

Original article

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**Interdisciplinary Connections: An Integrative Foreign Language Learning Environment
at a Civil Engineering University**

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At present, the interaction between different areas of knowledge is becoming an integral part of our life, which has resulted in the research interest in interdisciplinarity in the system of higher professional education. The interdisciplinary approach to teaching foreign languages in higher education makes it possible to combine knowledge and skills from various fields to solve complex problems that students will face in their future professional environment. The next factor that determines the relevance of the problem under study is the specific character of the "Foreign Language" discipline. Professionally oriented foreign language instruction involves close interaction between the participants of the educational process beyond linguistic aspects. The study represents a theoretical stage and considers the problem of creating an integrative foreign language learning environment at NR Moscow State University of Civil Engineering. An analysis of domestic and foreign pedagogical and methodological literature on the research topic has been carried out through theoretical (analysis of methodological literature, synthesis, generalization) and practical (questioning of students and teachers) methods. Identifying interdisciplinary connections is considered a necessary condition for creating an integrative foreign language learning environment. Domestic and foreign studies of the teachers and methodologists demonstrate the depth and sufficient elaboration of specific issues of the interdisciplinary approach. However, practical teaching experience shows that some theoretical aspects do not correspond to the real educational environment. This imbalance is based on the conditions that are considered in the study. Based on the analysis, recommendations for successful implementation of the interdisciplinary approach to professionally oriented language instruction at the civil engineering university have been developed: integration of educational materials on construction; project-based learning, cross-cultural learning; use of interactive technologies; cooperation with the teachers of engineering disciplines; educational and methodological seminars for teachers.

Keywords: interdisciplinarity, higher professional education, learning environment, foreign language instruction, interdisciplinary connections.

Научная статья

**Междисциплинарные связи: интегративная среда изучения иностранных языков
в строительном университете**

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В современном меняющемся мире границы между различными областями знаний постепенно стираются, взаимодействие между ними становится неотъемлемой частью нашей жизни, междисциплинарность приобретает особое место в системе высшего профессионального образования. Междисциплинарный подход к преподаванию иностранных языков в высшей школе позволяет объединять знания и навыки из различных областей, чтобы решать сложные задачи, с которыми столкнутся студенты

в будущей профессиональной деятельности. Следующий фактор, обуславливающий актуальность исследуемой проблемы, – это специфика дисциплины «Иностранный язык» в инженерно-строительном вузе, которая предполагает тесное взаимодействие участников образовательного процесса, выходящее за рамки лингвистических аспектов дисциплины, для организации профессионально ориентированного обучения. Исследование представляет собой теоретический этап в рассмотрении проблемы создания интегративной иноязычной обучающей среды в инженерно-строительном вузе. На данном этапе проведён анализ отечественной и зарубежной педагогической и методической литературы по теме исследования посредством теоретических (анализа методической литературы, синтеза, обобщения) и практических (анкетирование студентов и преподавателей) методов. Междисциплинарные связи рассматриваются как необходимое условие создания интегративной иноязычной обучающей среды в инженерно-строительном вузе. Исследования отечественных и зарубежных педагогов и методистов в области преподавания иностранных языков свидетельствуют о глубине и достаточной разработанности отдельных вопросов междисциплинарного подхода, однако практический опыт работы в инженерно-строительном вузе показывает, что не все теоретически обоснованные аспекты соответствуют реальной картине. Эти несоответствия обусловлены рядом причин, которые рассматриваются в исследовании. На основе анализа теоретических исследований и практического опыта работы по установлению междисциплинарных связей для создания интегративной иноязычной обучающей среды в инженерно-строительном вузе разработаны рекомендации: интеграция с учебными материалами по строительству; проектная деятельность, кросс-культурное обучение; использование интерактивных технологий; сотрудничество с преподавателями профильных дисциплин; формирование готовности преподавателей к реализации междисциплинарного подхода к преподаванию иностранных языков.

