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Special Topic: Technologies in a Multilingual World Editors Alfred Nordmann and Daria Bylieva



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Editorial introduction

Technologies in a Multilingual World

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Abstract

By way of introduction, the many relations are considered between technologies and languages in a multilingual world. The contemporary biotechnosphere is also a sphere where natural and technical languages intermingle. In particular, three questions will be considered, all three pertaining to the relation between the technological and the multilingual condition of modern life: To what extent does technology foster and create the multilingual condition? What do the competencies acquired for navigating under the multilingual condition tell us more generally about linguistic competence as a technical skill? How can technologies help us navigate and orient ourselves in a multilingual world? If languages are themselves fixtures of the world that afford orientation in our socio-technical environment and coordination among people, we will no longer absolutize our native language as a standard for proper understanding. We multilingually learn to technically orient ourselves and control our social and material world.

Keywords: Technology; Multilingualism; Language of technology; Multilingual world

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Технологии в мультилингвальном мире

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Аннотация

В качестве введения рассматриваются многие отношения между технологиями и языками в мультилингвальном мире. Современная биотехносфера также является сферой смешения естественных и технических языков. В частности, будут рассмотрены три вопроса, все три из них относятся к соотношению между технологическими и многоязычными условиями современной жизни: в какой степени технология способствует и создает мультилингвальные условия? Что приобретенные для навигации в условиях мультилингвизма навыки говорят нам в более общем плане о языковой компетенции как техническом навыке? Как технологии могут помочь нам ориентироваться и управлять мультилингвальным миром? Если языки сами по себе являются средствами, которые обеспечивают ориентацию в нашей социотехнической среде и координацию между людьми, мы больше не будем абсолютизировать естественные языки как стандарт для правильного понимания. Мы многоязычно учимся технически ориентироваться и контролировать наш социальный и материальный мир.

Ключевые слова: Технологии; Мультилингвизм; Язык технологии; Многоязычный мир

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INTRODUCTION

Creativity has been described as active adaptation to the world. But what if this world is a multilingual world – an environment in which we are surrounded by a multiplicity of languages and codes, more than anyone can produce or understand but which have to be navigated nonetheless? Aside from all the "natural languages," including the many variants of English and all the local dialects, these include the language of the ticketing-machine as well as the language of powerpoint, the language that instructs the automatic loom as well as the language of traffic signs.

It was in the course of a large-scale engineering project – the construction of the tower of Babel – that humans were dispersed and separated by language. As technology keeps developing, are we still building a tower of Babel, creating new human-machine interfaces, multiplying signals and codes, sign systems, and many different ways of processing and transmitting natural languages? In this and other ways, an increasingly technological world makes for an increasingly multilingual world. At the same time, the increasingly multilingual world produces ever more advanced technologies and technologies and learning, sounding and translating languages. All this is reason enough to look more closely not just at language and technology, not just at bilingualism and technology, but at multilingualism and technology.

It is one thing if there are many languages but each person and each community grows up with just one. An insular culture that is defined by one native language may well hold on to its own standards and measures, using specially shaped electric plugs or peculiar traffic signs. To be sure, such islands of monolingualism hardly exist anymore. As soon as people enter into trade with others, they meet people from a different linguistic background. This is where bilingualism comes in and with it the question: How does one learn to speak and understand a language? Seeking not only to coordinate with others but to express ourselves or exchange ideas, we pursue an ideal of translation according to which one represents in one language the meaning of words and sentences from another language. Translation is a kind of transportation as thoughts become utterances first in one language and then the other, finally ending up – unadulterated – in the mind of the reader, listener, or recipient.

What happens to this ideal in a multilingual world in which one does not primarily translate or carry meaningful information across linguistic boundaries? In the multilingual condition one constantly moves between bubbles or nests that are dominated by different languages: People speak one language in their home and neighborhood, another in their city and state, yet another for professional purposes, moving among and between many linguistic as well as material cultures. With the inclusion of technical jargon, the arcane grammar of ticketing systems, the communication among gamers, and so much else, we might say that contemporary urbanites are confronted with a bewildering cacophony, with a babylonian confusion of languages. Under this multilingual condition, the ideal of translation as representation of meaning often fails to be satisfied and often is not even pursued. How important is it to grasp semantic content and to "understand" when the real object is to successfully negotiate this multilingual world – to find our way about? Perhaps, in respect to many of the techno-linguistic systems that surround us, we are like



illiterates who cannot read or write in their own native language but have developed a remarkable competence or technical skill to compensate and live as if they did.

In this issue of *Technology and Language* we therefore propose to look at the relation between the technological and the multilingual condition of modern life, asking three questions: To what extent does technology foster and create the multilingual condition? What do the competencies acquired for navigating under the multilingual condition tell us more generally about linguistic competence as a technical skill? How can technologies help us navigate and orient ourselves in a multilingual world? Most generally and in respect to multilingualism as an academic subject, these questions are addressed in a dialogue between a linguist and a philosopher of technology (Hufeisen, Nordmann, & Liu, 2022). Several other papers contribute to the discussion of more particular questions.

A MULTILINGUAL TECHNOSPHERE

How does technology contribute to the multilingual condition? There is a simple, perhaps superficial as well as a more profound or far-reaching answer. The simple answer considers the traffic of people and things. Even in the 18th century, if one wanted to import a steam engine, one needed to import a machine warden as well, and with Watt's invention thus spread British culture and language. Much more of the same takes place under the heading of technology transfer, globalization, and a world wide web of social media – with Chinese engineering students coming to Russian universities, with United Nations inspectors visiting Iranian power plants, with German machines powering Japanese factories in Mexico, and so much more. Nations might be at war, trying to distance and dissociate themselves, but remain inextricably bound up in their inventions and the devices they use. Also it is technology that shapes trade and migration routes.

As for the more far-reaching and compelling answer, however, we have only to consider that our technical and social environments are saturated by natural and device languages – traffic lights and road signs, the whistles and bells of vehicles and dispensing machines, announcements in various languages, and the many scripts which govern the use even of ordinary technology (Latour, 2000). In light of all this, the human being is engulfed by a bewildering cacophony of letters and sounds, only some of which rooted in the natural languages.

What was always the case, to some extent, is taking new twists and turns as the technosphere expands and thus the challenge of multilingualism. Cats were domesticated as long as 7000 or 8000 years ago, and since then humans have been surrounded by some kind of cat-talk. Though we were never concerned until recently whether cats have a proper "language," most cat-owners have learned to understand their cats' meows. If feline language was part of the unconsidered background of the multilingual condition, it is moving to the foreground thanks to technology: The same kind of machine learning which successfully produces translations of German, English, Russian, and Portuguese now offers translations between human and feline language as well. As Rostislav Skripchenko and Ivan Burlakov show in their contribution,



cats' meows have thus become an acknowledged part of the multilingual condition – even if they continue to pose questions and challenges of their own (Skripchenko and Burlakov, 2022).

If this is a story of an expanding technosphere, the close connection between language and technology can also constrain and restrict it. In Soviet trains, in order for water to flow from the tap, it was necessary to keep the inlet valve pressed. A somewhat arcane technological ritual ensured not only that water would not be wasted but prevented access by foreigners who are not familiar with such a system – who do not speak the language.

Tokens tell another kind of story. Their technical function is not unlike that of passwords today, they are the magic word that opens doors and gets things to work (Bylieva and Nordmann, 2021). The contribution on "Everyday problems of international students in the Russian language environment" provides the example of a student from Turkmenistan who for the very first time enters a metro-station. Not knowing about the required tokens she takes the advice to loudly state her full name at the turnstile, thus applying to be let in (Lobatyuk and Nam, 2022). Her apparent failure makes sense when one sees in the Saint Petersburg metro a crowd of people passing through closed turnstiles, apparently without stopping – what does one need to get into the underworld? If saying the name does not provide passage, a token does, and it carries a name as well, and any time soon facial recognition might do the job. The first bronze metro tokens in Moscow in 1935 were rich in signs. On one side there was an instruction "To pay for the fare – lower it into a machine," on the other – the inscription "Metropolitan RSFSR Moscow 1935" and the Moscow emblem of that time. This sequence of symbols was completed by a hole in the form of a star (fig. 1).



Figure 1. Metro token (Moscow, 1935)

Larissa Aronin (2018) discussed objects of material culture as part of the multilingual human condition, with special emphasis on objects such as banknotes, billboards, and baked goods which integrate material and verbal components. Since tokens can be used for different machines, they need to verbally clarify to which technical system they belong. For example, a 1966 Israeli token for payphones contains the inscription telephone in Hebrew and Arabic, and the numbers arranged in a



semicircle, visually referring to the telephone's dial (fig. 2). Also there is the inscription "Israel Post" and its symbol, a running deer, along with the year according to the Jewish calendar.



Figure 2. Payphone token (Israel, 1966)

In the case of material objects that are part of the technical world, their verbal or symbolic coding is part of the language of technology. And as in the case of combining several "natural" languages, their relationships can be one of agreement, complementarity, or disagreement. Just as the "turbo"-button on the controls of a Chinese vacuum cleaner becomes a "violence"-button in Russian translation (Fig 3), so the Yekaterinburg subway tokens bear the inscription of the Moscow metro system.



Figure 3. Robot vacuum cleaner control panel with a "violence" button in the lower right corner



Thus the verbal coding can "repeat" or reveal a technical grammar, typically in the case of instruction, but it can also supplement or change the meaning. An archetypal example in popular culture of the contradiction between technical and verbal meanings is the red button with the inscription "do not press" – for example, in the online role-playing game *World of Warcraft* there is a huge red button hanging on the wall with the inscription "Do not press this button!" When pressed it starts a mechanism of self-destruction.

TECHNO-LINGUAL COMPETENCE

At different levels of abstraction and with different kinds of instruments humans are trying to figure how things work in their world – a world which we can now describe as a multilingual biotechnosphere. Technical interventions tend to focus on the world of things where many of these things are made or shaped by people. Linguistic interventions similarly focus on the world of people which is populated by many things. Navigating a multiplicity of languages we learn how the social world as well as material culture works which gives rise to the question of how the multilingual condition brings to the fore the technical character of linguistic competence. This question is like the one raised in this issue by the contribution on Industrial music (Trofimov et al., 2022). Whether we consider today's techno-sounds or the mythical constructivist Symphony of Sirens for ship-whistles or factory horns, this music is simultaneously more and less than traditional kinds of music (Schwartz, 2020). This music does not merely transgress the classical idiom and does not simply expand the very idea of music, it also illuminates the technical character of all music - starting with the "instruments" via the notion of composition of "works" all the way to the making and building of an artificial world that can be discovered and explored as well as playfully explored.

Music is sometimes said to be a universal language and at least in some traditions this is adduced to the fact that it is closely related to another universal language, namely that of mathematics. But as one sees on the payphone token (fig 2) already, this universal language is also subject to the multilingual condition with arabic numerals for the phone dial and Hebrew numerals for the year 5726 according to the Hebrew calendar. The language of mathematics is one in which we perform cognitive operations, it is instrumental or technical in many contexts. If these technical operations are affected by linguistic transformations, this will be another way in which we become aware of the technical dimension of linguistic competence as a way of navigating material culture and social world. The terms of a "universal language" should be translatable into any language under preservation of meaning. The limits of this notion are subject of the contribution by Victor Krasnoschekov and Natalia Semenova who discuss the existence of multilingualism in mathematics, tracing it back to linguistic, historical and cultural features (Krasnoschekov & Semenova, 2022). Highlighting differences in mathematical terminology, they view this as an opportunity for students of mathematics and of engineering: These differences open a space for reflection and afford, perhaps, different modalities of operation and use.



Considering once more the payphone token with its Arab und Hebrew numerals, a perplexing question regards the "zero" which was a peculiar mathematical achievement for the system of natural numbers (Rotman, 1993) and which perhaps looks very different in a system of alphabetic numerals in which 10, 20, 30 all have different names and do not share the "zero." It is an open question here and for many other examples whether these different conventions of naming make for different "metaphors we live by" (Lakoff & Johnson, 2003). In the Australian aboriginal language Guugu Yimithirr, for example, the terms right and left, back and forward are missing (Spradley & McCurdy, 2012, p. 53). Instead, native speakers locate things within a geographical space, mapped in reference to the cardinal points, formulating: "You should take the southwest knife from the table." Cardinal points are used even when describing what is happening on TV, taking the actual location and positioning of the TV set as a basis. In our language, in addition to operating with right/left we also use "clockwise" to indicate a direction of movement. This word is grounded in a specific technology, giving rise to the question what happens to language and our conceptual thinking once this technology disappears from our culture. Our capacity to imagine and conceptualize recurrent circular motion is tied to the movement of the hands of a mechanical clock which is borrowed from a sundial in the northern hemisphere where the shadow moves accordingly. Deeply entrenched in a technical understanding of the world, will the idea of circular recurrence vanish with digital clockworks that simultaneously represent all timezones, south and north?

TECHNOLOGIES FOR MULTILINGUAL LIVING

In a multilingual world one needs to figure how things work materially, symbolically, socially, technically. Technologies do not just increase the complexity of this world, they also provide the means to orient ourselves, navigate, even "master" it. This is most evident for technologies in the area of language education. Digital technology can recreate multilingual environments and helps us "become" multilingual, be it by supporting language learning, be it by supporting communicating across language boundaries. The contribution by Pavel Balyshev (2022) shows how a digital lingual professional environment can be built where students improve both their language and professional skills. The article "Convergence of Foreign Language and Engineering Education: Opportunities for Development" explores in more detail the idea of combining language and engineering education (Krylov and Vasileva, 2022). For the implementation of this pedagogical approach, the integration of two languages is required: "the language of technology (or of engineering)" and the foreign language to be acquired.

Finally, however, there is a sense in which multilingual living is less limiting and less constrained than the simple life in a mono-lingual world. The philosophical tradition inhabits a monolingual mind-set, concerned with the ways in which our concepts structure our experience of reality, thus concerned with questions of knowledge and truth. Along with this came in post-Kantian philosophy the almost obsessive struggle against the insight that we are caught, indeed trapped within our language. Whether one thinks with Herder or Humboldt about language as a creative process and energetic principle, or



whether one thinks with Heidegger and Wittgenstein that, in language, the world is my world, this comes with the conviction that we cannot step outside language and that there is no vantage point from which one can judge how language relates to the world.

With the awareness of the multilingual condition comes quite another conviction since relative to each other all languages are on the outside of other languages, they appear artefactual, a such available for appropriation. If languages are themselves fixtures of the world that afford orientation in our socio-technical environment and co-ordination among people, we will no longer absolutize our native language as a standard for proper understanding. This is playfully empowering. No longer trapped in any one given language, we multilingually learn to technically orient ourselves and control our social and material world.

