ПРОБЛЕМЫ МЕТОДОЛОГИИ

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INTERDISCIPLINARY COMMUNICATIVE COMPETENCE: FROM CONCEPTUALISING TO OPERATIONALISING

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Abstract. *Introduction.* Communication complexities which often occur in interdisciplinary work gave rise to the studies on teaching interdisciplinary communication. A growing need to provide pedagogical solutions to facilitate teaching interdisciplinary communication stimulated the research into language as a social practice to better understand communication process for interdisciplinary purposes.

Aim. This exploratory study investigates the concept of interdisciplinary communicative competence and proposes a framework of interdisciplinary communicative competence with the focus on three underlying components: knowledge, skills, and personal attributes of interdisciplinary team members.

Methodology and research methods. Qualitative and quantitative methods were used. The data obtained from 24 in-depth semi-structured interviews with five groups of higher education stakeholders (employers, academic directors of the programmes, professors, students, and alumni) revealed the existing interdisciplinary practices in the university and cross-functional practices in the companies. The proposed framework was empirically tested using an online survey with 139 responses from professors, students, and employers. The data processing techniques included the use of Kendall's concordance coefficient, Cronbach's alpha, and the principal component analysis.

Results. The study presents the authors' conceptualisation of interdisciplinary communicative competence and its framework as the result of the literature analysis and the empirical research. The findings provided evidence on the importance of language skills for effective interdisciplinary communication as perceived by 5 groups of respondents. The choice of language skills as a basic component of interdisciplinary communicative competence is justified.

Scientific novelty. The study contributes to the conceptualisation of a framework of interdisciplinary communicative competence. The elements of the framework are identified and their relevance is empirically tested.

Practical significance. The results of the empirical part of the study can be applied in the design of interdisciplinary learning process in higher education, for example, in the design of interdisciplinary courses, and teaching materials.

Keywords: interdisciplinary communication, interdisciplinary communicative competence, language skills, knowledge of language, interdisciplinary thinking, personal attributes, interdisciplinary team members.

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МЕЖДИСЦИПЛИНАРНАЯ КОММУНИКАТИВНАЯ КОМПЕТЕНЦИЯ: КОНЦЕПТУАЛИЗАЦИЯ И ПРАКТИЧЕСКОЕ ПРИМЕНЕНИЕ

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Аннотация. *Введение*. Междисциплинарная академическая деятельность сопряжена с рядом сложностей, которые возникают в процессе коммуникации у участников взаимодействия. В настоящее время возрастает интерес исследователей к изучению данной темы в связи с необходимостью обеспечить процесс междисциплинарного обучения дидактическими средствами и методическими материалами. Не менее актуальным становится изучение вопроса использования языка участниками междисциплинарного общения.

Цель работы – на основе теоретических и практических исследований сформулировать концепт «междисциплинарная коммуникативная компетенция» и разработать модель данной компетенции.

Методология, методы и методики. В ходе работы были использованы количественные и качественные методы исследования. Полученные данные в результате проведения 24 полуструктурированных интервью среди представителей пяти групп респондентов, заинтересованных в образовательном процессе в вузе (работодателей, академических директоров программ, преподавателей, студентов и выпускников), позволили выявить их отношение к междисциплинарному подходу в обучении и преподавании в университете, а также понять особенности кросс-функционального общения в компаниях. Разработанная авторами статьи модель междисциплинарной коммуникативной компетенции была апробирована путем проведения онлайн-опроса среди преподавателей, студентов и работодателей. Обработка данных (139 ответов) проводилась с использованием современных количественных методов.

Результаты. В результате исследования был сформулирован концепт междисциплинарной коммуникативной компетенции и разработана модель данной компетенции, которая включает три компонента: (1) знание функционального использования языка и когнитивные навыки осуществления междисциплинарной деятельности, (2) речевые умения и навыки, (3) личностные качества участников междисциплинарной команды. Анализ данных, полученных в ходе 24 глубинных интервью и опроса 134 респондентов, выявил необходимость и целесообразность формирования междисциплинарной коммуникативной компетенции у всех участников образовательного процесса для осуществления эффективной коммуникации. В структуре модели междисциплинарной коммуникативной компетенции все группы респондентов отметили приоритет формирования речевых умений и навыков участников междисциплинарной команды, что под-

утверждает обоснованность выбора данных элементов в качестве ведущего компонента в структуре модели междисциплинарной коммуникативной компетенции.

Научная новизна. Настоящая работа вносит вклад в разработку концепта «междисциплинарная коммуникативная компетенция» и предлагает модель междисциплинарной коммуникативной компетенции с опорой на эмпирические данные, полученные в ходе интервью и опроса.

Практическая значимость. Результаты исследования могут найти практическое применение в разработке программ междисциплинарных курсов и учебных материалов для обучения в вузе.

Ключевые слова: междисциплинарная коммуникация, междисциплинарная коммуникативная компетенция, речевые навыки и умения, когнитивные навыки осуществления междисциплинарной деятельности, личностные качества участников междисциплинарного общения.

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COMPETENCIA COMUNICATIVA INTERDISCIPLINARIA: CONCEPTUALIZACIÓN Y APLICACIÓN PRÁCTICA

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Abstracto. *Introducción*. La actividad académica interdisciplinaria está asociada a una serie de dificultades que surgen durante el proceso de la comunicación entre los participantes en su interactuar. Hoy día, el interés de los investigadores por el estudio de este tema es creciente debido a la necesidad de dotar al proceso de aprendizaje interdisciplinario de herramientas didácticas y materiales metodológicos. No menos relevante es el estudio de la cuestión del uso del lenguaje por parte de los participantes en la comunicación interdisciplinaria.