Ключевые слова: междисциплинарность, высшее профессиональное образование, образовательная среда, обучение иностранному языку, междисциплинарные связи

Introduction. The modern global social space represents a complex system where all spheres of human life interact and form specific integrity. In order to describe the processes of interaction in the system, the concept of “integration” is used. Integration connections provide the elements of the system with integrity and individuality. The computerization of all spheres of human activity has a huge impact on the integration processes. The volume of information has increased unprecedentedly resulting in change of people’s cognitive abilities and expansion of the international scientific cooperation. The above has the potential for ground-breaking technological upgrading and economic prosperity. People quickly and efficiently learn to implement scientific ideas and turn them into “products.” These have resulted in social and economic transformation of advanced nations [1, p. 58]. G. Yu. Belyaev describes the processes of society transformation as a “cognitive revolution”. Such concepts as “knowledge society” and “knowledge economy” have appeared [2, p. 146]. The knowledge society invests in education and science, new knowledge becomes the main factor influencing the production efficiency. The knowledge society forms new economic relations which are called the “knowledge economy.”

Integrative processes and associated changes in society have led to changes in the educational system. These pose new challenges for the educational system and transform its goal setting. The most important purpose of a

higher engineering school is to form a personality capable of adapting to the changing, complex world. At present, the source of individual success is knowledge, creativity, intellectual development and ability to interact. Thus, education becomes the main source of human capital formation. An integrative foreign language learning environment can become a platform for the formation of the professional culture of a modern global engineer – a representative of the knowledge society, ready to participate in the international business, industrial and scientific activities, capable of making a contribution to the global knowledge economy.

Methods and Materials. The aim of the study is to analyse the learning environment in the civil engineering university and to determine interdisciplinary connections between major disciplines and a foreign language on the basis of the discipline “Foreign Language”, which is considered a condition for creating an innovative integrative foreign language learning environment [3; 4]. The aim has determined the methods and materials.

The study represents a theoretical stage in considering the problem of creating an integrative foreign language learning environment in the civil engineering university. At this stage, an analysis of domestic and foreign pedagogical and methodological literature on the research topic has been carried out through theoretical (analysis of methodological literature, synthesis, generalization) and practical (questioning of students and teachers) methods.

The research has been supported by both the works of domestic (G. Altaeva, O. Yu. Afanasyeva, S. A. Bezklubaya, G. Yu. Belyaev, N. V. Popova, A. A. Sadykova, etc.) and foreign (A. S. Hornby, M. Splatt, D. Marsh and others) methodologists, teachers and psychologists, for formulation of the theoretical approaches, and the results of the surveys of the students and teachers of the National Research Moscow State University of Civil Engineering (hereinafter referred to as MGSU), for practical substantiation of the proposed recommendations, for the implementation of the integrative foreign language professional content instructions.

Discussion. In Oxford English Dictionary, “integration” is the action or process of combining two or more elements that begin to work together as a result of this process or action¹. Pedagogical integration is the highest form of didactic components unity and the foundation for making up new pedagogical educational units based on building interdisciplinary connections between academic disciplines and the corresponding scientific and didactic justification [5, p. 24–28].

Interdisciplinary connections enhance the didactic result due to the synergetic effect that arises as a result of the integration of individual didactic components of the major engineering disciplines and the Foreign Language.

In general characteristics of the Principal Professional Educational Program of Higher Education (PPEP) in the field of study 03/08/01 Construction, the profile “Industrial and civil engineering”, the acquisition of knowledge, skills and experience necessary for professional activity in the field of industrial and civil engineering is stated as the goal. According to the PPEP, the graduate must learn to solve the problems in the design, construction, operation, repair and reconstruction of industrial and civil construction facilities. The criterion for acquisition of the PPEP is a set of competencies manifested in the graduate’s readiness and ability to apply knowledge, skills and personal qualities to solving problems during the professional activity [6]. As part of the professional training, civil engineers get prepared for the following types of professional activities: survey and design; operation; operation management; experimental research; installation-setup works, service and operation; entrepreneurial. Thus, professional competencies formed by the en-

gineering departments are determined by the field of study of the educational program considering the type of the chosen professional activity. Professional competencies determine how the portrait of the graduate of one program differs from the portrait of the graduate of another program [7, p. 217].

However, first of all, the future graduate develops universal competencies (UC) within the framework of Block 1 of the basic part of the PPEP “Disciplines (Modules)” regardless of the profile of the PPEP. UC unite the specialists of one field with the others in a certain professional sphere.