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Two Perspectives on the Multilingual Condition – Linguistics meets Philosophy of Technology

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Abstract

Multilingualism as a (sub)-discipline of linguistics with special interest in language acquisition and didactics was established in the 1990s. As time moved on, the discipline of multilingualism evolved into an interdisciplinary field of research, but not yet including a philosophy of multilingualism. In this record of a conversation between linguist Britta Hufeisen and philosopher Alfred Nordmann, the concept of multilingualism is explored as well as its differences to monolingualism. This implies differences also between the philosophy of language and a philosophy of multilingualism. Upon closer scrutiny it becomes clear that multilingualism is not only about language acquisition anymore but about the ways in which individuals can make themselves understood and orient themselves in a multilingual environment which includes artificial languages. In this way, the notion of affordances comes to the fore as individuals are afforded by their environment the use different language skills in different situations. The same applies to technology: Technology always affords us to do something in a specific way, but at the same time, while using it, we discover other possible uses and thus assign new meanings to it. This is where the linguist and the philosophic view diverge: The former puts an emphasis on the use of language and the actual semantic meaning of words, whereas the latter analyzes language and technology primarily in terms of its use, therefore meaning becomes a product of use. Both stress, however, the importance of culture and context for meaning and use.

Keywords: Multilingualism; Affordances; Dominant language constellations; Translanguaging; Ludwig Wittgenstein; Larissa Aronin

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Два взгляда на многоязычие – лингвистика встречается с философией техники

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Аннотация

Мультилингвизм как (под)дисциплина лингвистики с особым интересом к овладению языком и дидактике была признана в 1990-х годах. Со временем мультилингвизм превратился в междисциплинарную область исследований, но еще не включающую в себя философию мультилингвизма. В этой записи разговора между Бриттой Хуфайзен и Альфредом Нордманном исследуется концепция мультилингвизма и ее отличия от монолингвизма, а также различия между философией языка и философией мультилингвизма с лингвистической и философской точек зрения. При ближайшем рассмотрении становится ясно, что мультилингвизм – это не только овладение языком, но и то, как человек может сделать себя понятным и ориентироваться в мультилингвальной среде, которая включает в себя и искусственные языки. Таким образом, на первый план выходит понятие аффордансов, поскольку окружающая среда позволяет людям использовать разные языковые навыки в разных ситуациях. То же самое относится и к технологии: когда мы используем технику, она всегда позволяет нам делать с ней что-то определенным образом, но в то же время, используя ее, мы обнаруживаем другие возможные применения и, таким образом, придаем ей новое значение. Вот где взгляд лингвиста и философа расходятся: первый делает акцент на использовании языка и фактическом семантическом значении слов, тогда как второй анализирует язык и технологию прежде всего с точки зрения их использования, поэтому значение становится продуктом использования. Оба подчеркивают, тем не менее, важность культуры и контекста для значения и использования.

Ключевые слова: Мультилингвизм; Аффорданс; Доминирующие языковые созвездия; Транслингвизм; Людвиг Витгенштейн; Лариса Аронин

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INTRODUCTION

Multilingualism came into its own as a field of research in the 1990s and has since grown into an academic community with its own journals and conferences. It is generally considered a sub-discipline of linguistics with close affinities to linguo-didactics and theories of language acquisition but in effect, it reaches far beyond these disciplinary boundaries: "multilingualism, as an academic subject, embraces not only fields connected with language, but also necessarily involves psychology, sociology, ethnology, ethnography, globalization studies, urban studies, material culture studies, and many more" (Aronin, 2017, p. 184).¹ As long as it is, this list does not yet include the philosophy of multilingualism which might provide a synoptic reflection of this interdisciplinary field.

In the same text, Aronin sets out a challenge: "In the same way that linguistics as a field of research is different from multilingualism, the philosophy of language and the philosophy of multilingualism diverge" (Aronin, 2017, p. 184). This challenge provoked a coffeehouse conversation between a linguist (Britta Hufeisen) and a philosopher (Alfred Nordmann), seeking to understand multilingualism as distinct from monolingualism, and to understand the philosophy of multilingualism as distinct from the philosophy of language. The following provides a synopsis of their exchange which identified several issues but did not aspire to provide a comprehensive review.

WHAT IS MULTILINGUALISM?

From the point of view of linguistics, didactics, and theories of language acquisition, the meaning of multilingualism is that more than two languages are involved, separately or intermingling, either in a societal or in an individual context. A multilingual individual often grows up in a multilingual society, though multilingual families and individuals can also be found in a monolingual environment.

There are differences in competences when it comes to bilingualism and multilingualism. Primarily there is the number of languages in play. To be sure, many bilingualism researchers would say that there is not much difference whether two, three or six languages are involved. Multilingualism researchers, on the other hand, say the number of languages does indeed matter. If somebody grows up bilingually or starts learning a second language at school, that person has a completely different starting point than if someone starts learning a third, fourth or fifth language. Theoretical discussions about multilingualism, however, are not mainly concerned with communicative competence but with a change of attitude (and this has developed in Europe differently than in North America, see Bartelheimer et al., 2019). Twenty years ago, many would have said that if you learn a language or grow up with a language, you must aim to know it perfectly and to approximate as closely the ideal of speaking, reading, writing like a native speaker. The attitude of today's multilingualism is that one cannot be absolutely

¹ Larissa Aronin is one of the main intellectual driving forces behind the study of multilingualism. She introduced a considerable number of fruitful and influential concepts which explains why she is frequently cited also in the following pages.



proficient in each and every one of your languages. Instead, we say it could be that in one language you are very good at reading texts. It could be that you do not have any problems understanding the language, but you do not speak it very fluently. For example, someone reads French texts well but never speaks French. That is why we differentiate between different language skills or levels of skill. So today's multilingualism is much more complex than and not as demanding as traditional bilingualism. It is simply unrealistic to become perfect in several languages at the same time.

Perfection here is this broad idea of communicative competence and takes C2 as its standard, that is, the highest level in the Common European Framework of Reference for Languages. One of the main drawbacks of traditional language acquisition research is the fact that the default is the idealized L1 native language speaker. This is highly unfair, not only because you have to have grown up in a certain environment in order to become an L1 speaker, but also because it implies also that every L1 speaker is perfect in every skill. This is not true. Someone who was born and raised in Germany is as German as one can be, and yet his or her writing skills might not be C2. Still nobody would ever question whether German is this person's L1, and so L1 does not refer to the ideal native speaker all the time (see for example Dewaele, 2018). In today's multilingualism research, we say, on the contrary, that you may very well have different skills, different competences in different domains and situations, and that is the innovative part of it. This is where concepts like Larissa Aronin's Dominant Language Constellations come into play (Aronin, 2006). This means that you not only have various competencies in various languages and different contexts of use, but also that you have a specific set of languages that you use on a regular basis. Your repertoire of languages might include further languages but many of them are dormant and are not used frequently. The idea of acknowledging and using your complete languages repertoire with a focus on your dominant language constellation is also embedded in the idea of a multilingual whole school curriculum (Hufeisen, 2018).

Philosophy does not as yet acknowledge multilingualism as a distinct topic. Interest in this question grows out of the discussions within studies of multilingualism, if only because it suggests a significant divergence from the philosophy of language which is also rooted in the ideal of the monolingual native speaker. The question is therefore, what would it mean even to have a philosophy of multilingualism? When philosophers of technology, in particular, hear about multilingualism and the new linguistic dispensation (Aronin & Singleton, 2008), the first thing that comes to their mind is not so much the competence of speaking or understanding one or three or more languages. In analogy to discussions of the technosphere, what comes to mind is the fact that we move about in a world in which we encounter on a daily basis many more languages than any individual could speak or understand. While most individuals claim for themselves to be monolingual or bilingual, they nevertheless manage to find their way in a multilingual environment. Without speaking the language, people go to China, go to Russia, and even within their own country they are confronted with a proliferation of languages. And these are not only the main natural languages, but include dialects and jargons, recorded words and codes that are implemented in vending machines, signage, device interfaces, or any technical sequence of signals.



AFFORDANCES AND FUNCTIONAL MULTILINGUALISM

What does it take for an intelligent person to navigate in such a multilingual world? Even if one is quite illiterate when it comes to Chinese, one learns to recognize patterns such as names of subway stations which one cannot even enunciate, just by remembering the visual shape of a word. This would mean, then, that the departure of multilingualism from the native speaker ideal can be pushed to an extreme: In the multilingual condition, the shared competencies include those kinds of compensatory competencies which we might assign to illiterates who cannot read and write but have learned to disguise this fact by successfully acting as if they could. In this way, they somehow survive in society and can compensate for their apparent lack of competence. These abilities to compensate ignorance should now be treated as a linguistic competence in its own right, a competence required for successful navigation in a multilingual world.

On this account, affordances play a major role. The environment or our surroundings provide affordances that put one in the position of being able to act, as in the case of China. After some time one picks up certain signs or words and their function. The concept of "affordance" figures centrally also in Larissa Aronin's thinking about multilingualism (Aronin, 2017; Kordt, 2018). They are very useful because otherwise we would restrict our idea of learning too much to specific learning environments. But the specific environments with their classrooms and language labs are not our main source for learning. We learn from the affordances of the world around us. The second aspect brought out by multilingualism and the notion of affordances is that learners more or less pick what they need in certain situations: Being in China, for example, one tries to remember the signs for a specific subway station in order to remember when to get off. This is why affordances are said to be relational. This idea is further developed with the concept of functional multilingualism (Bradlaw et al., 2022a, 2022b). This enjoins us to concentrate mainly on the fact that whichever language you bring to the language table, you use whatever is useful for you in a specific situation, and that mixes very well with the affordance theory. In the beginning of a situation, one might need only German and English, but sitting in the train later on, one might need several other languages, at least rudiments of other languages.

To multilingualism researchers, the recognition of what is useful in a situation does not treat the notion of use and usefulness as fundamental – as in Wittgenstein's "meaning is use" (Wittgenstein, 1953, 43). What is central, instead, is what we call *Sprachenhandlungskompetenz* in German²: What have I learned about how I behave by way of speaking? This again fits very well with the concept of affordances because it is not so interesting for us what the property, essential feature, or definition of the lexical item "chair" is. The interesting thing is what it affords to me. What do I as a learner or speaker connect with the term "chair," what speech acts can I perform with that term? This owes to a shift in research perspective: We do not start off with the things themselves but with the learners, and this is why the relational notion of affordance is so important.

² Sprachkompetenz is akin to proficiency or command of a language. Sprachhandlungskompetenz would be the competency to perform speech-acts in a language. Sprachenhandlungskompetenz is a multilingual concept and refers to the competency to act with and through different languages in different situations.



The two of us might look at the same object, but our interpretations are completely different because it is not the thing itself, but what the objects allows us to do and how we attribute this to the object.

Take the definition of a chair for instance and its affordance of "sittability." The semantic description of it might always imply that is has four legs. Now, the farmer's strapped-on stool for milking cows has one leg only. It also invites you to sit on it but in what sense is this a chair with just one leg? We therefore shift the perspective to *Sprachenhandlungskompetenz*, especially in semantics and pragmatics. You can try to describe the different meanings of love, and still, it means completely different things and is taken up differently by various individuals. This change of perspective by looking not at a standardized lexicon entry but at the individual lexicon of a person – especially if somebody has a multilingual lexicon – is highly interesting because you can see how the individual balances the different meanings of *chair*, *Stuhl*, or *chaise*. There you will notice that the scope of interpretations by individuals is much broader than what you would find, for example, in a dictionary.

The notion of affordance can serve as a hinge concept between the perspectives of linguistics and philosophy because here is a concept with a long tradition and practical significance for technology developers, in particular. It started in the fields of perceptual or *Gestalt* psychology and ecological psychology. It is implicit in the notion of human and other animals that they have relational interactions with their environment. From the beginning, it was very clear it describes somehow an objective kind of structure and relationship. James J. Gibson (1979) considered things like a chair which offer the sitting ability, for instance, and it was only a small step from there to move to design theory. This step was taken by Donald Norman (1988): He spoke about design as mostly concerned with affordances and the creation of ways to engage with things - as inscribed in the original meaning of the German word Aufforderungscharakter [the character of a thing to prompt, invite, or summon] (Wertheimer, 1912). Natural and designed things invite us to handle them in a certain way: A ball lying around, for instance, invites us to kick it somewhere. The notion that things invite us to do things and take them up as a resource or in a functional way informs the theory and practice of design. It guides the construction of user-friendly interfaces for intuitive handling. Here, product designers would say that they need to guide or steer users to push this button or that button because there is an objective story behind the requirements for an interface between humans and their environment. This way of talking signals quite a shift from classical thinking in that "affordance" replaces the old concept of "property." Classically, we think of objects in terms of their properties: Here is the essence of the thing, and there are its attributes which inhere or belong to the thing. We define things by way of its qualities. With affordances, on the other hand, we arrive at a relational notion of properties, so to speak, which exist only between a thing and some human or animal user, such as chair's "sittability." If the nature of things is eternally set by its essential properties, affordances can change since we can discover new affordances in new contexts of use: the chair is not only sittable but also climbable when used as a ladder. This brings us back to the linguists and the philosophy of language as opposed to a philosophy of multilingualism. From the point of view of philosophy, we held on for many years to the idea that we should think about



language in a monolingual, at best a bilingual mode. There has to be a meaning behind every sentence or word or speech-act, and we need to understand these meanings which are like properties that adhere to the words and anything composed from words: The word has a certain property which might be its lexical definition or something like that, we have to understand and preserve this property as we pass it on in a communicative act. Now we speak not only about "meaning is use" but about knowing how to appropriate and employ a sequence of sounds or signs situationally: Words and sentences are things to be handled and negotiated for purposes of orientation in the world and co-ordination with other people. They are no longer considered as carriers or vessels of meaning which is somehow invested in them, lurking behind them. Interestingly, alongside this multilingualist recognition came a breakthrough in digital speech recognition and translation. Instead of programming ontologies and teaching computers syntax and semantics, present-day algorithms learn about the occurrences and statistical distributions of thing-like spoken or written utterances.