Objetivo. El objetivo del trabajo es formular el concepto de "competencia comunicativa interdisciplinar" sobre la base de la investigación teórica y práctica y desarrollar un modelo de dicha competencia.

Metodología, métodos y procesos de investigación. En el desarrollo del trabajo se utilizaron métodos de investigación cuantitativos y cualitativos. Los datos obtenidos como resultado de la realización de 24 entrevistas semiestructuradas entre representantes de cinco grupos de encuestados interesados en el proceso educativo al interior de la universidad (empleadores, directores académicos de programas, docentes, estudiantes y egresados) permitieron identificar su actitud hacia un enfoque interdisciplinario para aprender y enseñar en la universidad, así como comprender las características de la comunicación multifuncional en las empresas. El modelo de competencia comunicativa interdisciplinaria desarrollado por los autores del artículo se puso a prueba mediante la realización de una encuesta en línea entre docentes, estudiantes y empleadores. El procesamiento de datos (139 respuestas) se llevó a cabo utilizando métodos cuantitativos modernos.

Resultados. Como resultado del estudio se formuló el concepto de competencia comunicativa interdisciplinaria y se desarrolló un modelo de esta competencia que incluye tres componentes: 1) Conocimiento del uso funcional del lenguaje y habilidades cognitivas para la realización de actividades interdisciplinarias, 2) Habilidades del habla, 3) Cualidades personales de los miembros del equipo interdisciplinario. Un análisis de los datos obtenidos durante 24 entrevistas en profundidad y una encuesta a 134 encuestados reveló la necesidad y conveniencia de desarrollar la competencia comunicativa inter-

disciplinaria entre todos los participantes en el proceso educativo para una comunicación efectiva. En la estructura del modelo de competencia comunicativa interdisciplinaria, todos los grupos de encuestados coincidieron en resaltar la prioridad de la formación de habilidades y destrezas del habla de los integrantes del equipo interdisciplinario, lo que confirma la validez de elegir estos elementos como componente protagónico en la estructura del modelo de la competencia comunicativa interdisciplinaria.

Novedad científica. Este artículo contribuye al desarrollo del concepto de "competencia comunicativa interdisciplinaria" y propone un modelo de competencia comunicativa interdisciplinaria basado en datos empíricos obtenidos durante entrevistas y encuestas.

Significado práctico. Los resultados del estudio pueden tener aplicación práctica en el desarrollo de programas para cursos interdisciplinarios y materiales didácticos para la enseñanza en la universidad.

Palabras claves: Comunicación interdisciplinaria, competencia comunicativa interdisciplinaria, destrezas y habilidades del habla, habilidades cognitivas para la implementación de actividades interdisciplinarias, cualidades personales de los participantes en la comunicación interdisciplinaria.

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Introduction

Interdisciplinary teamwork in higher education and cross-functional practices in contemporary organisations are associated with communication complexities caused by a diversity of participants' disciplinary and professional backgrounds. This problem stimulated research into interdisciplinary communication which qualifies as a minimal condition for interdisciplinary work because "interdisciplinarians should be able to adequately communicate the concept of interdisciplinarity to disciplinarians and they can do it more effectively when they are mindful of its communication aspect"[1, p. 220]. At the same time, boundaries across disciplines and a diversity of specialist languages often result in misunderstanding and miscommunication among interdisciplinary team members and, as a result, lead to lack of trust, failure to fulfil the intended goals, and unwillingness to return to unsuccessful interactions. These issues were discussed in the studies on interdisciplinary way of learning [2, 3, 4] and the nature of interdisciplinary communication [5]. The introduction of interdisciplinary programmes and courses in higher educational institutions stimulated the reconsideration of existing competences and the emergence of new ones, in particular, interdisciplinary communicative competence (hereinafter ICC).

Literature Review

This section gives a brief overview of the role of language in interdisciplinary communication because the authors put forward the argument that language becomes an integral part of the process of interdisciplinary knowledge creation when various academic visions, concepts and theories are discussed with the purpose to come to their shared understanding. The literature review also discusses the research outputs from the previous studies: the dimensions of interdisciplinary

competence, personal attributes of interdisciplinary team members, and the nature of communicative language competence. This section concludes with the authors' conceptualisation of interdisciplinary communicative competence based on the critical analysis of the literature and proposes a framework of ICC developed by the authors.

The Role of Language for Interdisciplinary Communication

In interdisciplinary communication, the ability of an expert to communicate specific knowledge to non-experts is imperative. From communication perspective, interdisciplinary form of communication has its specific goal and characteristics; it involves three main processes – transfer, translation, and transformation of knowledge along with three types of boundaries – syntactic, semantic, and pragmatic, respectively [6]. For effective interdisciplinary communication, participants need "to establish a common lexicon for transferring knowledge at the syntactic boundary, develop common meanings for translating knowledge at the semantic boundary, and establish common interests for transforming knowledge at the pragmatic boundary" [7, p. 2812]. Successful implementation of these processes and achievement of mutual understanding during interdisciplinary communication rest much on the ability of team members to skilfully use language. For interdisciplinary interactions, language can be conceptualised as a social practice when language becomes a product of social action among interdisciplinary team members [8]. Experts from different academic fields often have specific interpretations of the same concepts and theories and it may result in hearing and understanding of meanings in a variety of ways. Thus, in interdisciplinary communication, language stops being only an instrument of communication; it serves as a social construct when meanings are created, clarified, and evaluated in the process of communication which is always situation-specific and context-bound. Such interactions require the ability of speakers to communicate across the boundaries between disciplines and make connections across the fields of knowledge: verbalise and communicate the shared goals and responsibility, formulate, and explain complex problems, negotiate diverse meanings, ask clarifying questions, choose an appropriate register, and evaluate the identified solutions. Linguistic competence, as part of communicative competence, becomes essential in interdisciplinary communication when participants mobilise multiple linguistic resources simultaneously to meet their communicative needs in the specific context.