The discipline “Foreign Language” is included in the mandatory part of the block of the PPEP compiled in accordance with the requirements of the Federal State Educational Standard of Higher Education. According to the discipline planned learning outcomes correlated with the PPEP planned results, UC-4 says that the student is able to communicate in business sphere in oral and written forms in the state language of the Russian Federation and foreign language(s)².

We consider the educational space within the framework of the Foreign Language discipline the potential for creating an integrative foreign language learning environment on the basis of the formation of interdisciplinary connections, which enables achieving the PPEP results. Interdisciplinary connection is seen as a result of mutual interaction of several components of the content of various disciplines. This interaction occurs naturally, that is objectively or is established intentionally [8, p. 15]. The interdisciplinary approach to the design of the integrative foreign language learning environment in MGSU involves the integration of a major engineering discipline or certain topics of various disciplines and a foreign language.

The idea of integrating a foreign language and specialized professional disciplines has come from Western pedagogical practice – the method is called CLIL (Content and Language Integrated Learning) and its separate branch is called ILCHE (Integrating Language and Content in Higher Education) [9]. The CLIL and ILCHE theory is based on the fact that a foreign language is best learned if it acts as support for obtaining specific information and

¹ Hornby A. S. Oxford Advanced Learner’s Dictionary of Current English. – Oxford: Oxford University Press, 2010. – P. 324.

² Federal State Educational Standard of the Federal District – bachelor’s degree in the field of preparation 03.08.01 Construction.

through its use when a second language is not the aim, but a means¹.

Results. The integration of disciplines stated by the educational program ensures the exchange of professional information between various topics of majoring engineering disciplines, which contributes to the conscious perception of knowledge: reformatting of existing knowledge and emergence of qualitatively new knowledge due to generalization of leading ideas, sometimes from several majoring disciplines, which contributes to the formation of top-to-bottom scientific worldview and professional culture of a global civil engineer.

The formation of interdisciplinary connections changes the status of a foreign language in professional education: a foreign language is not considered a separate object of study, but rather a tool of cognition, which contributes to the development of cognitive abilities aimed at acquisition of major engineering disciplines, thereby directly influencing the implementation of the stated goal of the educational program that is the ability and readiness for professional activities in the field of industrial and civil engineering [10].

Thus, the student's thinking ability relevant to the professional culture of an engineer is formed and developed due to the fact that interdisciplinary connections organize, complement, and coordinate the content, which leads to the emergence of complex integrative mental operations such as generalization, algorithmization, systematization, etc. Consequently, interdisciplinary connections contribute to both the flexibility and mobility of the application of knowledge to new professional situations and the ability to view the educational process from the systematic approach [11, p. 10]. Generalized, systematized knowledge allows both the teacher and the student to identify interdisciplinary connections or even to create the new ones so that to gain new knowledge and become aware of its application to practice, thus developing creative thinking [12, p. 185–196].

Considering the pedagogical conditions for the effective implementation of the interdisciplinary approach to setting up an innovative integrative foreign language learning environment for students majoring in civil engineering, a sur-

vey has been conducted; 27 teachers of the Department of Foreign Languages and Professional Communication (DFLPC) in MGSU have participated in the survey aimed at identification of both the attitude of the teachers to the implementation of the interdisciplinary approach and the problems they encounter during their work.

Characteristics of the teachers of the DFLPC in MGSU

Parameters	Characteristics	Number	%
Gender	Female / male	25/2	92,59 / 7,41
Age	20–30	6	22,22
	31–40	1	3,71
	41–50	6	22,22
	51–60	6	22,22
	61–70	7	25,92
	over 70	1	3,71

The teachers have been asked the following questions in a free form:

1. What does the interdisciplinary approach to teaching involve?
2. How do you implement the interdisciplinary approach?
3. Do the educational materials used in the educational process comply with the principle of interdisciplinarity?
4. Do you consider it useful and/or necessary for the teachers to participate in educational and methodological seminars on interdisciplinarity?