TRANSLANGUAGING, DOMINANT LANGUAGE CONSTELLATIONS

Philosophy and sociology of technology are interested in stories about how technical objects can be retrofitted or re-appropriated for different purposes. The smartphone, for example, can be used for doing karaoke in public places. The smartphone was not originally designed for it, but affords karaoke nonetheless. The discovery of this affordance goes along with assigning new meaning and coming together in different ways. The smartphone is not just a communication and information tool but a device that helps us sing together and be merry. These kinds of shifts happen all the time and this corresponds to an extension of the ways in which users can express their interests and desires through technology. New technologies and the discovery of new affordances of old technologies thus expand our lexical repertoire, or maybe mental lexicon. This expansion creates opportunities and difficulties to orient ourselves and know our way about among the many languages, symbols, and codes that contribute to our multilingual condition. If multilingual competencies include the ability to navigate an environment that is saturated with signs and symbols from many sources in many shapes and forms, one thereby navigates also around Wittgenstein's ,,beetle in the box" (Wittgenstein, 1953, 293): Where a traditional or intuitive philosophy of language thinks of words or expressions as having a meaning, and of concepts referring in some sense to definitions, ideas, mental entities, multilingualism asks whether we really need these or whether these might as well drop out of the picture? If meaning, speaker's intention, or content are like beetles in boxes labelled "beetle," and if everyone carries such beetles around with them but no one can look inside anyone else's box, the beetles themselves don't actually enter the conversation as we show each other our boxes and agree that we all have beetles. The question of meaning or mental aspects of language drops out of the picture when we coordinate ourselves with one another through our linguistic performances.

From the point of view of linguistics, our beetle in the box is not our personal definitional thing. The very fact that we can talk to each other is a perfect source for misunderstanding, and this is why we need this negotiation of meaning because if we all



knew what we meant by XYZ we would not misunderstand each other. Here again the multilingual aspect comes into play. Through the learning of more languages, one's mental lexicon expands with each and every mental entry. Those are linked to certain lexical items in various languages, but one still has to negotiate with speakers of this language or other people in general. What do I mean when I refer to a chair? This is a stupid example, of course, but we still need this idea of negotiation of meaning, which is an old concept in linguistics, which you certainly have as well, because otherwise we just think we communicate with each other or we just think we understand each other, but in fact we do not.

There are new concepts of this idea of negotiation of meaning which are, if you not new at all. In the end, it all comes look closely, down to Sprachenhandlungskompetenz. Take, for example, migrant communities. If you sit in the tram and listen to people, you might hear "blah, blah, blah tram blah, blah, blah." This code switching, for instance – which was something absolutely forbidden in the 1970s because it was seen as a bad mixing of languages – has now become a communicative tool. This new concept or tool is called translanguaging. That means you systematically try to refer to various languages in your repertoire in order to make yourself understood as precisely as possible. The positive acknowledgment of it is something that is completely new because for a long time it was linked to the idea of bad interferences. It was this horror notion that the use of some phrase in another language ruins your own language, but now we say that there is so much more to it. Translanguaging and code mixing and code meshing, they can all contribute to the fact that we can talk to each other. So there has been a kind of a paradigms shift in multilingualism research in comparison to monolingual linguistics. In the beginning, bilingualism research was more or less all about those poor kids who grow up bilingually and who cannot speak any of their languages perfectly. The attitude towards people growing up multilingually has changed completely because we allow the languages to mingle and mix and allow individuals to use their languages as needed.

Society has become more liberal in this regard, and this is an attitude which researchers of multilingualism have been trying to match. In a way, multilingualism researchers were the first ones to listen to what is actually happening in society: The languages mingle and mix. In Germany, we once in a while complain about all those anglicisms in German. Some people hate this language mixing and others maintain that this is an enrichment of the German language and society. You can say that this kind of mixing is like the process of becoming multilingual. There is a change, and the linguists dealing with multilingualism were the first ones who listened and recognized that code mixing is happening already, and we should change our research focus and behavior in order to discover and appreciate what is out there. It certainly should not become normative, because this is not the task of researchers. Their task is to describe what is happening, when, for instance, a child grows up multilingually.

Philosophers are prone to wonder, however, about the historical periodization: what is new about the "new linguistic dispensation" as Aronin calls it (Aronin and Singleton, 2008)? No matter how we date it precisely, what is new is not the fact of many languages being spoken, but how they bump up against each other, how they intermingle. In the old



paradigm perhaps one would say, "I speak English, I speak French, I speak Latin, and then I speak German." The goal was then to master each of those languages, seeking perhaps to become perfectly eloquent in each. Since the languages were set off and separated from one another, one has to cross a border as one moves from one to the other, carrying packages of meaning from German to English, trying carefully to preserve it along the way. And there is always the skeptical question regarding the very possibility and quality of translation. Under the new linguistic dispensation characterized by translanguaging, we are talking about people who inhabit and are part of many different settings in which different languages are dominant. With people moving between these settings, there are shifts within their dominant language constellations (Aronin, 2006). And the question of translation does not really arise so often. People just move from one sphere to the next, you are speaking to your mother in your native tongue and speak to your boss in the local tongue of your profession, and in a shop you often use a regional idiom and usually you do not even hesitate to move between all those spheres. This is, perhaps, a more fluent way of using language even than a certain ease of translation. This makes it really interesting to see how technical jargons, certain kinds of local idioms, or even just being engrossed in some kind of apparatus and how it works, seamlessly moving between situations with different linguistic requirements. To use a technological analogue, this is like moving from a train station to a restaurant, to a dance club, to a hospital – where each setting has its own language or constellation of languages. One could be a bit provocative by saying that one of the affordances of the multilingual condition might be that when you go to a restaurant in China, you can order something without speaking the language. You are, then, extremely happy that the 'language' of the menu consists just of pictures. As one points at the pictures, one is doing something very crude, not at all learned. At the same time, it belongs to a highly sophisticated skill of navigating a multilingual world by way of compensation. We get along and understand each other even where a real linguistic competence, strictly speaking, is missing. Do we, then, even need the linguistic factor?

A linguist will look at this situation a bit differently, and will not say that pointing at pictures in the menu compensates an absence of linguistic competence. One would say that even being able to interpret pictures is part of language as well, since a picture can mean various things. This is again a matter of affordances. If you have a look at the menu, and you can interpret those pictures, those photographs tell you: "Well, this looks as if I would like to eat that." This is different from somebody opening the menu, saying: "What's that?" In and of themselves, photographs do not provide one affordance or another – this happens only when a person links it to the idea of what do I want to eat, so pictures can definitely be part of the linguistic repertoire for people.

CONCLUSION

Philosophers of technology are interested in this way of looking at language, because languages are tools that we use, resources that we employ, helping us orient ourselves in the world or coordinate ourselves with other people. All technology does this. Instruments, technological systems or infrastructures, and the devices we share also



coordinate our actions and socialize us in a certain way: We became Europeans through certain kinds of European technology, as some historians have shown, and we became Europeans because technological habituated us in certain similar ways (Hård & Oldenziel, 2013; Figes, 2019). We should just look at the design of toilets or the like, and we can see how certain forms of technology attune us to one another, produce a shared rhythm of life. And this is what the sharing in a stock of natural and technical languages affords as well. Even though one should not say technology and language are the same, they become strikingly similar when it comes to the ways in which we use them: We use science, technology, and linguistic gestures to navigate the social and natural world.

At the same time, linguists keep in mind and remind us that the examples of technology shaping us are very specific of culture, just like language. For instance, we have some notion of toilets. If you come to a house in another culture and find that it does not have a porcelain bowl but a hole in the ground, you might think that this house has not been finished yet, but in the end it merely inhabits a different technology. The cup, for instance, is a thing that we always associate with a handle. And if you see a picture of something that looks like a cup but has no handle, you might think of it as something else, but there are cultures that have cups without handles, Turkey for example. Without handles, these vessels are used as cups and not as glasses or mugs. The same applies to technology and technical science and technical languages because they are highly specific to their own engineering cultures and scientific traditions. So, from another point of view linguistic researchers of multilingualism arrive at the same conclusion: Technology is not so different, it is culture-specific – just like language.

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Research article

The Cat's Meow – Feline Translations

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Abstract

Modern trends of posthumanism are increasingly changing the relationship between humans, animals and machines. Technology can become an intermediary in the communication between people and pets. The possibility of using artificial intelligence without needing to recover the ontology and semantics of the feline language, allows one to use it for the "translation" of cats' talk. A necessary condition for this is the presence of a language. As with other languages in the multilingual environment, testing the results is difficult, as one can only rely on circumstantial evidence to judge the correctness of the translation. Here, particular attention is paid to the work of the application that renders human speech into feline, as well as the effectiveness and reliability of, for example, *MeowTalk* to translate from feline into human language. To this end, 143 cats were studied aged 3 to 8 years, of which 30 were female. Of these 143 cats, 74% appeared to respond to the sounds generated by the app. During the experiment, the application translated the cats' meowing in different ways, for example, "I'm on the hunt," "My love, I'm here," and "Let me relax." Inversely, the pets were interested in the sounds made by the app. This suggests that cats perceive these sounds as real cat "language." As a result, it was concluded that the application is partly functional, but it remains an open question whether it can serve as a true translator from feline language. Nevertheless, there is reason to believe that technologies can become real intermediaries in the communication of people and animals.

Keywords: Feline language; Cats' talk; Cat translations; Translation; Animal; Cat; Language; Human-cat

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Кошачье Мяу – Перевод с кошачьего

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Аннотация

Современные течения постгуманизма все больше меняют отношения человека, животного и машины. Возможности использования искусственного интеллекта без непосредственного обучения правилам, позволяет применять его для перевода с кошачьего. Необходимым условие для этого является наличие языка. Однако тестирование результатов также затруднено, так как мы модем полагаться только на косвенные свидетельства корректности перевода. Особое внимание уделяется работе как приложения, переводящего человеческую речь на кошачий, так и эффективности приложения "MeowTalk" для определения надежности перевода с кошачьего на человеческий язык. Мы провели исследования на 143 кошках в возрасте от 3 до 8 лет, из которых 30 особей были самками. Из них 74% кошек пришли на звуки приложения. В ходе проведения эксперимента приложение переводило мяуканье котов по-разному, например, "Я на охоте", "Любовь моя, я здесь", "Дай мне расслабиться". Домашние животные были заинтересованы в звуках, издаваемых приложением. Что свидетельствует о том, что кошки могут воспринимать эти звуки как настоящую кошачью "речь". В результате было установлено, что приложение отчасти функционально, но данном этапе еще не может служить полноценным переводчиком с кошачьего. Тем не менее существует потенциал развития технологий, которые могут стать реальными посредниками в коммуникации людей и животных.

Ключевые слова: Кошачий язык; Речь кошки; Перевод кошачьего; Перевод; Животные; Кошка; Язык; Кошка-человек

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Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



INTRODUCTION

Modern discussions of posthumanism are increasingly concerned with the changing relationship between humans, animals, and machine (Mustola, 2021). The rejection of anthropocentrism "opens up new and exciting opportunities for the study of non-human lives" (Fox, 2006). Instone (1998) writes that all beings are connected in a series of overlapping "networks" or "networks" of activity (p. 453). These interwoven lives make up a so-called "materialistic semiotics" where "all sorts of fragments and fragments – bodies, cars and buildings, as well as texts – are linked together in an attempt to restore order" (Bingham, 1996, p. 643).

Nevertheless, such fascinating philosophical thoughts do not provide a foundation for the everyday interaction of human and non-human entities. And few studies go beyond suggestive metaphors to properly flesh out what a modern politics of socionatural hybridity is all about (Castree, 2003).

Technology has become part of the life of pets: There are smart food feeders, smart toys, lockable doors for cats with electronic tags, smart pet houses, fully automated dog and cat toilets, and so on. All these technologies primarily create convenience for people, but one of the most interesting areas of technological development seeks to improve the communication between pets and humans.

Language has traditionally been considered the basis of identity that separates humans and animals (Fox, 2006). Nevertheless, recent studies indicate that many animal species may have some kind of "linguistics" that does not share all the features of human language, but can still be very rich and complex (Kershenbaum, 2017). Humans and animals living together master common forms of communication, which depend on various factors, including the type of animal. In this study, we will turn to one of the most popular pets, namely cats. For communication, it can use visual, tactile, and olfactory signals, but voice (auditory, acoustic) language is one of the most important. Their vocal repertoire is more complex than that of many other mammals, it is also characterized by an "infinite wide variety of sounds and patterns" (Moelk, 1944). Susanna Schötz (2020) believes that a deeper study of the vocal component of cat-human communication can improve our interspecific communication.

There is a fairly long history of studying cat language (Brown et al., 1978; Moelk, 1944; Nicastro & Owen, 2003; Owens et al., 2017; Schötz, 2017; Yeon et al., 2011), however, digital technologies of the last decade have made it possible to move forward in identifying the meaning of meowing – for much the same reason that the digital translation of human languages has also improved.

The association of animals, people, and machines contributes to the creation of close networks of interaction. Digital solutions aimed at animals are already being created today. There are means of communication connecting pets and their owners, digital games designed for animals (Bylieva et al., 2020; Hirsky-Douglas and Lucero, 2019; Rossi et al., 2016). Even a robot vacuum cleaner can be used to communicate with a pet left at home. There are computer games with a species-appropriate interface (Noz & An, 2011) and apps for building of interactive connection between a person and a deaf cat (Zhang et al., 2021). Today, there are dozens of games for mobile devices designed for cats, where the pet catches a mouse, a fish, a ball etc. moving across the screen with its paw



(fig. 1), some of them even have a multiplayer mode. There are games that allow a person to play with a cat.



Figure 1. Cats play a game on a tablet (My Funny Cats, 2018)

COMMUNICATION WITH CATS

According to official data, 33.7 million domestic cats are kept in the homes of Russians. That is, there is one cat for four people. In Russia, the highest indicator in Europe of the number of apartments or houses in which there is at least one cat – it reaches 54% (Abrashkina, 2020). Of course, all owners independently build up communication patterns with their pet, but, of course, they might want to make facilitate this process.

Scientists counted eighteen different shades of cat meow with different intensity, with different pitch of voice, tone, duration, and timbre (Tavernier et al., 2020). Dennis C. Turner claims that meowing can be used by the cat in order to express food or attention seeking, illness, stress, loneliness, aging, or need to breed (Turner, 2017). Elena Filippova (2006) writes that some cats even appear to utter "human" words – ma-ma (mother), y-mi-rai (die), mne (me). Whether these words relate to their meaning is, of course, an open question, but one thing is certain: there are cats who like to talk, and there are cats who won't open their mouths. This depends in part on the natural volubility of the cat, that is, on its breed. Siamese cats are very talkative. "Woolen" cats are less talkative, they prefer to talk by purring. Of course, no cat can understand abstract concepts (Filippova, 2006).