Interdisciplinary practitioners identify two essential features of interdisciplinary communication: the use of language and active listening skills. Dahm et al. claim that "when communicating across fields, going into technical detail is often no longer possible. Instead, you should use more simple, explanatory language, limit technical terms to those essential to the issue, and regularly engage with your audience to ensure you are being understood correctly" [9, p. 1]. Comprehension of spoken speech is unlikely without active listening – especially asking questions,

seeking clarification, and frequently summarising what is understood. Öberg [2] points out the importance of establishing the common ground for credible work between different disciplines through having a dialogue which becomes possible only if interdisciplinarians use plain language and communicate unambiguously. Bracken and Oughton [10, p. 371] argue that "common understanding derived from shared languages in turn plays a vital role in enhancing the relations of trust that are necessary for effective interdisciplinary working". They, experts in social sciences, discuss three linguistic practices which facilitated interdisciplinary communication processes in their teamwork: dialects, metaphors, and articulation. Dialects stand for different meanings of words in the professional contexts and in everyday use it may result in the ambiguities of understanding specialist languages. Metaphors clarify an argument and stimulate thinking in new directions leading to insights which may not be achievable in a situation when participants express their ideas in a literal meaning exclusively. Nevertheless, when using metaphors interdisciplinarians need to be aware of the risk of misinterpretation of meanings by different experts and be able to employ universal concepts shared by all specialists regardless of their professional and cultural backgrounds. The linguistic practice of articulation of a complex concept or an individual disciplinary knowledge connotes the process of translation from the language of one discipline into the language of another. This process includes deconstruction of meaning into smaller units of knowledge and then reconstruction of the meaning for reciprocal understanding [10]. The outlined practices clearly emphasise the need for language abilities to perform interdisciplinary tasks.

The interpretation of language as a social construct and, on the other hand, lack of empirical studies on making language skills a part of interdisciplinary learning practices puts forward a demand to deepen the knowledge of interdisciplinary communicative competence as a core competence in interdisciplinary learning. The research into interdisciplinary communication has raised a renewed interest in communicative competence in the field of foreign language teaching [11, 12]. The statement that "all human competences contribute in one way or another to the language user's ability to communicate may be regarded as aspects of communicative competence" (p. 101) [1] harmonises with the argument of making language skills a part of ICC. Bachman and Palmer [13] point out that communicative language abilities include both knowledge of language and the ability to implement that knowledge in the use of language. Knowledge of language or awareness of the features of language use in a specific discipline includes: (1) knowledge and understanding of the principles according to which languages are organised and used, (2) knowledge of academic and professional discourse, (3) knowledge of disciplinary language, (4) awareness of linguistic behaviour requirements. The capacity to apply the named elements of knowledge of language manifests in language skills.

[1] Council of Europe. Common European Framework of Reference for Languages: Learning, Teaching and Assessment. 2001. Available from: http://rm.coe.int/16802fc1bf

Interdisciplinary Competence

To understand a synthetic nature of ICC, the other underlying constituent–interdisciplinary competence will be analysed. The existing research on interdisciplinary competence was investigated to the extent that the findings helped the authors identify the dimensions related to the process of interdisciplinary communication. Several studies [14, 15, 11] turned to critical thinking skills to explain interdisciplinary competence because they stand for the abilities to search, identify, understand, critically appraise, connect, and integrate theories and methods of other disciplines. The application of critical thinking skills in interdisciplinary practices fosters "the appreciation of knowledge, methods and perspectives of their own and other disciplines and critical understandings of the limitations of each of these" [16, p. 732], and results in cognitive advancement to a particular context without having one-sided monological argumentation.

The methodology of interdisciplinary learning is in the focus of the studies [17, 1, 18, 19, 3, 20]; nonetheless, only a few authors [16, 21, 22] identified the dimensions which help to operationalise interdisciplinary communicative competence. Spelt et al. characterise interdisciplinary way of thinking as a cognitive skill that comprises the following subskills: knowledge of disciplines, knowledge of disciplinary paradigms and knowledge of interdisciplinarity [22]. For Lattuca et al. [16, p. 727], interdisciplinary competence stands for "the understanding of different disciplinary knowledge, methods, expectations, and boundaries and includes eight dimensions: (1) awareness of disciplinarity, (2) appreciation of disciplinary perspectives, (3) appreciation of non-disciplinary perspectives, (4) recognition of disciplinary limitations, (5) interdisciplinary evaluation, (6) ability to find common ground, (7) reflexivity, (8) integrative skill." Kachalov et al. [21, p. 30] emphasise a motivational side of interdisciplinary competence: "the ability and willingness to complexly apply the knowledge of several disciplines according to the requirement of professional activities". The scholars identify seven dimensions of interdisciplinary competence: "(1) the understanding of the communication between the different disciplines, (2) the psychological readiness to apply the knowledge of the relevant related disciplines, (3) the experience of application of discipline knowledge in the study of other disciplines, (4) the use of knowledge of different disciplines in professional activities, (5) the experience of integrative application of knowledge from various disciplines in professional activities, (6) the credibility of the student in solving the problems of professional activity, (7) the willingness and readiness to learn the discipline in order to obtain new knowledge in the process of studying other disciplines". Both approaches to identify the dimensions of interdisciplinary competence are complementary; they shed light on interdisciplinary learning skills which entail not only understanding of cognitive apparatuses that structure interdisciplinary inquiry but also imply the development of "an appreciative attitude towards other stories and disciplinary frames of reference" [3, p. 126]. The ability of a learner to apply and integrate knowledge from various disciplines in both approaches relies on the ability to negotiate meanings and communicate shared understanding by making use