From the teachers' responses it has become clear that the interdisciplinary approach to teaching involves going beyond the boundaries of the discipline and integrating knowledge from professional fields related to the students' specialties. Some teachers point out that they are limited to the textbook materials due to the limited amount of time allocated to the "Foreign Language" discipline; while the others, in particular, those working in two departments simultaneously – humanitarian and technical – implement the approach more widely (3 people). The teachers also note that the teaching materials used in the educational process generally comply with the principle of interdisciplinarity, but they need to be supplemented with various resources, including electronic ones. The teachers fully agree with the need to participate in educational and methodological seminars on interdisciplinarity, viewing them both as a platform for cooperation with the representatives of the technical departments and/or industry and as a place for the exchange of practical experience,

¹ Spratt M., Pulvernness A., Williams M. The Teaching Knowledge Test Course. – Cambridge: Cambridge University Press, 2011. – URL: <https://pdfslide.us/documents/the-tkt-teaching-knowledge-test-course-modules-1-2-and-3-2nd-ed-mary.html?page=2> (дата обращения: 12.01.2024). – Текст: электронный.

serving as a springboard for the transition from theory to practice.

The implementation of the interdisciplinary principles in foreign language instructions is a complex task that requires an integrated approach and specific recommendations. Taking into account the experience of working in MGSU as well as the experience gained by the country's and foreign leading technical universities, the teachers of the DFLPC in MGSU have determined the mechanisms both for implementing the interdisciplinary educational programs in MGSU and training the scientific and teaching staff, which makes it possible to formulate the following basic recommendations that will help effectively implement the interdisciplinary approach to teaching a professionally oriented foreign language to future engineers:

- integration of educational materials on construction;
- project based learning;
- cross-cultural learning;
- use of interactive technologies;
- collaboration with the teachers of the major engineering disciplines;
- cultivation in teachers readiness to implement the interdisciplinary approach to setting up an integrative foreign language learning environment for future engineers, through the participation in educational and methodological seminars on the problems of integration and professional interdisciplinary interaction.

Further the above recommendations are briefly described.

Integration of the professional content into the learning process is best done through the use of authentic texts, communicative tasks and exercises related to the topic on construction [13, p. 267]. This approach will help students better understand specific terminology and develop professional culture and communication skills.

Project-based learning is one of the most effective educational activities for creating a presentation or writing a scientific article about innovative technologies in construction.

Cross-cultural learning is crucial, which helps learners to better understand the peculiarities of professional communication with foreign partners as well as develop cultural awareness.

The use of interactive technologies is recommended, for example, online courses, mobile applications that help students both to develop communication skills and to understand specialized vocabulary on construction in a foreign language.

Cooperation with the teachers of major engineering disciplines allows combining the efforts in teaching, exchanging experience and creating thought-provoking projects for students.

According to the authors, one of the effective mechanisms for both preparing foreign language teachers to implement the interdisciplinary approach to teaching professional content in a foreign language and enhancing their awareness of interdisciplinary connections is the organization of educational and methodological seminars [14; 15].

The main purpose of the educational and methodological seminars is the acquisition of the theory of the building interdisciplinary connections basic approaches developed in domestic and foreign science, in order to support an integrative foreign language learning environment. It should also be noted that application of the above approaches to the specific educational practice of the university is considered. The work of the educational and methodological seminars is carried out within the framework of the cumulative system of teachers' advanced training. The seminar topic is determined by the teachers themselves, considering the difficulties that arise throughout the teaching process aimed at developing professional competencies in students.

The main objectives of the educational and methodological seminars are:

- introduction of modern, educational standards compliant pedagogical technologies and educational and methodological complexes built on the basis of the integrative interdisciplinary approach, considering students interests as well;
- assistance in improving the quality of engineering instructions as well as increasing the qualifications of the foreign language teachers through acquaintance with specific fields of construction professions;
- expert evaluation and review of working curricula, teaching guidelines, projects and other works regarding the content of the interdisciplinary texts and connections to support the integrative foreign language learning environment in the university.

The teachers involved in the process should undergo diagnostic testing to make sure they are capable of building interdisciplinary connections on the basis of the discipline "Foreign Language", which makes their psychological and pedagogical competency. The testing

is carried out according to specific criteria. The first one is the ability to “see” an individual student in the educational process, in other words, learner-oriented approach is crucial. Identification of this criterion is determined by the following indicators:

- the teacher’s ability to identify the indicators of the interdisciplinary course results in accordance with the intellectual characteristics of the students and the level of their self-organization;

- the use of diagnostic tools for studying the students’ individual characteristics, professional awareness, foreign language level etc.;

- cultivation in the students motivation for study of foreign language professionally-oriented topics, texts and other educational materials compiled on the basis of the interdisciplinary integration;

- monitoring the student’s performance, identifying their achievements and problems in integrated learning.