Communication with cats is possible with eyes. "As a person who studies animal behavior and as a cat owner, I am glad that I have the opportunity to show that cats and people can communicate in this way", the psychologist McComb (1988) reported. Cats often close their eyes, blinking slowly. This is a bit like people squinting their eyes and smiling, suggesting that the cat is relaxed and happy. Cat owners often attempt to copy this expression when communicating with cats.



The study of communication with cats is an open and controversial area of research. Kitaygorodaya and Rozanova (1999) analyze conversations with animals from the point of view of genres of speech. They believe that the communication with animals implements different genres depending on the type of communication: the monological genre of prescriptive and appellative speech (prohibition, reprimand, etc.).

Excellent summaries of cat–cat communication through olfactory, auditory, visual and tactile channels are already available in Bradshaw (1992), Bradshaw and Cameron-Beaumont (2000) and Bradshaw (2018). Cats employ vocalizations much more frequently when humans are present than when together with conspecifics, probably reflecting a learning process. Generally, meows are typical attention-seeking vocalizations in interspecific settings and higher pitched (more pleasant) than the equivalent vocalization in feral cats and the wild ancestor of the domestic cat (Yeon et al., 2011). Meows and purring can be varied by the cat in different situations and interpreted differently by human listeners (Turner & Bateson, 2014). In food-soliciting situations elements of meow-like vocalizations are found within the purr and humans can detect the difference. Bradshaw et al. (2012) suggest that this purring may function as a 'manipulative' contact- and caresoliciting signal possibly encouraged by the positive response of the owner. Humphrey et al. (2020) found that 40% of the participants in their study identified the correct contexts of recorded meow vocalizations of their own cats at a level greater than that predicted by chance.

TECHNOLOGIES OF TRANSLATING FROM FELINE

Non-human language translation

Despite the commonness of communication with pets, the question of the technology of translation of feline language refers us to popular science fiction literature. In many literary works there is a translator device which, having listened to incomprehensible sounds made by aliens, begins to translate them into human language. In some cases, for plausibility, the help of people who fixed some initial concepts was needed. However, in reality (as opposed to fantastic literature) there has never been a technology that translates from a non-human language.

The use of artificial intelligence technologies today has improved the quality of machine translation, it has become possible to "translate" text into program code, into visual images, and other forms. However, there is a fundamental difference to working with translations of natural languages and other sign systems used by humans: With these we know for sure that they are meaningful sign systems, we know how they work, and we can test the result obtained by an AI system for correctness. In the case of a non-human language, there are difficulties with all three indicated components:

- we are not sure whether we are really dealing with a language as we understand it,
- we have no idea about the principles underlying this sign system (if it is a language in the first place),
- we cannot get feedback on the adequacy of the "translation."



In order to create a technology that can translate the sounds produced by cats, at least we need to be convinced on the first point: that a cat really possesses an aural language. An alternative to the language hypothesis might be that the sounds have no meaning, that they simply serve to attract attention and express emotions that are not endowed with meaning, that they are kind of singing or senseless copying of sounds. The difference between emotional sounds and words will be that in the first case, it doesn't matter which sounds are used, the important thing is the volume, timbre, intonation, and in the second, regardless of the method of enunciation, the meaning is preserved. That is, in order to create translation technology, one needs to be sure that cats have a certain symbolic system that associates meanings to certain sound signals. An interesting feature of cats' meowing is that adult cats rarely use meows to communicate with one another, but more often to interact with people (Brown, 1993; Vigne et al., 2004). This speaks in favor of considering their meows a language if one assumes that cats have already taken the first step to switch to a vocal language familiar to humans.

Despite the fixation of various sound parameters, current research on cat meowing is far from providing valid hypotheses about the construction of feline language (Saito et al., 2019). This fact would completely undermine any attempt to create a translation technology, if "dictionaries" were still used today for machine translation. However, modern translation technologies use machine learning, which does not require people to transfer the rules for working with data to the machine. Artificial intelligence, having received a dataset, will itself build hypotheses about correspondences and will produce results, regardless of whether the people who set the task understand how the results are obtained. The weakest point of translating from feline with the help of AI is the need for a database in which there should be translation now depends entirely on whether the owners are able to intuitively understand animals. Nevertheless, the use of AI allows you to remove from the development of technology the stage that requires specialists to understand the construction of cat grammar.

The third difficulty lies in evaluating the performance of the translation technology. How can one evaluate the correctness of the translation from and into feline language? To check the adequacy of translations from feline, one must again rely on the owners' assessment of how the non-verbal cat's behavior corresponds to the translation. In this situation, both human empathy and animal characteristics can influence the results.

In our experiment the *MeowTalk* application was tested. Before the experiment, the owners of their pets had to install this application on their smartphones and register their pets in it, whose meowing will be translated in the future. To receive the translation, the owners had to hold a special button on the screen to record their pet's meowing, and after processing, the application has to translate the meowing into one of eleven statements: Let me in; Let me out; I am angry; Leave me alone; I'm going to attack; Hello there; I'm hunting; I'm in love; Mommy; I'm in pain; I'm resting. In parallel with this, a video was recorded so that a smartphone with the *MeowTalk* application running was visible in the field of view, making it possible to observe the behaviour of the animal as it hears sounds from the smartphone. This behaviour can also be analyzed to further explore the translation process.



As for translating into feline, it is possible to try to translate a phrase that should cause a reaction, and see if it happens. In this study, the translation into feline of the phrase "Go eat" was tested. The study involved 143 cats aged 3 to 8 years, of which 30 cats were female. All cats were domestic, and the owners were familiar with the rules and procedures for conducting our research, and agreed to the publication of these experiments. On the first day, we checked whether the cat could understand human speech, for this, we asked owners to record a video in which they would call their pet to a bowl of food with the phrase "Go eat" to see the cat's reaction: whether it would respond to the call or ignore it. On the second day, it was decided to use the application *Humanto-Cat Translator* which would call the cat by sounding out its feline rendition of "Go eat."

Cat translation applications

Although you can find dozens of cat translators in the app store, most of them are a joke that randomly selects sounds from a library of cat sounds. But there are some applications that are actually doing sound analysis. The application *Human-to-Cat Translator* performs audio analysis on the voice and issues carefully crafted meows according to human input, it also includes a 16-meow soundboard for instant access to common cat calls. An analysis of the reviews indicates that although for some cat it doesn't work at all, there are positive results.¹ It is clear that the reaction of cats to the translation made by the application can be a reaction to the sound or anything else, and be a coincidence. At the same time, the positive reviews and owners' reports are reason enough to study the phenomenon.

The most advanced application of this kind is *MeowTalk* which also received mixed reviews but some of them quite positive.² It was developed by Javierz, a former Amazon engineer who worked on the Alexa voice assistant. The application works on the principle of machine learning, that is, an AI-system was initially exposed to tens of thousands of different examples allowing the neural net to learn to recognize the sounds made by cats. Users can mark unidentified sounds and thereby continue AI training and improving the operation of the application.

Although the application is based on machine learning, which was used for voice assistants, it could not be used directly for cat language, since, unlike human language,

¹ For example "It WORKS! I love this app so so so so so so sooooo much! My cat is my best friend and she listened and hit the screen, and ALSO meowed back, this is AMAZING!!! As humans we force cats to learn our languages but we need to be less ignorant and learn the cat's languages as well, because it might be hard for them to communicate with us, since they are not bilingual;" "It's amazing! First I was trying to get my cat and kitten to listen and I looked for an app and I downloaded this app as soon as I tried it I said in the microphone come here baby you are the best and she came up to me and started purring I couldn't believe it and I've been using this app ever since I would definitely recommend this app if you are a cat lover."

² "Surprisingly, it works. The program captures a barely noticeable intonation in the meow, and correctly conveys the mood of the cat, by 90 percent. You can listen to the story and make sure that there is still a difference between 'hello,' 'I'm looking for love,' 'what's going on?' etc. When I leave the kitchen without feeding him for the 5th time in a day, the cat is quietly indignant, the program writes 'I'm not doing so good.' I failed to meow in such a way as to deceive the program such that it would confuse me with a cat."



cat language does not have a dictionary. It should be mentioned that Alexa's capabilities include meow recognition, but in a very primitive way: She can note that a cat is meowing and issues a random meow in response. Alexa's developers do not seem to believe that cat language is more than just a random collection of sounds.

MeowTalk combines three layers of analysis for the voice of cats: first, there is the determination of the cat's language (based on a Google data science model the application knows that this sound is a meow); second, a general model that provides the app's initial cat vocabulary and associated actions; and third, a highly specific model which is trained for each cat.

The application is user-friendly, similar to the Shazam-app which identifies musical tracks. At the touch of a button, the decryptor is activated, and users are offered the probable translation of the meow, with which they can agree or request another option.

Even if cats do not have a shared language, the application might render unique meows as an understandable phrase if the owners upload unique pet's meows that robustly correspond to certain situations, for example, of the cat saying "food" at feeding time, or "let me out" at the door. At least 5-10 examples are required for each new "word". Using machine learning, the MeowTalk app learns to translate the cat's unique sound, paying attention to cats' specific vocalizations and intentions.

A number of applications have also been developed that can translate human language into feline and cat language into human language. Their aim is to remove the language barrier between the pet and its owner. Also there is a prototype of a collar that will translate any meows sounds to human speech and also can send a message to the smartphone if the cat is outside.

Feedback on translation

The results of the experiments inviting cats to "Go eat!" showed that 93% of the total number of cats respond to the human voice on the first day. More precisely, 86.7% came on the first call, 6.3% responded to a second call, and 7% did not come at all. On the second day, when using an app that translated "Go eat!" into a meow, 74.13% of the total number of cats responded to it. Of these, 64.3% came on the first call, 9.8% on a second call, and 25.9% did not respond at all.

The application allows us to try to understand this language. Since the application analyzes the "speech" of animals through sound, it is very important to consider how differently cats enunciate. For an analysis of the sounds uttered by cats, we collected video materials and sound wave patterns of audio tracks which we received from animal owners. To demonstrate the result of the translation, let's take a detailed look at some examples of where the application appeared to work. The task was to record cat sounds on a video. After analyzing the video, the features of their conversation and literal interpretation were identified.



"Let me relax!³"

During the making of the video which shows Leon the cat, sound was recorded in parallel using the "MeowTalk" application. It translated the cat's loud meowing as: "Let me relax!" His phrase appeared to be a response to excessive attention from the owner and was a desire for privacy.

The sound wave generated by the beacon of this cat has the maximum amplitude of all the presented oscillations. This indicates that the cat has a high tone of meowing. If we decompose the recording of a given cat's meowing into extremely small time intervals $d\tau$, then it will also be possible to observe that the presented sound is high-frequency. The results of the decryption and translation are presented in fig. 2 and 3.



Figure 2. Sound wave characterizing the cat's phrase "Let me relax"

×	Результат перевода
	Дай мне расслабиться.
	Подтвердить перевод
Ē	Manager

Figure 3. "Let me relax"

The other cat is eating, at this time the owner touches the cat by the tail, moves the bowl with food, and strokes her back. The reaction of the cat can be observed in Figure 4. The cat does not like it, she constantly jerks her head, obviously does not want

³ https://youtu.be/4_YKjR6PoUQ





Figure 4. The cat is dissatisfied with the actions of the owner

the owner to interfere with her eating. She meows. and the app translates her meowing as "let me relax." In this situation, it appears obvious that the translation is correct since the cat's demand coincides with its reaction to the actions of the owner.

Hunting and love

The owner comes into the kitchen and sees how the cat is trying to climb on the table where the food is. The owner uses the app to ask the cat what she is doing. The cat meows in response, and the app translates her meowing as follows: "I'm on the hunt." In this example, there is no reason to believe that the application is not working correctly, because the cat "gave an answer" that completely coincides with her actions.

In the same video, one can see how the owner approached her second pet, and the cat began to caress her feet. She looks into the face of the owner and begins to purr and meow. At that moment, the app interpreted her meowing as "Hello. I want to be loved." The application translated the pet's meowing exactly as one would expect in this situation: The cat wanted affection, demanding to be petted.

In another video⁴ a cat named Zhora was filmed in close-up, walking along a dark corridor and meowing. The app interpreted her meowing as: "My love, I'm here!". The result of the audio decoding is shown in fig. 5 and fig. 6. Thanks to the translation the viewers perceive a longing in the voice, attributing the desire to find a soul mate.



Figure 5. Sound wave characterizing the phrase "My love, I am here."

⁴ <u>https://youtu.be/sjcqfoHpfsA</u>





Figure 6. "My love, I am here!"

In one more video⁵ the cat Misha examines and sniffs a jacket with interest. At the same time, he meowed loudly and for a long time. The person who experimented brought the phone with the application. The translator interpreted the animal's voice as "I'm looking for someone special!", which can be interpreted as the intention of the cat to find the owner of the jacket or another cat who owns the smell left on the jacket. The result of the audio decoding is shown in fig. 7 and fig. 8. The application with a high degree of probability correctly determined Misha's intention.



Figure 7. Sound wave characterizing the phrase "I'm looking for someone special".



Figure 8. "I'm looking for someone special"

The sounds of the meowing cats Leon (Miaou), Tisha (Nyarv), Zhora (Rrnyau), Misha (Mmryau) have low amplitudes of oscillations, therefore, these voices of cats are quiet and characterized as low-frequency.

In another video⁶ the cat Anesa is sitting in front of the owner holding a bowl. During this process, audio was recorded with the *MeowTalk* application. The app translated Anesa's quiet meowing as: "My love, I'm here!" The transcript of the recording is presented in fig. 10 and fig. 11. Then the owner gives Anesa a bowl of food. It would appear that the cat understands that she is being teased, and therefore says that she is here and wants to eat.

⁵ https://youtu.be/N21AND5dUKo

⁶ https://youtu.be/-haGd-jlZ0k


It is worth noting separately the final oscillation in the recording of the cat meowing Anesa. It is characterized by a sharp increase in amplitude. This phenomenon can lead to resonance of sound waves, that is, there is a coincidence of some external frequency of the wave with the frequency of the waves created by the cat's vocal cords. If the coincidence of these frequencies occurs at a level caught by the human ear, then you can hear not the usual meowing, but some distorted sound, in certain cases similar to familiar words.



Figure 9. Anesa is waiting for food



Figure 10. Sound wave characterizing the phrase "My love, I am here!"



Figure 11. "My love, I'm here!"

The cat Asya rushes from side to side, she is alarmed by something. The owner set up the application to translate the meowing and asked the cat to say something. Asya replied, "I'm chasing something." Indeed, the actions of the pet seem to justify this interpretation. After all, the cat is definitely not sitting still, she pulls the blanket on the bed with her paws, and turns her head, from which it can be concluded that she is looking for something.

