example, by defending projects on the topics "Engineering Mechanics" or "Energy-Saving Technologies" in German, students develop not only their vocabulary, but also a culture of professional communication.

Thirdly, another important aspect of integrated education is the expansion of opportunities for international cooperation. Many universities in Germany (for example, Technische Universität München, RWTH Aachen University) offer special technical courses

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in German for international students. In Uzbekistan, through such integrated programs, students will have the opportunity to participate in grant programs such as DAAD, participate in scientific internships, and establish scientific cooperation. This is an important factor in adapting the education system to international standards.

Fourthly, the integration of language and science develops students' ability for complex thinking. They can analyze information not only in one direction, but also through a multifaceted approach. These competencies are subsequently of great importance in the processes of communication at the workplace, working with technical documentation, and conducting scientific research.

The integrated education system will also change the role of teachers: they will become not only language teachers, but also specialists who create bridges between culture and science. This requires methodological innovations, the use of modern resources, and the formation of students' independent learning skills.

Based on this, the following conclusions can be drawn:

The integration of the German language with technical sciences is an effective means of training competitive personnel in modern education.

Integrated education develops interdisciplinary thinking, scientific communication, and professional competence in students.

Through the CLIL method and project-based learning, language learning is connected with practice, increasing its effectiveness.

Opportunities for scientific cooperation with Germany and other developed countries will expand.

In the process of integration, the professional training of teachers and their openness to methodological innovations are of great importance.

Therefore, teaching German in combination with technical sciences is an important factor in the formation of future specialists as internationally competitive and scientifically capable individuals.

For the integration of the German language with technical sciences to be effective, it is necessary to consider it not only as a language or science, but also as a process of creating a new model of the education system. Below are scientific and practical recommendations for the implementation of this integration:

1. Recommendations at the level of the education system

1.1. Development of integrated curricula

In higher educational institutions, it is recommended to introduce such subjects as "Technisches Deutsch" ("German language for engineers") or "Deutsch im technischen Kontext." These courses are not grammar, but:

working with technical documentation,

Writing reports and patent texts,

professional communication and interviewing

Focus on practical skills such as

1.2. Implementation of integrated lesson formats

It is recommended to establish the practice of teaching certain topics in technical disciplines in two languages (German and native). For example, if 1-2 topics of subjects such as "Fundamentals of Energy" or "Automation Systems" are taught in German, students' language knowledge and professional speaking skills will increase significantly.

1.3. Strengthening international cooperation

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Technical universities should establish memorandums of cooperation with German scientific institutions (for example, DAAD, Goethe-Institut, TU Berlin, RWTH Aachen University). This is:

internships for students,

professional development programs for teachers,

creation of opportunities for the organization of joint scientific projects and webinars.

2. Recommendations in the field of teachers and methodology

2.1. Teaching CLIL (Content and Language Integrated Learning) to teachers

Organize special advanced training courses for German language teachers to study the CLIL methodology, integrated with technical disciplines. This is for them:

correct application of scientific terminology,

conveying the content of science through language,

organization of interdisciplinary communication

provides an opportunity.

2.2. Collaboration between language teachers and subject teachers

The success of integration depends on the cooperation of language and subject teachers. For example:

The subject teacher selects materials in German,

The language teacher provides grammatical and lexical support.

The experience of such "duet learning" has proven itself well in European and Korean universities.

3. Recommendations in the educational process

3.1. Intensification of project and practical training

Students should be offered practical projects combining science and language. For example:

"Energie sparen im Haushalt" - energy-saving technologies at home;

"Robotertechnik und künstliche Intelligenz" - presentations on the topic of robotics and artificial intelligence;

"Nachhaltige Technologien in Deutschland" - sustainable technologies in Germany.

Such projects develop students' skills in scientific thinking, teamwork, and presentation in German.

3.2. Establishing work with technical literature in the German language

Recommend special online resources, magazines, and podcasts to students. For example

Deutsches Ingenieurblatt - engineering news magazine,

Spektrum der Wissenschaft - scientific journal,

DW Learn German - Deutsch im Beruf - a professional language platform.

These sources connect language knowledge with the real professional environment.

4. Recommendations on Information Technologies and Digital Education

4.1. Creation of online courses and multimedia content

It is recommended to develop an online platform for technical sciences in German. In it:

video tutorials,

interactive dictionaries,

audio and visual terminology dictionaries.

These digital tools expand students' opportunities for independent study.

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4.2. Simulation and Virtual Laboratories

Working with a German-language interface and commands through practical exercises (simulators) in a virtual environment in the study of technical disciplines allows students to realise the professional environment.

5. Recommendations in the field of scientific research and evaluation

5.1. Study of the effectiveness of integration

It is necessary to evaluate and analyze the results of practical experiments on the integration of subjects with the German language. For this:

student motivation,

level of language proficiency

indicators of academic performance

It is necessary to scientifically study the relationship between.

5.2. Organization of scientific articles and seminars

Teachers should conduct research on the scientific and methodological aspects of integration and present the results at conferences. This will strengthen the exchange of experience and scientific cooperation.

The integration of the German language with technical sciences develops not only the language, but also the knowledge, skills, and international competence of the specialist. Therefore, the systematic establishment of this direction in educational institutions is a requirement of the times and the main direction for training future potential personnel.

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