The next criterion is the teacher’s ability to set up an educational process enabling the students to achieve high level of professionally-oriented foreign language through both the formation of interdisciplinary connections and ensuring the functioning of the integrative foreign language learning environment in the university. It assumes the ability to:

- choose teaching technologies that are adequate to the educational goals, age and personal characteristics of students (personal – since each learner has their own psychological and behavioral characteristics, perceives educational information, reacts to it, presents it in a different way);

- offer methods of pedagogical support adequate to the results of diagnosing the individual characteristics of students, their knowledge about future profession, their foreign language level etc.;

- develop and implement assessment procedures in order to determine the adequacy of methods and techniques for making up interdisciplinary connections to support an integrative foreign language learning environment.

The authors believe that at present one of the criteria should be the ability to establish interaction with other subjects of the educational process, that is to:

- organize both cooperation between students and interaction with industry representatives in a foreign language;

- work in a team;

- use forms and technologies of interaction with colleagues to solve specific professional educational problems;

- design and use various forms and technologies of interaction with students’ parents in accordance with the educational situation;

- interact with the university administration to solve professional problems;

- interact with professional organizations to effectively form interdisciplinary connections and support the integrative foreign language learning environment.

As part of student’s performance testing of the in interdisciplinary knowledge and skills gained on the basis of the integrative foreign language learning environment, a survey has been conducted among the senior students completed the study of the Foreign Language discipline at MGSU. The survey involved 237 people of 2d, 3d, 4th courses in the field of study 03/08/01 “Construction”. The survey has the following objectives:

- identification of the students’ awareness of the need for professional foreign languages;

- study of student’s satisfaction with the results of the foreign language learning;

- assessment of the teacher’s role in building interdisciplinary connections based on interdisciplinary knowledge and pedagogical skills;

- identification and awareness of interdisciplinary connections;

- assessment of motivation for further study of professional foreign languages on an interdisciplinary basis.

The survey shows that:

- 90 % of students have the need to study a professional foreign language;

- 68 % of students are satisfied with the learning results;

- 5,8 % believe that a foreign language at a university is of no practical use;

- 94,2 % see a foreign language teacher as a mentor capable of translating interdisciplinary knowledge in a foreign language;

- 87 % would like to continue studying a foreign language on an interdisciplinary basis.

The interdisciplinary connections are built basing on the content of the following disciplines: Engineering Design; Engineering Graphics; Construction Materials; Reinforced Concrete Structures; Chemistry; Physics; Technologies of Construction Processes; Strength of Materials; Technology of Construction of Buildings and Structures.

It should be noted that the subjects based on building interdisciplinary connections have

been named by the students surveyed. Foreign language teachers, being non-engineers, may not always be aware of all the connections between specialized engineering disciplines. This indicates the initial professionalization of future engineers through the study of a professional foreign language in the integrative foreign language learning environment created on the basis of building interdisciplinary connections.

Conclusion. The results of the study indicate that foreign language teachers at the MGSU are interested in implementing interdisciplinary learning in Foreign Language classes. The surveys of the teachers show that almost all of them, to a certain degree, implement the interdisciplinary approach to teaching in their classes. However, everyone notes that there is lack of centralized assistance for foreign language teachers in the form of special programs, courses, educational and methodological seminars with participation of teachers of the engineering disciplines. Regarding the compliance of educational materials with the interdisciplinary paradigm of teaching foreign languages, it is noted that teachers use textbooks in which topics corresponding to en-

gineering disciplines are selected, but this is fragmented and requires further development in this direction, which is complicated, among other things, by the large variety of engineering disciplines. The implementation of the interdisciplinary connections at this stage largely depends on the personality of the teacher, on their flexibility, desire and ability to use additional sources of information, including electronic resources, in the learning process. The most successful teachers are those who have not only a foreign language pedagogical education, but also a technical one, which is not the norm, and further demonstrates the need for educational and methodological seminars based on cooperation with the engineering departments in order to improve the qualifications of teachers of professional foreign languages.

It is worth noting that conducting educational and methodological seminars is only a single example of the actively developing and expanding training of teaching and scientific personnel for the implementation of interdisciplinary training programs aimed at setting up an integrative foreign language learning environment at a civil engineering university.

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