Sometimes the app translated human speech and cats' meowing not correctly enough. For example, in test number 24 a cat named Pushok is sleeping on his couch, and the owner starts waking the animal. At this moment, the cat meows and the app translates the sound of meowing as "I'm on the hunt!". The translation does not correspond to the



current situation, because Fluff was asleep, and not going to hunt. Or in test number 25, the owner of a cat named Katya calls her pet to eat using the translator *MeowTalk*, but the animal does not show any reaction. The experiment lasts about 10 minutes, and Katya never comes. But at the voice of the owner, the pet came running almost immediately. That is, Katya wanted to eat, but the application could not convey to her the meaning of the owner's words. This shows that the animal did not understand the translation of the application.

DISCUSSION AND CONCLUSION

Translation from feline language still seem more like a whimsical experiment or joke, and along with technologies aimed at actually analyzing cat language, there are a lot of unserious translators with random meows (including Amazon's virtual assistant Alexa). Perhaps, technologically mediated communication with animals is a promising area of development. At the very least, it testifies to an expanded notion of a multilingual world which we navigate with digital tools.

Several translations, which the owners of the animals considered accurate, suggest that digital technologies can actually contribute to the establishment of communication, although this is not sufficiently proven or developed as of today. The pets were interested in the unexpected sounds made by the app. This suggests at least that cats perceive these sounds as genuine cat meowing.

The *MeowTalk* application performed well on some occasions, not so well on others. Overall, it remains evident that cats respond better to normal human speech than to machine translation into feline talk. This is probably because this is a more familiar way of communicating for cats.

In all the experiments distortions could arise since the animals were confronted and confounded by new situations. For example, a cat who sees a camera pointed at her will experience awkwardness, fear or confusion, which may cause the whole experiment to fail. Due to conducting experiments at home, it is impossible to unambiguously exclude the influence of various noises on the final result of translation. The animal's voice can also influence the result, for example, the application can more accurately translate the intentions of cats with a larger amplitude of meowing and the voices of cats whose it is louder. Another important factor influencing the accuracy of successful translation is the distance of the microphone from the pet, as with increasing distance between the recording device and the object of translation, the clarity of recognition deteriorates.

The results of the study show that the application that translates human speech into feline speech works to some extent. But there is no proof of its reliability. It is in any cases impossible to determine exactly whether the translation coincides with the intentions of cats. Thus cats often come to eat on other cues than the translator app's meow or the call by human voice.

The mixed results obtained from application testing is not discouraging. Even if the experiments are not conclusive, the indicate possible directions for further work. Translation errors themselves are also normal, just remember the history of trial and error in machine translation. Any inaccuracy of the translation can always be explained by the



fact that the technology is not sufficiently developed at the moment. Increasing the number of tests and edits contributes to learning and improving the work of AI and the application.

The positive results are encouraging in terms of creating a technical intermediary in communication with animals. If we can claim that a feline spoken language exists and we can use AI to translate it, then further improvement of the system will only be a matter of collecting the most complete and correct database possible – deliberately including cats and other pets in our conception of a multilingual world.

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Everyday Problems of International Students in the Russian Language Environment

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Abstract

The article aims to reveal the typical problems of international students in the Russian language environment. The authors analyzed essays in which students (N=89) voluntarily described examples of everyday language difficulties they encountered while studying and living in Russia. The article is devoted to the assessment of individual cases and examines the most common problems at three levels of the language environment scale: mega (city), meso (university) and micro (personal). The research showed that the most significant issues that require quick solutions arise in the mega-environment for students with a low level of language proficiency. Thus, moving around the city, shopping in stores, and even more so calling a taxi, going to a doctor, ordering services – these are the tasks of really high complexity for them. Language problems are usually resolved with the help of people around them, using English and/or technical means, and in extreme cases, some of them may be addressed to compatriots. As a rule, the University environment does not create problems that require urgent solutions, but insufficient knowledge of the language significantly complicates the learning process. In personal communication students most often use their native language, which helps to avoid stress, but hinders the rapid learning of a new language.

Keywords: International students; Russian; Chinese; Russia; Language difficulties; Language environment

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УДК 81`246.3 https://doi.org/10.48417/technolang.2022.03.04 Научная статья

Повседневные проблемы иностранных студентов в русскоязычной среде

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Аннотация

В статье ставится задача выявить типичные проблемы иностранных студентов в русскоязычной среде. Авторы проанализировали эссе, в которых студенты (N=89) добровольно описали примеры повседневных языковых трудностей, с которыми они столкнулись во время учебы и жизни в России. Статья посвящена оценке отдельных случаев и рассматривает наиболее распространенные проблемы на трех уровнях шкалы языковой среды: мега (городская), мезо (университетская) и микро (личная). Исследование показало, что наиболее значимые вопросы, требующие быстрого решения, возникают в мегасреде для учащихся с низким уровнем владения языком. Таким образом, передвижение по городу, покупки в магазинах, а уж тем более вызов такси, обращение к врачу, заказ услуг – это задачи высокой сложности для них. Языковые проблемы обычно решаются с помощью окружающих, с использованием английского языка и/или технических средств, а в крайнем случае благодаря соотечественникам. Как правило, университетская среда не создает проблем, требующих срочного решения, но недостаточное знание языка значительно усложняет процесс обучения. В личном общении студенты чаще всего используют родной язык, что помогает избежать стресса, но препятствует быстрому изучению нового языка.

Ключевые слова: Иностранные студенты; Русский; Китайский язык; Россия; Языковые трудности; Языковая среда

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Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



INTRODUCTION

Despite the difficulties that have recently hindered the international exchange of students, it remains an important part of the educational ecosystem. In 2019, in the last pre-Covid year, the number of international students in Russian universities amounted to 297.9 thousand people, and this figure has almost doubled (153 thousand people) since the 2010 academic year. According to the statistics from the Ministry of science and higher education of the Russian Federation, currently, students from abroad study at 688 Russian universities and 465 of their branches. Meanwhile, most of the international students attend one of five higher education institutions. These are Kazan Federal University with 8717 students, Peoples' Friendship University of Russia with 7248 visitors, Moscow University for Industry and Finance "Synergy" with 6123 students, Peter the Great St. Petersburg Polytechnic University (SPbPU) with 4976 foreign students, as well as Higher School of Economics National Research University with 4362 students.

According to the Federal State Autonomous Scientific Institution Center for Sociological Research ("Sociocenter") which operates "Project 5-100" that aims to improve the competitiveness of Russian higher education, about 30 thousand Chinese citizens study at Russian universities. Chinese students enrol in 305 universities in 85 cities, primarily in Moscow and St. Petersburg, as well as in the far East and Siberia. Currently most students from China study at Lomonosov Moscow State University, Peter the Great St Petersburg Polytechnic University, Saint Petersburg State University, the Herzen State Pedagogical University of Russia and Peoples' Friendship University of Russia.

Most Chinese students enrol for full-time education in Russian universities. Only about 700 out of all Chinese students chose part-time education. Chinese citizens who come to Russia prefer state universities, in particular those that are under the jurisdiction of the Ministry of science and higher education of the Russian Federation. In Russian universities they choose in their bachelor degree program such specialities as Humanities and Russian (including linguistics and literature), Economics and management, as well as some engineering and technical specialities, primarily related to construction, machinebuilding industry, electric power and heat power industry. Under the master and postgraduate programs, Chinese citizens study primarily humanitarian and social specialities, Economics and management, pedagogy and art (Where and How Chinese Citizens Study in Russia, 2019).

There are 8,500 international students at Peter the Great St Petersburg Polytechnic University. SPbPU offers a wide range of degree and non-degree educational programs for them: Degree programs in Russian as well as Degree programs in English, short-term and exchange programs (Summer schools, Russian Language Programs, etc.). Chinese citizens are the general group of international students (about 3,000 students).

Such a large number of international students allow us to consider SPbPU as a transcultural University that requires a new level of language competence, cultural and national exchange (Baker, 2016).

The main problem faced by international first-year students is the language of the country of their study (non-native language), the level of which is rarely sufficient for



carrying out the daily tasks including communication, shopping and other errands and learning. Interaction with the external world of the student is based on the language of the host society in one or another of its manifestations.

The Russian language is quite difficult for international students to learn, both in terms of pronunciation and grammar (Kazanina, 2017; Medina et al., 2020; Yang et al., 2020). However, unlike China (He & Chiang, 2016; Jiang et al., 2019), for example, Russian education does not create English-medium instruction, but offers pre-University training programs, Russian language courses. During their studies, international students continue to study Russian as a foreign language, and English as a part of the National Curriculum, together with local students. The need to immerse yourself in a language environment with different Cyrillic and Latin spellings is another challenge for international students (Valieva et al., 2019).

The research of Trenkic and Warmington (2019) confirms that there is a direct relationship between the language, literacy skills and academic performance of Chinese students at the British University. Researchers point out that if students do not feel themselves quite confident as language users, they get into a difficult situation. They are afraid of speaking in front of the class due to shame, shyness, and self-doubt (Girardelli et al., 2020, p. 10). Students understand that people might perceive them as unmotivated or not hardworking (Shin & Sterzuk, 2019, p. 154). Moreover, sometimes the imperfection of language skills causes microaggressions in everyday life, and students do not know how to cope with it (Ee, 2013). The research (Kim & Harwood, 2020) shows that language proficiency influences the desire to interact with international students. Overall, the study of international students of different nationalities around the world indicates that the level of language proficiency linked to academic achievement and sociocultural adaptation (Alharbi & Smith, 2018; Andrade, 2006; Cao et al., 2016; Constantine et al., 2007; Ladum & Burkholder, 2019; Wang et al., 2012; Zhang & Brunton, 2007).

EDUCATION OF INTERNATIONAL STUDENTS AT PETER THE GREAT ST. PETERSBURG POLYTECHNIC UNIVERSITY

During a year international students study Russian either in their home country or at one of the preparatory departments of Russian universities, and also they can take language courses. The Test of Russian as a Foreign Language (TORFL) is offered to prospective students after successful completion of the Russian language course as a part of University Foundation Program. Also at Peter the Great St Petersburg Polytechnic University, there is an opportunity to pass the entrance exam in the Russian language, developed by the teaching staff of the Higher School of International Educational Programs. It consists of two parts that evaluate both the spoken language and the academic language used in the educational process.

SPbPU has been providing pre-University training since 1965. Over the years, more than 16,000 international students from Europe, Central, North and South America, Asia and Africa have completed the program. Educational programs and curricula in all academic disciplines take into account the requirements of the standards of Russian



secondary schools and standards for the first year of higher education. More than 50% of the time is devoted to learning Russian.

For international students who do not speak or do not speak Russian well, universities have special preparatory departments that provide the support necessary for further higher education in Russia. In addition to learning the Russian language, students of the University foundation program study subjects that correspond to their future speciality, and to the extent sufficient for further study at the University. In other words, students not only learn spoken Russian but also the basic vocabulary of their speciality. The University foundation program is designed for one or one and a half academic years, depending on the requirements of the concrete University and the level of training of applicants. At SPbPU educational process takes a year (the total number of hours is 2,376, of which 1,116 are classroom hours), but there are also intensive programs designed for 6 and 8 months. During this period international students also get acquainted with the Russian culture, mentality and the city, where they are going to study. All educational programs meet the state requirements for programs that prepare foreign citizens for the mastering of professional educational programs, which were developed with the active participation of SPbPU specialists. The results of SPbPU research on adaptation processes of international students were also taken into account when researchers were developing the programs. Depending on the future specialization of students, the University training program is divided into three directions: Engineering, Economics and Humanities. Basic engineering disciplines: Russian language, mathematics and physics (additional subjects: computer science and chemistry). For Economics basic disciplines are Russian, mathematics and social studies (optional subjects: computer science and history). The Humanities basic disciplines include the Russian language, history, social science basics (optional subjects: literature, mathematics and computer science).

If applicants have a sufficiently high level of preparation for the future speciality and only need to learn the language, SPbPU has an educational program "Russian as a foreign language." Training in this program allows you to prepare for the first level certification test. That indicates an intermediate communicative competency in Russian as a foreign language. Also, this course ensures the readiness for the comprehensive exam in Russian as a foreign language, the history of Russia and the basics of the legislation of the Russian Federation (for those who want to get Russian citizenship in the future, these are usually citizens of the former Soviet Union republics). Foreign citizens study in groups of up to 12-14 people. Usually they have classroom studies in the morning and in the day time for 5-6 days a week. Independent work of students is provided by both the library fund and electronic resources. For international students a tutor service and excursions are organized around the city, suburbs and university campus. There are also different on-campus activities such as Russian conversation club, the video and music studio "Red Brick," cooking classes, literary evenings, festive and sporting events. During their studies international students receive support from the group of Russian students, which is so-called "Tutor Forces" (a tutor organization of SPbPU). A tutor is both a friend and an instructor. It is a voluntary student organization of Peter the Great St Petersburg Polytechnic University, the main goal of which is to provide a comfortable



and friendly environment for international students in the process of their social and cultural adaptation to life in Russia.

The general forms of tutor's activities include organizing thematic events aimed at introducing students to the traditions and culture of Russia and other countries. Russian students with the support of the University administration have developed a reference guide for international students. Every international student can get it for free in addition to a student ID card. This guide helps them adapt to the new environment and includes the following information: safety tips, emergency actions and medical recommendations, contact details of information services of the city and the University, as well as legal assistance, recommendations on transport, recreation and entertainment, shopping, tourist services, and a mini-dictionary.

In 2020 Peter the Great St Petersburg Polytechnic University and Qingdao Hengxing University of Science and Technology launched a joint educational program to prepare Chinese students for study in Russia. University foundation programs have always been in demand among Chinese applicants. So the opening of foundation courses at the sites of SPbPU university partners in China is a logical step in the context of the coronavirus pandemic and temporary restrictions on movement between countries. During the academic year Chinese students will study Russian language and other disciplines in Russian according to the profile of the future speciality. Chinese teachers will teach them based on the methodological materials of their colleagues from SPbPU. Also, the Polytechnic University teachers will conduct weekly online lessons in selected disciplines and Russian, and at the end of the year they will come to Qingdao for full-time final exams.

Students from the former Soviet Union republics tend to consider themselves as people who know the language well since they used to speak Russian in their homeland. They do not feel a significant perceived cultural distance from Russia (Galchenko & van de Vijver, 2007). They watch Russian TV channels, learn the language at school and read books in Russian. In fact, despite a good understanding of the spoken language, they have little knowledge of the scientific language, and their written speech can be grammatically incorrect.