of language. The dimension of reflexivity depends on the linguistic ability to express thoughts clearly by finding associative images perceived unambiguously by all members of interdisciplinary team. There are some specific features highlighted in both approaches, respectively. Lattuca et al. [16] point out the importance of finding common ground between disciplines which precedes integration of knowledge from different disciplines and depends on collaborative skills of interdisciplinarians. As discussed in the previous section on the role of language for interdisciplinary communication, participants of an interdisciplinary team can achieve common ground through a mutual dialogue, which again justifies the importance of developing language skills for effective interdisciplinary communication. Kachalov et al. [21] lay emphasis on willingness and readiness to learn a new discipline and apply the acquired knowledge in interdisciplinary activities. This approach reflects the need to develop qualities of interpersonal communication, the latter facilitating cognitive work and learning activities. On top of that, the dimension of "the credibility of the student in solving the problems of professional activity" rests on high-quality language skills of a learner because only unequivocal and persuasive way of presentation can lead to trust and credibility towards a specialist.

The feature of psychological readiness to apply knowledge from relevant related disciplines pertains to collaboration skills as collective efforts of interdisciplinary team members in formulating a common goal, situation awareness and shared leadership [24]. Situation awareness requires team members to be sensitive to the context of academic endeavour and team members' positions, to be careful when formulating the main question or topic accurately keeping in mind team members' positions. Shared leadership is a widespread practice in interdisciplinary teamwork when the role of a leader may shift between team members depending on the situation. In such collaboration, every participant's expertise and skills are equally valuable and the capacity of any member to lead a team towards a successful result by organising a creative work climate may be decisive. Mature interdisciplinary teams tend to demonstrate primary-group relations by thinking in terms of 'we' [25] when the microclimate in teamwork is favourable to collective thinking and sense making in the open dialogue between experts from different disciplines.

The findings from the studies show that interdisciplinary team members need to develop prerequisites to be able to achieve shared goals and communicate effectively. Among such prerequisites there are: (1) knowledge of a different professional area, (2) interdisciplinary thinking, (3) knowledge of language, (4) language skills, (5) psychological willingness and readiness to initiate and maintain interdisciplinary interactions. We argue that these prerequisites should be considered in conceptualisation of interdisciplinary communicative competence and included into its framework.

The analysis of literature on the role of language for interdisciplinary communication and the discussion on interdisciplinary competence served as the basis for the conceptualisation of interdisciplinary communicative competence. This study defines interdisciplinary communicative competence as the ability and willingness of an interdisciplinary team member to achieve shared goals by establishing a com-

mon lexicon, negotiating meanings, and producing texts in the process of integrating knowledge and expertise from two or more disciplinary areas. This concept encompasses the purpose of interdisciplinary communication, communicative means, and behaviour of interdisciplinary team members in the process of interdisciplinary interaction; it needs to be operationalised for educational purposes.

Aim of the Research

There seems to be little evidence to what knowledge of language and what language skills are sufficient to facilitate interdisciplinary communication so that students can deal with negotiation of meanings, to produce interdisciplinary texts and to communicate cognitive advancements to a broader audience. More empirical research should be carried out on interdisciplinary thinking, language skills and personal qualities which enable learners to operate in interdisciplinary academic environment.

The aim of this exploratory study was to develop a framework of ICC: to specify its composition, analyse its elements and provide empirical support for the proposed framework. For this purpose, the study draws on the critical analysis of the literature and the findings of the existing research by adopting the perspectives on interdisciplinary competence dimensions [16, 21], interdisciplinary communicative competence in negotiating meaning and interdisciplinary text production [11], interdisciplinary communication skills [9], communicative language abilities [13], and personal attributes of interdisciplinary communicators [26, 18, 10]. The empirical part of the research seeks for support what elements should be incorporated in a framework of ICC.

Framework of Interdisciplinary Communicative Competence

The proposed framework specifies the linguistic elements, outlines the knowledge component and offers personal attributes for interdisciplinary communication. The concept of a competence as "a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving" [26, p. 242] explicates the structure of a three-component framework of ICC including knowledge, skills, and personal attributes (Figure 1).

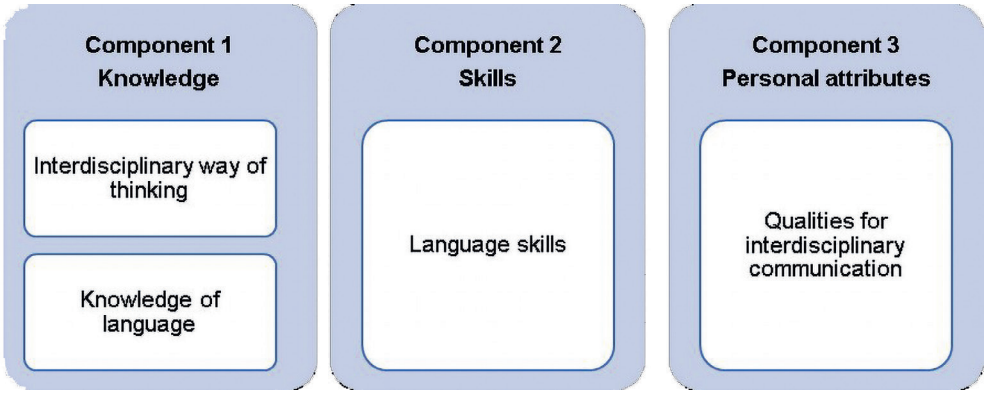

Fig. 1. Framework of Interdisciplinary Communicative Competence

The knowledge and skills components of the framework contain sets of underlying elements which serve as units of knowledge and a range of language skills, respectively. The first component is comprised of two kinds of knowledge – (1) knowledge of interdisciplinary way of thinking and (2) knowledge of language.

Knowledge of interdisciplinary way of thinking incorporates two elements: (1) knowledge of a different professional area, (2) knowledge of the language of a different professional area. Knowledge of language relates to the following elements: (a) knowledge of the rules of language organisation and functioning, (b) knowledge of language norms of using spoken and written speech styles, (c) knowledge of specific meanings of terms in different professional areas, and (d) knowledge when terms or concepts of one's profession requires explanation for other experts.

Language skills enable learners to communicate by using specific linguistic means appropriate to the goal and context of interdisciplinary communication. The second component includes the following set of language skills:

- to achieve shared understanding of meaning;
- to speak and write according to the situational context;
- to listen actively to each other (ask questions, summarise what was understood and give feedback);
- to use plain language;
- to formulate shared goals and objectives;
- to request expert information to solve complex problems;
- to integrate expert information from different professional areas to solve complex problems;
- to evaluate the integrated expert information from different areas to solve complex problems;
- to see things from the perspective of others.

Personal attributes of interdisciplinary communicators mean "characteristics that allow a person to perform actions" (p. 17)[1]. Sometimes personal attributes are named attitudes of an interdisciplinary thinker as "one of the main defining constituents" in the structure of a competence [27, p. 8]. The proposed framework of ICC includes seven personal attributes essential for interdisciplinary communication: (1) personal involvement, (2) readiness to take responsibility, (3) readiness to listen actively; (4) perseverance, (5) non-confrontational behaviour, (6) aspiration for self-development and (7) flexibility. Newell [18] claims that flexibility of mind and behaviour can sometimes become even more useful than logic throughout interdisciplinary collaborative work. We argue that the identified personal attributes may act as a motivating force setting into action efficient interdisciplinary work or become a barrier to a productive interdisciplinary communication process.

The proposed framework of ICC seeks to operationalise the process of interdisciplinary learning: the identified elements in both knowledge and skills components of the framework can become the learning outcomes and contribute to solving complex problems in the performance of interdisciplinary teams.

[1] Council of Europe. Common European Framework of Reference for Languages: Learning, Teaching and Assessment. 2001. Available from: http://rm.coe.int/16802fc1bf

It is interesting to know how diverse groups of stakeholders in higher education perceive the hierarchy of three components of the framework of ICC: knowledge, skills, and personal attributes. Moreover, stakeholders may attach different levels of significance to the elements underlying each of the components based on their individual experience and background knowledge. Thus, the study raises 4 research questions for the empirical inquiry to obtain evidence on the validity of the proposed framework of ICC.

Research question 1: What is the perceived hierarchy of components 1, 2 and 3 in the structure of the framework of ICC by three groups of the key stakeholders of higher education[1]?

Research question 2: How do three groups of respondents prioritise the elements within each of the three components in the framework of ICC?

Research question 3: How do three groups of respondents assess the level of development of the elements within component 1 and component 2 of the framework of ICC?

Research question 4: What do the respondents' patterns of perception of the hierarchy of components 1, 2 and 3, and prioritisation of the elements in the framework of ICC reveal as to interdisciplinary communication learning and teaching?

Methodology, materials and methods

Study Design and Participants

The empirical study included three phases with their specific aims. During the first phase, the team members designed a semi-structured in-depth interview and carried it out with 24 interviewees. The goal of the interview phase was to obtain a broader perspective on the existing interdisciplinary practices in the university and cross-functional practices in the companies as well as to identify if stakeholders in higher education recognise the importance of language skills for efficient interdisciplinary communication. To achieve this goal, we developed criteria for interview participants. Five groups of respondents were identified – the stakeholders, who generate education agenda and perform transformation processes: (1) employees who work in the companies employing the school graduates and who are experienced in cross-functional projects; (2) academic directors of master programmes; (3) the faculty teaching various academic disciplines regardless of their experience of interdisciplinary work; (4) bachelor programmes students in their fourth year of study and master programmes students; (5) the alumni who obtained their master's degrees in the business school over the last five years.

In the second phase, the authors analysed the findings from the interviews with the purpose to provide evidence to the selection of elements in the framework of ICC. The interview findings helped generate survey questions to test the proposed framework in the following phase of the empirical study.

[1] Three groups of the key stakeholders of higher education are referred to below as three groups of respondents: professors, students, and employers.

The third phase included data collection by means of an online survey from three groups of respondents: (1) the faculty (Professors); (2) bachelor programmes students, master programmes students and PhD students; (Students); (3) employees of companies which hire the business school graduates (Managers).

Interview

The data analysis sought for any in-group and across the group dependencies in the respondents' statements related to interdisciplinary education, the role of language and communication disciplines in interdisciplinary endeavours and, as a result, a demand for interdisciplinary communicative competence formation in graduate students. All questions were worded around the formulated conceptual cores reflecting the main concepts of interdisciplinarity and interdisciplinary communication. The questions were also tailored to the contextual use relatable to diverse groups of respondents. For example, for the subjects, who are academic representatives of higher education, the questions were worded around the concept of 'interdisciplinary communication' while for managers and alumni (early career specialists) the concept 'cross-functional communication' was used. Natural Language Processing algorithms were chosen as the main tool for the development process. At the pre-processing stage, the interview scripts were cleaned up: all the words were transformed into the standard form and only the notional parts of speech were left (nouns, adjectives, adverbs, and verbs).

The first approach to find out correlations between the respondents' opinions involved the use of the TF-IDF algorithm (term frequency – inverse document frequency) [28] that performs the quantitative analysis of the responses, mapping them onto a matrix representing the common word used by each pair of respondents. The second and final method included the meanings of the responses and the keywords. Using the RusVectores model [29] for the Natural Russian Language Processing, the dependencies between the separate words in the interviews and correlations between the keywords and the frequently used words were analysed. The matrices for both the inside-the-group correlations and the correlations based on the question cores were built.