FINDINGS AND DISCUSSION

At the end of the first semester (December 2019 – January 2020) international students of Peter the Great St Petersburg Polytechnic University took part in writing a free-form essay about the language difficulties they encountered when they arrived in Russia. Students also assessed their proficiency in Russian and English. Students of the first year of bachelor and master degrees took part in this research. Undergraduates had not got their bachelor degree at Russian universities, so this was the first semester of study in Russia for all of the participants of the group under research. The sample consists of 89 students, 68 of them are Chinese citizens, and the rest are from different countries: Mozambique (1 student), Bolivia (1 student), Vietnam (1 student), and also from Uzbekistan, Turkmenistan, Tajikistan (a total of 18 students). All participants voluntarily



agreed to participate in the research, and are aware of the use of their essay data in an anonymous form.

We would like to note that when discussing language difficulties, students wrote about either difficulty in multilingual space or linguistic problems related to the learning and use of the Russian language (we do not consider the latter in this research). Analyzing language difficulties, we get into the world of human interaction with the outside world, in the learning of cultural practices considered as an integral part of the language (Rafieyan et al., 2014). Most students believe that their problems with an orientation in various life situations to be language issues. The practical reason for this may be when faced with such circumstances (moving around the city, currency exchange, shopping, food, receiving services, etc.) in the native language environment the young person will somehow be able to get the necessary information to make a decision.

The student comes across a defined language in material culture, which includes a variety of objects: from food and kitchen utensils, furniture, technical devices, stationery and books to buildings and monuments (Aronin, L., & Laoire, 2013, p. 227; Aronin et al., 2018). Or they may also encounter language in the course of oral or written communication. We divide all the covered problems into three levels according to the scale of multilingual space (fig. 1).



Figure 1. Multilingual space segments from the student's perspective (Bylieva et al., 2021)

Macro multilingual space

Macro multilingual space for international students is a city, considered as a set of material objects that carry a verbal message on the streets, in shops, canteens, banks,



medical, entertainment institutions, in transport arteries, and people who do some work or simply move around the city. Students interact with them for whatever reason.

Although students come to Saint Petersburg and immerse themselves in the Russian-speaking environment, their level of English proficiency is also a significant factor if it is higher than Russian. Material urban culture and partly University culture consider English as a second language, lingua franca. Speaking English, international students can communicate with a significant part of the local people.

A student from Mozambique describes the difference between the language environment of Saint Petersburg and a small city near Saint Petersburg – Pskov, where she had started her studies:

In Pskov, almost no one spoke English. It was very difficult for me because I could not communicate with anyone or express myself. In Saint-Petersburg the situation is different, more people speak English. And Whenever I needed help, they understood me and helped me (01Mozambique05R09E)

Numbers in addresses is another challenge for students from China. Several young people described mistakes in house numbers that they made, confusing the position of number in the numerical digit. In general, the entire visual sign system of the city, including letters, numbers, and drawings, is not always clear to the newcomer:

When I first came to Russia, I did not understand the road signs and bus and metro signs in Russian. I got lost several times and decided to stay at home more often and communicate only with Chinese friends (40Chinese04R05E)

When international students get into an unfamiliar language environment, they get lost, feel insecure, and it takes a lot of effort to do ordinary things. Individuals with low levels of Russian and English proficiency tell about some of the consequences of "linguistic mutism" emotionally, even though these results may be sad. A person describes himself as not knowing what to do and very concerned. When the student did not know how to get to the right place, how to change money, how to rent an apartment, only a "linguistic intermediary" solves that sort of problems. In most cases, it was a familiar compatriot who knows Russian better. Relatives, friends or fellow students, who acted as a means of universal protection from the difficulties of the urban language environment, solved all situations that the students could not cope with themselves. Although such challenges cause stress for an international student, we reckon that they are one-time and contribute to the acquisition of experience. There was no repetition more in any of the essays.

The only case, when compatriots played a joke on a student from Turkmenistan, is connected with her first acquaintance with a subway:

It was the first time I saw the subway in my life since we have not got one. I did not know how to get through the turnstile in the subway. My friends said that I had to give my first and last name when crossing the turnstile, which, of course, looked ridiculous. Unfortunately, it was my first time here. I did not understand anything at all, as if I had fallen from the moon. As a result, I said my first and last name loudly to get through the turnstile, and it did not open. It was the first



joke from my close friends. I felt ashamed, but I kept myself in my hands. Then a subway employee came up to me and explained that I need to buy a token or buy a travel ticket (03Turkmen).

The residents resolved less difficult situations, which in most cases showed hospitality and a desire to help (8 against 1 episode of microaggression on the part of an 8-year-old boy). International students also mentioned other ways to solve this sort of problems: by using technical tools (Internet translators, Google maps, an app for metro rides, etc.) and implementing their English speaking skills (by those who have a level of English proficiency significantly higher than Russian).

A Chinese student says that having settled far enough away from the University, she experienced difficulties, and even passed her bus stop. However, further she shares her positive experience: "After a few days, I got used to it. And even the bus drivers told me: "Chengxin, we reached your stop". I appreciate drivers' help" (01Chinese04R07E).

Another example of a successful solution to a problem related to transport:

When I first arrived in Saint Petersburg, I took a taxi for the first time. I could not communicate with the driver, so I was worried very much. Then the driver started talking to me using an electronic translator, and I finally got to my destination safely. The driver also told me: "Welcome to St. Petersburg". It makes me think that the Russians are very friendly.

In the next case a student uses an online translator after having several attempts to solve a problem with the help of passers-by:

To save time, I asked the local Russian for the address of the University preparatory course, but I did not speak Russian well enough. A few times I failed it. Finally, I used a translator app on my mobile phone to explain which University I needed (50Chinese06R05E).

Unlike Chinese-Russian translation, which has long been supported by online translators, some students from the Eastern republics had not this advantage in the fall semester of 2019. For example, the Turkmen language appeared in Google translator only in February 2020.

Overall, one of the main challenges related to the language environment of St. Petersburg, which students described was relevant to transport (35 mentions). A large city with the complex transport arteries: a subway, hundreds of bus routes, trams, trolleybuses for new arrivals turn out to be a trap. Even at the airport in St. Petersburg, where most of the information stands and signs are in Chinese, students from China experience difficulties that they attribute to a lack of understanding of the language (5 people). One of these students writes:

Boarding was a big problem for me, because everything was in Russian. I could not find a place to store my luggage and get tickets. I almost missed the departure time (03Chinese05R06E).

Most frequently, students do not understand what customs officers and other airport employees told them:



Because I did not know what the personnel was saying or what they wanted me to do, I ignored what was said. Every time I said "Yes" or "No". So when the officer asked me to take off my glasses, I also said "Yes". At that moment he got angry, but I did not say that deliberately. Then a Chinese man who knew Russian and was near me explained what they wanted from me, and I was confused (19Chinese04R03E).

The language landscape of the Saint Petersburg metro is Russian-English. The names of all stations are transliterated in Latin letters on all diagrams and signs, and there is no Chinese language. Students complain that they can not find their way around, do not understand where to get in and out, can not understand the names of the announced stations because of the noise, and often end up in the wrong place. Students often turn to other passengers for help – with more or less success:

Metro. In my opinion, this is the place where I most often made mistakes. I missed the stations and could not find my line. And it was very difficult for me, but I asked everyone. Some of the people helped, and some did not (01Chinese04R07E).

Many of the students found a technical solution in the form of maps, apps, and so

on:

I had problems on the subway. I often missed stations, got lost, but I was helped by passers-by who told me which station to change at, which one to get off at. But over time, I got used to it and downloaded a metro map to my phone (02Chinese05R05R).

However, at the same time the students recognize the benefits of using the metro:

I think that the metro ride here is very convenient. It is much more convenient than the city I live in. The metro here covers the whole of Saint Petersburg. It is very convenient to go where I want to go, so I want to get a metro map. When I first entered one of the metro stations, I found an employee to ask him, but I could not understand him because I still didn't speak Russian well. I really couldn't do anything about it. But I had one senior international student with me who helped me in time (50Chinese06R05E)

Although the metro most often causes problems, there are also problems with other public transport and taxis. Students can technically manage the process of communication during taxi rides with the help of apps. At the same time, this action also implies interpersonal interaction, which, as a rule, causes the greatest difficulties. And even more so when they use phone calls for clarification. A separate problem is a situation when the taxi driver himself speaks Russian poorly, which is quite common when using budget taxi aggregators where people from the former Eastern republics of the USSR work. But on the other hand, as it turned out, such a situation can be useful, for example, when a student from Tajikistan meets a compatriot taxi driver at the airport, helping to get to the University.

In studies Park et al. (2017), Spencer-Oatey & Xiong (2006) international students in English – speaking environments noted that they rarely experience communication



difficulties while shopping. But as a result of this research, we found out that shopping is one of the most popular sources of problems (40 mentions). The language landscape inside the stores is exclusively Russian, except for the city centre. A student often buys the wrong product, having difficulty reading the price tags. Students gave such examples as situations when they bought carbonated water instead of regular water, salt instead of sugar, pork instead of beef, and sugar instead of semolina. One student always ordered only black coffee in the students' cafeteria, because he did not know any other drinks and how to ask for sugar. Another student could not buy laundry detergent:

One day I went to the supermarket to buy laundry detergent, but since I could not read the product description, I bought several bottles of softener (37Chinese03R04E)

The situation was even more complicated in budget canteens, where the menu with names is only in Russian, and there are often handwritten price tags, which are difficult to translate as well as read them. Problems increase when direct communication with sellers and waiters is required:

it was getting colder and colder. But I had only a sweater here, because in China it was not very cold in winter in comparison with the weather in Russia, which was colder than I thought. So I had to go to a shopping centre to buy a warm jacket, but my Russian was too bad. When I first went shopping at the mall, I saw suitable clothes, but I did not know how to tell the seller that I needed a smaller size. I stood there for a while, embarrassed, but then I bought some clothes of my size (50Chinese06R05E)

Some students often respond inappropriately to the questions of the cashier at the checkout in grocery stores:

I just wanted to buy only cigarettes. I went to the supermarket and asked if there were any cigarettes. The seller replied: "Certainly! Which ones do you want?" I just answered: "Red cigarettes". Then she asked me again: "Do I need a plastic bag?" And I answered the last question without understanding: "Yes, Yes, Yes!" I had thought I would know for the future, it might be useful. I got this, and it was an 'interesting' experience (44Chinese05R05E).

The cashier announced the amount of money to be paid, and it turned out to be a problem for five students:

At the supermarket I get confused because I do not know the total amount to be paid. I use a 5,000-ruble note every time I pay for my purchases (04Chinese06R06E).

And there is the alternative solution: "I can show the money to the cashier and let him take it"(27Chinese04R01E).

The more complex the purchase, the more intense the communication required, and the more problems there may be, for example, when buying medicines at a pharmacy. The same issues are associated with going to the doctor, issuing a bank card, etc.



Technical mediation of oral communication further complicates interpersonal communication.

Many students pointed out the inability to talk on the phone when it was necessary (specifying the address to the taxi driver, talking to the landlord, ordering food at home, and other services):

When we first arrived at a dormitory, there was no Internet. Our friend told us that we may book the Internet by phone, given on the billboard in the lobby of our dormitory, but my level of Russian was low. I tried to call in order to make an appointment. During the conversation they asked me if I needed to get the Internet connection. I replied that I did. And then they asked me if I had a router and a network cable and needed a TV? I did not understand the operator. I could only answer and repeat: "Yes, Yes". I did not understand anything and wanted to end this phone conversation. Then we found a friend who spoke Russian very well. We called again, answered questions and gave them my address. After that, we confirmed the time. The next day we got the Internet installed (44Chinese05R05E).

When visiting cultural places and different sights, students rarely experienced difficulties (2 stories). They give examples with vague captions in the names of objects in museums and the inability to get a free ticket to the Hermitage:

In the first month of my arrival in St. Petersburg, I went to the Hermitage. Then I found out that there were a lot of people in the queue to buy tickets. The staff asked me if I had a student ID card. But I did not understand anything at that time, so I just paid for the ticket. At home my friend told me that I had wasted my money(43Chinese03R07E).

Meso-language environment

The mesolanguage environment for an international student consists of the place of study, the University as a set of language carriers of material culture (inscriptions, signs on the campus, announcements, educational materials) and people who are the participants in language interaction at the University (teachers, staff and students of SPbPU).

The University language environment requires more language immersion than the city environment, due to the active exchange of information. However, stressful situations are less common here. The description of potentially dangerous consequences of language problems here is not directly related to study but to organizational issues, such as paperwork and red tape (visa, migration card, dormitory, etc.). For example, one student almost missed the deadline for visa processing. There are also problems with not understanding the schedule. So, the student got into the wrong class or at the wrong time at the beginning of his study.

Although the problem of understanding during the lectures and active working at seminars is mentioned quite often, they write comments facing it only at the beginning of their studies. Then everything has returned to normal. Now they follow a lecturer and participate in seminars:



It was very difficult for me in the classroom, although I studied Russian in China. I could not learn all the information in class. After classes, I analyzed everything and asked my classmates what they were talking about. But after a while, I got used to it. I have already started speaking in class and adding comments to presentations (02Chinese05R05R).

The rapid pace of presentation of the new material and the process of intra-University communication caused a great number of problems. Students emphasize that they need time to comprehend what was said:

One research supervisor always shouts when he talks to me, but I can hear quite well and understand slowly (68Chinese00R).

Another example is a situation when a teacher of university foundation program, changed the way of teaching, focusing on the middle level of the group:

We have been studying at the University foundation program for two weeks, but my Russian has not improved at all. It was very annoying because the teacher was teaching too fast. I had never studied Russian before, so I did not understand anything she said in class. I saw that the teacher also noticed that, and began to explain the material more carefully. It was moving. So we try to learn well, and we will continue to work hard as well (50Chinese06R05E).

Expressing your own thoughts, including the process of translation from the native language, remembering grammatical structures and choosing correct words also takes time. In addition, there is a fear of saying the wrong thing, which makes it hard to learn it in general.

We, international students, have a language barrier/phobia, fear of speaking with mistakes. So we think and repeat the speech for ourselves before saying something (10Turkmen08R03E).