Survey

An online survey was conducted in April 2021. The dataset was obtained by independently asking the respondents to answer the questions[1]. In total, 139 valid responses were collected during this exploratory study: 43 professors, 40 students, and 56 managers. The survey questions were the same for all groups of respondents except for the concept 'interdisciplinary communication' in the questionnaire for the Professors and the Students and the equivalent concept 'cross-functional communication' for the Managers. The questionnaire included two kinds of questions: ranking the items in the order of importance and using 5-grade Likert scales (with 1 – extremely low and 5 – extremely high).

[1] The link to the questionnaire used in the survey can be provided upon a request.

The data processing techniques included the use of Kendall's concordance coefficient, Cronbach's alpha, and the principal component analysis [30]. The application of these methods helped to obtain insightful findings and take an in-depth look into the respondents' patterns of perception of interdisciplinary communication.

Results

The findings from the interviews proved that regardless of work experience and academic or professional backgrounds, all the respondents agree on the importance of interdisciplinary communicative competence and its positive impact on academic and professional performance. Despite slight disagreements inside and between the groups on the questions related to personal experience, the respondents demonstrated mutual understanding of a specific role of language skills for interdisciplinary communication. For example, one of the respondents emphasised: "An individual should be able not only to use correct terms, but also to be understandable to a partner. It is this moment that is essential in a company, because people have different specialist knowledge, they can be from different multicultural or multinational backgrounds. I am sure that this skill is essential, so that co-workers can collaborate in a team and strive for the same goals". The interview findings revealed a range of topics, needs and attitudes of the respondents to interdisciplinary communication that helped the researchers to develop a framework of ICC and generate a bank of the survey questions to test its relevance among professors, students, and employers.

Outcome 1: Research Question 1

The survey findings indicated the significance which diverse groups of stakeholders attach to three components of ICC: knowledge, skills, or personal attributes. With reference to the average rankings assigned to these components (Table 1), the Knowledge component had the lowest priority in interdisciplinary teamwork. Both the knowledge of interdisciplinary way of thinking elements and the knowledge of language elements were consistently underrated by all groups of respondents. The Students and the Managers gave the highest priority to the Personal attributes component while the Professors prioritised the Skills component. According to the Kendall coefficient, there is quite significant concordance of the opinions between the groups.

Table 1

Average rankings of the components from 1 (most important) to 3 (least important)

Component	Students	Professors	Managers
Knowledge	2.275	2.233	2.518
Skills	1.925	**1.814**	1.821
Personal attributes	**1.800**	1.953	**1.661**
Kendall's coefficient of concordance	0.06*	0.04†	0.207***

Note: Figures in bold give the highest average rankings, while figures in italics give the lowest average rankings. Superscript *** indicates significance of the coefficient at the 1% level; * – at the 10% level; † – at the 15% level.

Outcome 2: Research Question 2

The survey also sought for the rankings of the elements within the Knowledge and the Skills components (Table 2). The respondents unanimously agreed on the priority of knowledge of the language norms of using spoken and written speech styles element and skills to listen actively to each other. The concordance in the opinions on the rankings of the elements was justified by the statistically significant Kendall concordance coefficients (at least, at the 10% level of significance). In the Knowledge component, one of the main observed findings in the responses of all groups was high importance attached to the knowledge of language elements for interdisciplinary team communication compared to the knowledge of interdisciplinary way of thinking elements. At the same time, a low significance is attached to the element of knowledge of specific meanings of terms in different professional areas.

Table 2

Average rankings of the Knowledge and Skills components

Element	Students	Professors	Managers
The *Knowledge* component rankings from 1 (most important) to 6 (least important)			
Knowledge of a different professional area	3.575	3.860	3.375
Knowledge of the language of a different professional area	3.975	3.767	3.714
Knowledge of the rules of language organisation and functioning	3.250	3.186	3.554
Knowledge of the language norms of using spoken and written speech styles	2.700	3.047	3.018
Knowledge of specific meanings of terms in different professional areas	4.225	3.907	4.125
Knowledge when terms or concepts of one's profession require explanation for other experts	3.275	3.233	3.214
Kendall's coefficient of concordance	0.086***	0.042*	0.044**
The *Skills* component rankings from 1 (most important) to 10 (least important)			
Skills to listen actively to each other (ask questions, summarise what was understood and give feedback)	2,23	2,37	2,13
Skills to formulate the shared goals and objectives	4,25	3,35	3,25
Skills to achieve shared understanding of meanings (e.g., terms, concepts, theories)	3,00	3,86	3,54
Skills to use plain language	3,95	5,37	4,20
Skills to see things from the perspective of others	5,38	5,16	5,68
Skills to speak and write according to the situational context	6,25	6,37	6,77
Skills to request expert information to solve complex problems	6,45	6,35	6,07

Skills to evaluate the integrated expert information from different professional areas to solve complex problems	8,25	7,49	8,41
Skills to integrate expert information from different professional areas to solve complex problems	7,83	7,47	7,79
Skills to provide expert information to solve complex problems	7,43	7,21	7,18
Kendall's coefficient of concordance	0.47***	0.36***	0.49***

Note: Figures in bold give the highest average rankings, while figures in italics give the lowest average rankings (within the corresponding components). Superscript *** indicates significance of the coefficient at the 1% level; ** – at the 5% level; * – at the 10% level.

The average rankings in the Skills component between and across the groups revealed another dependency. All respondents tend to prioritise the following language skills for interdisciplinary teamwork: to listen actively to each other, to formulate shared goals and objectives, and to achieve shared understanding of meanings. The other part of ranked language skills clusters around the abilities to see things from the perspective of others, request, provide, integrate, and evaluate expert information from different professional areas to solve complex problems: these skills ensure sequential implementation and making progress of interdisciplinary work. The skill to evaluate the integrated expert information from different professional areas to solve complex problems ranks low for all groups of the respondents.

Outcome 3: Research Question 3

The data (Tables 3.1–3.3) show the assessed level of development of the elements within each of the components in the framework of ICC as demonstrated by participants of interdisciplinary teams.

Table 3.1

Knowledge – modes of votes (most frequent choices)

Element	Students	Professors	Managers
Knowledge of a different professional area	3	3	3
Knowledge of the language of a different professional area	3	3	3
Knowledge of the rules of language organisation and functioning	5	3	4
Knowledge of the language norms of using spoken and written speech styles	5	4	4
Knowledge of specific meanings of terms in different professional areas	3	2, 3	3
Knowledge when terms or concepts of one's profession require explanation for other experts	5	3	3

Table 3.2

Skills – modes of votes (most frequent choices)

Element	Students	Professors	Managers
The ability of interdisciplinary team members to achieve shared understanding of meanings (e.g., terms, concepts, theories)	4	4	4
The ability of interdisciplinary team members to speak and write according to the situational context	4	3	4
The ability of interdisciplinary team members to listen actively to each other (ask questions, summarise what was understood and give feedback)	4	3	4
The ability of interdisciplinary team members to use plain language	5	4	3
The ability of interdisciplinary team members to formulate the shared goals and objectives	4	3	3
The ability of interdisciplinary team members to request expert information to solve complex problems	4	4	4
The ability of interdisciplinary team members to provide expert information to solve complex problems	4	4	4
The ability of interdisciplinary team members to integrate expert information from different professional areas to solve complex problems	4	3	3
The ability of interdisciplinary team members to evaluate integrated expert information from different professional areas to solve complex problems	4	4	4
The ability of interdisciplinary team members to see things from the perspective of others	4	3, 4	4

Table 3.3

Personal attributes – modes of votes (most frequent choices)

Element	Students	Professors	Managers
Involvement	5	5	5
Ability and readiness to take responsibility	5	4	5
Ability and readiness to listen actively	5	5	5
Perseverance	4	4	4
Non-confrontational behaviour	4	4	4,5
Aspiration for self-development	4	4	4
Flexibility	5	5	5

The knowledge of the language norms of using spoken and written speech styles element was estimated at the highest level by all groups of respondents. In the Skills component, the ability of interdisciplinary team members to use plain language element was given the highest score by the Students only, while the scores for the other skills did not show any significant differences among the groups. All groups demonstrated agreement in indicating a high level of development of three Personal attributes – involvement, readiness to listen actively, and flexibility. The average rankings within the Knowledge and Skills components (Tables 2, 3.1–3.2) showed that all groups of respondents rate the knowledge of language elements highly along with the language skills in component 2. The Students stand out as a group for their highest ranking of the knowledge of language and language skills elements.

Outcome 4: Research Question 4

The dataset also showed several patterns of perception of the hierarchy of components 1, 2 and 3, and prioritisation of the elements in the framework of ICC (Appendix, Tables 4.1–4.3). The patterns indicate similar and individual directions across the three groups of respondents. The Students and Professors groups clearly distinguished when a situation requires knowledge of language rules or knowledge of a different discipline/professional area, while the Managers, in addition, identified the pattern of knowledge of professional terms. In the Skills component, the Students group and Managers group had two common patterns – communication of information for integrated solutions and team interaction. Also, the Professors and Students demonstrated the pattern of appreciation of different perspectives, whereas only the Managers acknowledged the ability to use plain language as an independent pattern. The Professors developed three patterns for the Skills component: appreciation of another perspective (common to the Students), communication of information (common to both the Students and Managers), and the pattern of achievement of integrated solutions. For the Personal attributes component, the Students and the Managers showed two similar patterns of individual motivation and shared leadership while the Professors displayed three patterns – individual motivation, prerequisites to teamwork, and work as part of a team.

Discussion

The survey results provided empirical evidence for the proposed framework of ICC. The empirical study clarified: (1) the respondents' perceptions of the hierarchy of three components in the framework of ICC, (2) the respondents' attitudes towards prioritisation of the elements within each of the three components in the framework of ICC, (3) the assessment of the level of skills development as demonstrated by interdisciplinary team members based on the respondents' own experience, and (4) the respondents' patterns of perception of interdisciplinary communication in teamwork.

The perceived hierarchy of components in the framework of ICC revealed consistent tendencies across three groups of respondents. Firstly, knowledge of interdisciplinary way of thinking and knowledge of language were underrated. It can be accounted for the fact that it is not sufficient to be just knowledgeable to participate in interdisciplinary endeavours. Secondly, individual motivation of team members stemming from their personal qualities and abilities to perform is appreciated highly. Without a personal driving force of every interdisciplinary team member the results of the collective efforts are prone to a low productivity. Within the Knowledge component, a higher importance is attached to the knowledge of language element rather than to the knowledge of interdisciplinary way of thinking element. This fact reveals the need for interdisciplinary participants to be proficient language users who are sensitive to different professional contexts and who are aware of appropriate language features to be used when a situation demands it. The findings clearly show that the respondents draw a borderline between knowledge of a specific subject matter and knowledge of how accurately and adequately interdisciplinary team members can communicate a subject matter to those from different disciplinary or professional areas. The occurrence of a specific pattern of perception such as knowledge of professional terms by the Managers group deepens our understanding of cross-functional communication in organisations. For those who cross professional boundaries at workplaces, there is a difference between the general knowledge of another professional area and the knowledge of specific terms used by specialists of that professional area. At the same time, a low significance attached to the element of knowledge of specific meanings of terms in different professional areas by all groups of respondents may signal a challenge for disciplinarians and specialists at the workplaces to cross professional boundaries and their preference to contribute to a common project only within the area of one's own expertise.