One of the supporting factors in learning is fellow students. Students with the same native language sit down together and try to help each other. Scientists have noted in research the desire of international students to switch to their language as soon as supervision or evaluation ends (Murphy & Potvin, 2017). International students point out in their essays that local students tend to be caring and provide support in educational matters:

When I first went to a class at my University, I found out that people from other countries do not know Chinese. Fortunately, someone who knows the Chinese language, came after a while. When the teacher came, he just gave us a lecture, but my level of Russian was not very good. When the teacher asked us to take notes, I had not had time to write down many words. At this time, I was watching my Chinese groupmate, who was next to the teacher. I did not write. At the end of the lesson, a Russian groupmate enthusiastically asked me if I had done it, and then shared his notes with me (50Chinese06R05E).



However, students feel a sense of shame and anxiety because they cannot participate in group tasks on an equal basis with all other students in the group:

I felt myself completely helpless when I was working in one team with my Russian groupmates, completing together tasks, because they knew how to do them correctly following the requirements of the teacher but I did not know how to do anything, and this made me feel ashamed. For example, after splitting us up for group work, my part of the task always does not match the task. To do it correctly, every time I need the help of my Russian classmates (40Chinese04R05E).

Students note that they need to do a lot of translation work to understand the materials that are studied in the classroom and to sort out the scientific, professional texts of the coursebook. At home students analyze other notes of their groupmates, photos they took from the blackboard, etc. In some cases, students try to find the appropriate educational material in their native language but do not always succeed. Unable to cope with a flood of new information in the classroom, international students often ask local groupmates to explain what was discussed and borrow notes. However, the handwritten notes turn out to be a new challenge:

A Russian student sometimes lent me his notebooks. I find it hard to understand what it says. The handwritten text looks like an encrypted curse (03Chinese05R06R).

One Chinese student considered learning English as an inconvenience. He associated English with reading handwritten texts. He claims that he confuses the handwritten letters of Russian and English (52Chinese03R05E).

Only three students reported confusion in reading Russian and English letters. There is also a problem of teaching English in Russian at the University.

When communicating with people around them, students highlight a lack of understanding of jokes, local cultural realities (for example, customs, holidays, etc.). For example, a Chinese student was offended by the saying "No fluff, no feather". This is a traditional Russian idiom, which wishes good luck before the exam (*English equivalent: Break a leg!).

Although we have already mentioned that modern technologies often help in solving language problems (primarily, online translators and various applications), it turns out that a technogenic virtual environment is also fraught with some difficulties. An online translator does not always help you communicate. Students indicate translation errors and lack of translation flexibility, both for everyday communication and for study:

It told us: "Keep in touch". And we did not understand the meaning of this saying. At that moment we realized that after the translation via the online app, we still were not able to understand anything. Then I looked up the Russian dictionary, looked carefully at the meaning of each word, and finally found out that we could leave the classroom (44Chinese05R05E).

However, when it comes to professional terms, even Russian-Chinese dictionaries do not help.

Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



Micro-language environment

The micro-language environment is represented by the closest possible circle of students' communication, which they choose for themselves, as well as objects of material language culture, which they surround themselves with. The personal language environment is often dominated by the native language. Students who come from the same country tend to communicate with each other and try to stay in dormitories together. This sense of community was especially typical of the students coming from China, Uzbekistan, Turkmenistan (Anosova & Dashkina, 2020).

After classes international students also stay in groups and at least maintain Internet communication for joint learning tasks. Language difficulties in regards to being roommates were noted by those who lived together in a dormitory or rent an apartment with other international students whose native language was different. However, their proven stories about mutual assistance and support in the student environment are more important than language barriers:

I wanted to make my lunch, but I did not know how to make soup. I asked the girls for help to show how to make chicken soup. And my neighbours from China helped a lot (12Turkmen)

The penetration of the local language into the personal environment has a positive effect on language practice. A study Gibbs et al. (2020) confirms that a large number of connections with compatriots had inverse relationships with both psychological adjustment and sociocultural adaptation. And local friends increase sociocultural adjustment. Researchers (Kudo & Simkin, 2003) point out that one of the significant factors in forming friendships is self-disclosure based on language skills, while international students tend to be nervous and silent when talking to native speakers. With a low level of language skills, it is difficult for students to make local friends.

I came to Russia. I wanted to be a part of local life. Last year I had many opportunities to make friends with Russians. But, I could hardly speak Russian. I only used gestures and translations due to having language problems. So, unfortunately, it was hard to make a friend (37Chinese03R04E).

Analyzing the essays, considering them as a part of our research, we also found out pieces of evidence of the facts, which Chinese students in Britain identified as the most difficult issues (Spencer-Oatey & Xiong, 2006). Four of them indicate the problem of understanding of humour due to its ambiguity, which is common among Russian students. According to one of the students, this problem creates obstacles in friendship: "I can not laugh together with my Russian groupmates during the break, but they often gather to eat and have fun" (63chinese04R).

However, in our analysis, we found that language is not an insurmountable barrier to friendship:

Later I had a Russian friend. At first, communication was uncomfortable. They do not speak the official language, and I often do not understand colloquial phrases. I have already begun to understand many oral expressions. For example, what



does the word "Cheo?" mean? Pronunciation is already clear, and I can follow the conversation even on the phone. I am happy now (53Chinese04R08E)

Some of the older students came to Russia to study for a master degree. Some of them tried to build relationships with local girls. Sometimes it was accompanied by even greater language difficulties than with just making friends:

I like Russian girls. They are beautiful. But dating outside of University causes unexpected difficulties. For example, I thought we had love dating in clubs, bars, but it turned out that I just need to pay money for her (65chinese03R)

The material items acquired gradually bring the Russian language into the personal space of students. However, the greatest challenge for many students was the keyboard (there are six mentions in Chinese essays):

At the beginning of training, it is difficult to remember the order of letters on the keyboard. Every time I want to type a text, I need to search for a letter by letter. Entering words is very slow (04Chinese06R06E)

Another student writes that such slow text input can be annoying when they chat on a social network with groupmates.

The personal space also includes English, as students meet a different kind of English texts on products sold in Russia and on the Internet (primarily, in site addresses, emails, etc.)

One specific feature of Russian Internet communication is the possible replacement of the use of the "smile" symbol, which means a smile, with a single or several consecutive closing brackets. These brackets puzzle international students:

The first time I saw a few parentheses at the end of a sentence, I did not understand what happened, did it mean that the speaker was wrong? Later I learned that a bracket adds friendliness and courtesy (03Chinese05R06E).

CONCLUSION

Although researchers traditionally consider that life in the country, where the language is spoken, is valuable in all respects (Krundysheva & Gubareva, 2020), the language itself is a great challenge. This research reveals the peculiarities of the challenge for international students in Russia. We found out the following pattern: in the Russian environment with a low level of proficiency in Russian and English, stress for an international student is high. The higher the level of language, the less stress. As a result, ways to overcome difficulties become more effective.

We see that the urban language environment turns out to be a complicated world with which the students have to interact solving various tasks. Some students, who come to Russia to learn Russian, initially have a low language level. Thus, moving around the city, shopping in stores, and even more so calling a taxi, going to a doctor, ordering services – these are the tasks of really high complexity for them. They try to avoid the macro environment from the very beginning of their study at the University, by closing themselves in communication with their compatriots. As a rule, they begin to voluntarily



interact with the external environment only when they begin to gradually acquire the necessary language skills. However, there is always a forced interaction with the megaenvironment that requires a quick solution. Language problems are usually resolved with the help of people around them, using English and/or technical means, and in extreme cases, some of them may be addressed to compatriots.

At the University there is the average level of the language environment for a student. Problems related to the language rarely require a quick solution there, but they form the background of student life. Constant incomplete understanding of educational material requires a lot of additional independent work. At the same time peer support has been developed both from local students and within language groups. Students often use online translators and dictionaries there, but using only that kind of support is not enough for the educational process at University when students study authentic professional materials.

Initially, the student micro-language environment is mostly native. However, the Russian language gradually penetrates there both through different physical objects and via interpersonal communication. One of the first and most difficult objects is the Russian keyboard, which requires Chinese students to master for a long time. Making friends is also difficult because of language problems. But when it happens that international students make new friends among local students, it is seen as a great advantage.

The study of students' language problems at several levels makes it possible to conclude the need to take appropriate measures at the University to reduce the number and level of problems related to language. Taking them into account gives us an opportunity to put an appropriate emphasis on the University foundation programs for international students, as well as to make the welcome course more effective.

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Industrial Music, Noise, and the Sound of Machines

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Abstract

The industrial revolution gave rise to many new, previously unheard sounds. The howling and grinding of machine tools, the rhythmic blows of jackhammers - all these sounds began to accompany everyday life for many people. Their life was filled with "machine sounds." At this moment, "Industrial" was born as a genre of music. Its main feature was that the musical instruments were replaced by the noises of factories and trains familiar to ordinary workers of that time - the sounds of the New Era. The resulting music carried a rebellious character, it was rather dynamic and rhythmic, allowing the composers and producers to show the progressiveness and variability of the world which manifested itself in the mechanization of production. After having fulfilled its initial function, Industrial music was initially forgotten, taken up by other, more contemporary musical genres, some sounds borrowed by electronic music. We analyze many compositions from the early days to contemporary Industrial music, here discussing as striking examples Psyche Rock, Strette, Third Reich from the Sun, considering also the mechanical sounds that form the basis of this genre: guillotine, mechanical press, lathe. Technical sounds in industrial works are not only a complementary part of the work, in some pieces they also occupy a dominant position. We also show that compositions of industrial music can cause completely different emotions. For example, compositions of the Noise style mainly evoke a sense of frustration, the inevitability of failure. Aggro Industrial inspires people to act, gives them a feeling of close victory. Deaf and distant sounds in Percussion Industrial induce a sense of alarm, confusion. We also trace the chronology of the appearance of certain mechanical sounds in music. So, in the earliest works, for example, performer use the sounds of a guillotine cutting metal. In other works one can hear radio or TV interference. One can also hear absolutely modern sound, familiar to all of us from contemporary technology, such as sounds of a microphone.

Keywords: Industrial revolution; Machine sound; Industrial; Mechanical sounds; Noise; Music

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Индустриальная музыка, шум и звук машин

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Аннотация

Промышленная революция породила множество новых, до этого не встречавшихся звуков. Вой и скрежет станков, ритмичные удары отбойных молотков – все это для многих людей стало олицетворять повседневность. Их жизнь была наполнена "машинным звучанием". В этот момент и зародился такой жанр музыки как Индастриал. Основная особенность его заключалась в том, что музыкальные инструменты были заменены на привычные простым рабочим того времени шумы заводов, фабрик и поездов – звуки "Новой эры". Сформировавшаяся музыка несла в себе бунтующий характер, характеризовалась динамичностью, ритмичностью, что помогало передавать авторам прогрессивность и изменчивость мира, которые проявлялись в механизации производства. Выполнив свою первоначальную функцию, Индастриал музыка постепенно забылась, растворилась в других, более современных музыкальных жанрах, некоторые звуки были переняты, заимствованы в электронную музыку. Мы анализируем множество композиций от ранних дней до современной индустриальной музыки, обсуждая здесь в качестве ярких примеров Psyche rock, Strette, Third Reich From the Sun, а также механические звуки, составляющие основу этого жанра, наподобие: гильотины, механического пресса, токарного станка. Технические звуки в произведениях индастриала могут являться как дополняющей произведение частью, так и занимать главенствующее положение. Композиции индустриальной музыки могут вызывать совершенно разные эмоции.. Так, например композиции стиля Noise, преимущественно, внушают слушателю чувство разбитости, неизбежности провала. Aggro Industrial внушает людям мотивацию к действию, даёт им ощущение близкой победы. Глухие и отстранённые звуки в Percussion Industrial внушают тревогу, смятение (Einstürzende Neubauten - Tanz debil). Мы также прослеживаем хронологию появления тех или иных механических звуков в музыке. Так, наиболее ранних произведениях, к примеру, используются звуки гильотины, разрезающей металл. В других работах слышны можно услышать радио- или телепомехи. В музыке индастриал можно услышать и абсолютно современные, знакомые всем нам звуки техники, например, звуки микрофона.

Ключевые слова: Индустриальная революция; Звук машины; Индастриал; Механические звуки; Шум; Музыка

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Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



INTRODUCTION

Technologies changed the life of a modern person in many aspects, including changes of the soundscape and introducing a new kind of noise that differs from the sounds we know from nature and human daily life. Although mechanisms could creak and groan even before the industrial revolution, this revolution was the reason for the birth of a variety of sounds that accompany a person in factories, streets and later in houses.

The first theoretical mention of the inclusion of industrial noise in music can be considered the manifesto of the Italian futurist Luigi Russolo "The Art of Noise," which was published in 1913.



Figure 1. Arseny Avraamov conducts the *Symphony of Sirens* using flaming torches. Moscow (1923)

The sounds of machines in the twentieth century actively penetrated variety into of musical a There compositions. was an industrial direction, electroacoustic music (in which coughing can turn into the sound of a starting motor or car beeps turn into a game of wind instruments).

The famous Russian director Dziga Vertov, in his youth dreamt of the project of a Hearing Laboratory: "One day, in the spring of the 18th, returning from the railway station, I heard the rumbling of a departing Someone train in my ears. pronounces an oath, a kiss, someone makes excuses. Laughter, whistle, voices, the sound of a station bell, a puffing steam locomotive. whispering, farewell. I crying, thought to myself during the walk: I need to find equipment that will not describe, but record, photograph these sounds. Otherwise, there is no way to organize, edit them. They run into the past like time" (as cited in Safonov, 2017).

In Russia Industrial music is associated with the name of Boris Yurtsev, who proposed in a 1920 article "Orchestra of Things" the idea of creating a device for each branch of a noise orchestra using production



materials, which were specific to it. Thus, according to Yurtsev's idea, the instruments of the orchestra of metalworkers should consist of various combinations of steel, copper, cast iron, etc. (Dudakov-Kashuro, 2015).

Despite Yurtsev's creative approach, his ideas have never been translated into reality, although many different works have entered the history of noise events, the brightest of which are Eisenstein's last theatrical production *Gas Masks* and the *Symphony of Sirens* (1922) by Arseny Avraamov (fig. 1).