All stakeholders emphasised that successful interdisciplinary communication depends on effective communication skills, notably, how accurately, appropriately, and clearly participants can express their thoughts. Communication of information for integrated solutions becomes central for interdisciplinary interactions although the groups of respondents perceive communication differently. The Managers and Students treat communication as a holistic process comprised of small operations – to request, provide, integrate, and evaluate expert information from different professional areas to solve complex problems. The Professors tend to exclude evaluation of information to solve complex problems from a set of communication skills and designate the abilities to request, provide expert information, and be able to speak and write according to the situational context as communication skills necessary for interdisciplinary work. For them, the abilities to integrate and evaluate expert information from different professional areas are associated with a positive outcome of interdisciplinary teamwork – the achievement of integrated solutions. High importance attached to the skills of listening actively to each other, formulating shared goals and objectives, and achieving shared understanding of meanings implies the necessity of setting rapport between interdisciplinary team members and achieving

mutual understanding preferably by using plain language. It is worth spending time and efforts to establish the relationships of trust between team members especially at the initial stage of interdisciplinary team formation to increase the possibilities of achieving the shared outcomes.

The results of the empirical study supported the proposed framework of ICC with a three-component structure. The evidence from the study suggests that knowledge of language and language skills for interdisciplinary communication gain a profound significance for all groups of stakeholders, while interdisciplinary way of thinking elements are underrated. Interestingly, all groups of respondents demonstrate concordance in their attitudes to prioritisation of language constituent in the framework of ICC. An explanation for this result might be that language is treated by the key stakeholders of higher education as an asset with an enormous potential to enhance the quality of interdisciplinary communication. A special prominence has been given to the knowledge of language norms of oral and written speech styles, and skills to listen actively to each other in interdisciplinary interactions, which signifies the value of relevance, adequacy and meaning making in interdisciplinary communication. The Students and Managers distinguish between two levels of language performance – language functioning at a team level as a collective force and, on the other hand, the use of language at an individual level which can be attributed to self-efficacy.

However, there can be another explanation to a considerable significance attached to language elements and underrating the knowledge of interdisciplinary way of thinking elements in the framework of ICC by the respondents. The reason may have something to do with the lack of willingness to go towards and even beyond the boundaries of one's own area of knowledge, avoiding situations when a disciplinarian or specialist may find themselves to feel uncertain and, as a result, uncomfortable on a different professional 'territory' due to the lack of knowledge and competences. It is easy to delegate responsibilities to members of an interdisciplinary team who are experts rather than to make attempts to learn another professional area with its specific language and epistemologies. Only the Managers are unlikely to draw a strict distinction between knowledge of language and knowledge of interdisciplinary way of thinking.

The study findings suggest that interdisciplinary communicative competence can be treated as a boundary object when language skills become boundary-crossing skills along with interdisciplinary thinking skills. It is necessary, therefore, to put interdisciplinary communicative competence into a broader methodological context where the composition of ICC is not a finite set of knowledge items and language skills which enable interdisciplinary team members to operate efficiently. The goal of introducing the proposed framework of ICC is to contribute to the design of educational interdisciplinary programmes and courses with the purpose to raise the value of language as a key to interdisciplinary communication and to help students become sensitive to language choices in interdisciplinary learning.

Conclusion

The study contributes to the conceptualisation of interdisciplinary communicative competence by exploring its complex nature and defining it as the ability and willingness of an interdisciplinary team member to achieve shared goals by establishing a common lexicon, negotiating meanings, and producing texts in the process of integrating knowledge and expertise from two or more disciplinary areas.

The empirical part of the research helped to operationalise the concept of ICC and develop its framework by identifying, allocating, and empirically testing composite elements within a three-component structure of the competence. The study established the extent to which the proposed framework of ICC correlates to the perceptions, attitudes, and visions of interdisciplinary communicative competence formation among professors, students, and employers.

A limitation of this study lies in the survey sample: the survey was conducted in one university, while findings obtained from a range of universities and organisations could produce more comprehensive results. The composition of every group of respondents could also be more diverse and include representatives of various academic disciplines and areas of professional expertise. This limitation is accounted for the exploratory nature of the study, and it means that the survey findings need to be interpreted cautiously for the purposes of using the offered framework of ICC in the interdisciplinary programmes and courses of other universities. Despite the indicated limitation, the framework of ICC gives insight into its main components and composite elements which should be considered in the development of interdisciplinary programmes and courses.

This paper contributes to further exploration and discussion of the concept of interdisciplinary communicative competence and provides a methodological solution to facilitate the process of teaching interdisciplinary communication.

The research outcome proves that the request for reinforced language skills, which enhance the efficiency of interdisciplinary communication, increases the role of language learning for interdisciplinary communication purposes. The results of the study can be applied in the design of interdisciplinary programmes, courses, and materials, namely, in the formulation of learning goals and outcomes oriented at the development of language skills for interdisciplinary communication.

The study displayed the perceptions of higher education stakeholders towards the formation of interdisciplinary communicative competence in the context of one higher educational institution. At the next stage of the research, a broader sample will be surveyed to obtain extended data to negotiate sets of composite elements in the structure of the framework of ICC and decide on their hierarchy within the competence components. The proposed framework needs to be tested in the learning environment; it will provide evidence for validation of the framework of ICC. Also, the proposed framework leaves room for other researchers and interdisciplinary practitioners to reconsider the hierarchy of the elements within each component. A different prioritisation of components and elements can be established to meet the needs of stakeholder groups in different educational organisations.

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