Kurt Vonnegut's (1974) novel *Player Piano* of 1952 describes how the sound of machines becomes music:

At the door, in the old part of the building once more, Paul paused for a moment to listen to the music of Building 58. He had it in the back of his mind for years to get a composer to do something with it – *the Building 58 Suite*. It was wild and Latin music, hectic rhythms, fading in and out of phase, kaleidoscopic sound. He tried to separate and identify the themes. There! The lathe groups, the tenors: *"Furrazz-ow-ow-ow-ow-ow-ak! ting! Furr-azz-ow-ow...*" The welders, the baritoners: *"Vaaaaaaa-zuzip! Vaaaaaaa-zuzip!*" And, with the basement as a resonating chamber, the punch presses, the basses: *"Aw-grumph! tonka-tonka. Aw-grump! tonka-tonka...*" It was exciting music, and Paul, flushed, his vague anxietes gone, gave himself over to it. (p. 19)

Noise is something disturbing, irritating, unlike music that gives harmony. David Novak (2015) calls the noise as "a keynote sound of industrial development and mechanization." At the beginning of the century, Luigi Russolo claimed noise as the basis for the future of music and stated that intense, prolonged, and varied noise sounds were only possible in the modern era due to the proliferation of machines: "Ancient life was all silence. In the 19th Century, with the invention of machines, Noise was born. Today, Noise is triumphant and reigns sovereign over the sensibility of men" (Russolo, 1986, p. 23). Russolo himself created many noise mechanisms, such as the Whistler, Fuse, Kwakun, and others. Each of them was designed to extract one type of noise. Jacques Attali (1977/1985) adds to this by declaring:

All music, any organization of sounds, is thus a tool for creating or uniting a community [...] This is what connects the center of power with its subjects, and thus, more generally, it is an attribute of power in all its forms. Therefore, any theory of power today should include the theory of localization of noise and its endowment with form. Among birds, a tool for marking the boundaries of a territory, noise is inscribed in the arsenal of power from the very beginning. (p. 6)

LITERATURE REVIEW

The genre of Industrial music is radically different from all other musical styles. It does not use classical music or rule-bound structure because the whole composition is built on the basis of the author's ideas.

Mick Fish notes that with their noises, cut-ups, walls of sound, ethnic strains and synthesized bleeps, the early Industrial groups were awash with the flotsam and jetsam



of modern life. A snapshot in time. It wasn't that different from the Dadaists and surrealists of the twenties who had jumbled up and reassembled their version of reality (Fish, 2002, p. 189-190).

David Novak is the one who gave the best and most comprehensive description of noise and it's meaning: His studies have found in noise a subject of deep fascination that cuts across disciplinary boundaries of history, anthropology, music, literature, media studies, philosophy, urban studies, and studies of science and technology. Noise is a crucial element of communicational and cultural networks, a hyperproductive quality of musical aesthetics, an excessive term of affective perception, and a key metaphor for the incommensurable paradoxes of modernity. "Wherever we are," John Cage (1961) famously claimed, "what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating" (p. 3). We hear noise everywhere. But what do we listen to when we listen to noise? What kinds of noises does "noise" make? (Novak, 2015; Webb, 2019).

In information theory, noise opposes organized communication and is understood as a hindrance. Yuri Lotman emphasizes its entropy and attributes all types of destruction to noise. Noise is "the intrusion of disorder, disorganization into the sphere of structure and information" (Lotman, 1998, p. 84). At the same time Lotman notes that a person is able to transform noise into information. It "complicates its structure due to correlation with the external environment," and "everything foreign that can correlate in one way or another with the structure of the author's text ceases to be noise" (Lotman, 1998, p. 85). The transformation of "noise" into artistic information comes with the inclusion of nonartistic factors in another – artistic – reality and allows one to hear music in the clink of a spoon in a glass (as Sartre wrote), in the creak of a door (as Heidegger points out), in the squeak of a weak mouse (in Kafka's "Singer Josephine, or the Mouse folk").

At the same time, we must not forget that the opposite of noise is not music, but silence. As Jacques Attali (1985) notes, "Our science has always sought to track, measure, abstract and castrate meaning, forgetting that life is full of noise and that only death is silent: the noise of work, the noise of man and the noise of an animal" (p. 3). Therefore, industry in opposition to music expanded its boundaries, mixing technology and art: Pascal Bussy (2005) writes that "The German Krafwerk Group [...] illuminat[ed] the path to a more technologically motivated future" (pp. 17-18).

METHODS

A study of the genre was conducted as part of our exploration of the sounds of technology in Industrial music. We have identified several directions in it such as Noise, Aggro-Industrial, Concert music, etc. In each of them, we listened to 8 to 10 tracks which served as the basis for further research (we compiled criteria based on 60 to 65 units of tracks listened to). For each of the styles or directions of Industrial music we determined which sounds are most often heard in the tracks, what influence they have on the listener, to which epoch the sounds belong. This allowed for a comparative analysis of the selected tracks.



THE BEGINNING OF "INDUSTRIAL" MUSIC AND ITS SOUNDS

The beginnings of Industrial music date back to the beginning of the 20th century. However, the emergence of "Industrial" as a clearly separate genre of music occurred only in the second half of the same century in Germany and the USA A great variety of sounds were used in those compositions: blows on heavy metal with hammers (both jackhammers and conventional ones), timpani (rarely a simpler replacement in the form of empty metal barrels was mainly used instead of them), early types of synthesizers, metal clanging, the rumble of iron beams falling on concrete, machine-like electronic oscillators and psychedelic pop rhythms that differ from modern, more familiar ones. The combination of such instruments created an unusual feeling for listeners, since rock music was already commonplace at that time (Beckett, & Fairley, 1944; Hanley, 2011; Harrison, 2017; Howard, 2017).

Industrial and Post-Industrial Music

The definite formation of Industrial as a genre is associated with the names of the



Figure 2 Stefan Weiser – Z'EV. Preparation for the performance with the album
"Production and Decay of Spatial Relations," where all kinds of pipes and fittings were widely used (1981)

bands Throbbing Gristle (founder of Industrial Records), Cabaret Voltaire, and SPK, as well as musicians Boyd Rice and Z'EV (fig. 2).

For example, in the compositions of the pioneering Throbbing Gristle group there are hard aggressive rhythms, on top of which distorted noise samples are superimposed, which were not used before in the works of other initiators of Industrial. Industrial musicians immediately applied all available innovative technological solutions and invented their own mechanisms and technologies.

The German group "Terrorfakt" can also be distinguished among the notable figures of early Industrial. Unlike many other bands, that used more "primitive" instruments, "Terrorfakt" at their concerts resorted to using construction drills, sheets of iron, saws, sometimes small concrete mixers along with traditional rock tools. At the same time, the sounds of guitars and bass were repeatedly distorted, and the vocalist's voice was also processed.



Over time, like any other style of music, Industrial was divided into many different directions, putting an end to the era of "classical Industrial" and starting a new "post-Industrial" era (Broqua, C., & Douris, 2018; Reed, 2013).

Despite the aggressive nature of Industrial music itself, one finds quiet melodies among the post-Industrial compositions, the use of machine sounds in them is noticeably less. Basically these are works of the Ambient genre, the main sound in which are the sounds of synthesizers, a piano, utilities, as well as, quite rarely, male or female voices.

Another direction is Dark Ambient. The similarity of these two directions is quite understandable: If Ambient tries to convey the entire palette of colors, Dark Ambient paints everything black with the sounds of cracking and breaking glass.

Aggro-Industrial and Percussion Industrial are some of the directions closest to the era of classical Industrial, involving a large number of industrial sounds. Among them, the sounds of sirens stand out, also radio and TV interference, the work of the press at the factory, circular saws, machine tools, glass breaking and much more.

The direction of Noise is the brightest representative of the "post-industrial" era, at the same time it preserves the ideological heritage of Industrial music. Here we can find pronounced distortions of sound, the work of old mechanisms, machine tools, industrial presses, as well as interaction with both Aggro-Industrial and Percussion Industrial music.

Boyd Rice, a pioneer of Noise, was involved in the construction of noise generators and various strange instruments. For example, he made a guitar with a fan attached to the strings. His first disc had 3 closed tracks, the next two discs had from two to four holes, several closed tracks and a recommendation to listen to the disc at different speeds.

Misique Concrete is one of several other representatives of "post-industrial" music. It tries to resemble Ambient and carries a slightly different content. This can be traced to the use of similar instruments such as piano or synthesizer. However, the sound of these instruments is used in a distorted form, without creating a kind of holistic composition, more like trying to learn how to play these instruments. Nowadays, Misique Concrete is more like an offshoot of jazz music, although in this direction it is quite possible to hear sounds characteristic of Industrial, such as the tapping of iron pipes or tin dishes, as well as industrial hum, knocking and crowd sounds.

In 1926 composer Vladimir Deshevov worked on the music for a theatrical production called Rails in the genre of melodrama. One result was a laconic, but unusually expressive piano miniature. This is one of the first examples of railway music in Russia. In Rails the rhythm and movement of machines was depicted by musical means and sound editing was used along with orchestral music. In the piano piece, Deshevov put paper on the strings of the piano for a muting effect, thus using "prepared piano" long before it became a staple of avant-garde artists. In the USSR, the album of the Center group One-Room Apartment (1983) can be called the first record in Industrial style, because one of the pieces (1 minute long) represents an elevator ride ("Movement"). In 1985 the *Nochnoi Prospekt* group was formed which began in the techno-pop style but quickly moved towards classic Industrial. Around the same time, the avant-garde composer Sergei Kuryokhin put together a Leningrad performance project, Pop Mechanics, which is quite close to industrial aesthetics. On a tour in Sweden, along with the artists there was a stock of vehicles on stage – trucks, vintage emki cars and even a tank.



Sounds of Industrial

The non-standard and atypical sound of Industrial music is due to the choice of sounds in it. One should first highlight the basis of all the different directions of Industrial and only then tend to the specific features in each of them to better understand the approximate use of these sounds.

One basic feature is the use of very loud sounds which very often try to drown each other out, creating a feeling of some kind of competition between them. Moreover, Industrial music, despite the difference of its various directions, constantly evokes associations with something turbulent, for example, war or senseless cruelty, which was the primary basis of Industrial in its very first manifestations with their provocative themes (Kerr, 2005; 2010; Lockwood, 2013).

As for the use of specific sounds in music, everything is more narrowly focused here. The directions of Aggro-Industrial and Noise remained true to the original sound of Industrial, which continues to use extraordinary tools like the work of a press in a factory, a lathe or the sound of metal cutting. Undoubtedly, similar sounds are found in other musical styles, but they are less pronounced and rather serve as auxiliary elements and not independent sounds.

ANALYSIS OF THE USE OF NOISE TECHNOLOGIES IN MUSIC

The sounds of technologies used in musical compositions can vary greatly in a source, influencing the overall composition, the effects it produces, moods, etc.

In some directions of music only certain noises are used. Due to the freedom that Industrial music provides, it is difficult to predict which of them will be used. The list of possible sounds is huge, ranging from the simplest blows of a jackhammer to the work of various kinds of machines and presses. However, the key factor is still the mixing of these most incongruous sounds into one beautiful noise. The common feature is that the original intent of these various noises leaves the listener no chance for final and unambiguous conclusions.

Kinds of Machine Noise

It is worth noting that in addition to the above differences, the compositions vary in volume and intensity. One of the largest spaces is occupied by Noise. This style withholds musical harmonies, subjecting the listener to chaotic sounds. This includes the sounds of the grinding of old mechanisms or gears used in the creations of A Place to Bury Strangers or Melt-Banana. However, there is also music that uses loud sounds like a slot machine or a guillotine cutting metal, but these sounds are usually presented only at the end of the piece.

Concrete music is similar in frequency of noise use, but unlike Noise it does not reject the presence of musical instruments. Thus, Pierre Henry's composition *Psyche rock* is the clearest example of combining percussion and wind instruments with the whistling, clapping, ringing of bells. The leading sounds of Concrete music were blows – blows on metal, sounds of falling iron objects, or breaking dishes. In addition to the above, the music of Concrete music is characterized by knocks, shouts or exclamations, and



sometimes even the sound of a hair dryer or a steamboat horn, also presented by Pierre Henry in collaboration with Pierre Schaeffer in the composition *Strett*.

Industrial sounds occupy the central place in Dark Ambient. This style is not characterized by a classical sound or structure. On the contrary, performers who create music in this style use low-frequency sounds. This included the sounds of heavy machines, wind generators, fans and reciprocating compressors. These sounds can be heard in the creations of Kunst Grand, Raznolik, and Lustmord. However, there are also Dark Ambient compositions in which loud, noisy and harsh sounds are used. We identified the sounds of a sledge hammer, which is used to break through a brick wall, the sounds of a circular saw, which is cut into metal, or the sounds of a grinder.

A special place in Industrial music is occupied by Percussion Industrial, namely a style consisting entirely of noise. The mechanical impacts of a wide variety of machines, the rattling of parts, the tapping of pistons and gears – all this forms the basis of this style of music. In Percussion Industrial compositions the noise is continuing throughout the piece, by which in this case we mean the sounds of blows and, rhythmicalle the main line. For example, the sound of a jackhammer is used closer to the middle of the composition, but the blows of a mechanical hammer, are repeated every 3-5 seconds throughout the piece, setting a powerful rhythm.

Another Industrial style, which serves to represent a certain "anti-music" is called Aggro-Industrial. This style can be characterized by "familiar" rock, with guitar "rhymed" accompaniment, but in addition there are many noises and mechanical sounds in the music. Some of the most popular sounds in "aggro" are various explosions and cracklings, these were accompanied by the sounds of Third Reich From the Sun, Hansel and Gretel, sirens and alarms, television and radio interferences. Morover, there are various blows on metal, and scraping on glass that causes an anxious and hostile state in the listener. Such a technique is often used by the 16 Volt band. You can hear a rather vivid manifestation of this in the track *And I Go*. These sounds are used to immerse the listener in an aggressive and excited state. To enhance the energy in the track some bands use the sounds of a conveyor belt, sharpening knives and clapping as, for example, in

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Figure 3. Soundtrack of the song by Die Krupps – Trigger Warning

For an overall view of the sounds of this music, consider the following three works: Die Krupps – *Trigger Warning*. This composition is distinguished by a rather pleasant mix of male vocals together with industrial sounds like hammers or alarms. A special form of this song is given precisely by the sounds of machine tools and factory



press, which appear during the choruses and can be clearly observed on the music track (fig. 3).

The use of the sound of the press (fig. 4) noticeably increases the volume of the track itself, at the same time the work of the machines in the music increases its dynamics. The sounds preceding them are nothing more than an interlude between the choruses, setting the basis of the whole piece and helping the listener to feel it most fully, helping to experience a sense of power and authority.



Figure 4. A type of machine, the work of which is recorded and reproduced in Industrial music, sometimes modified and often left unchanged

A Place to Bury Strangers – *The Falling Sun*. This piece, unlike the previous example, goes against the concept of harmoniously sounding industrial noise, such as the sound of jackhammers or the constant fall of fragile objects and vocals. Here, the key role is given to guillotine metal cutting metal (fig. 5), which completely suppresses all other sounds with its sound, including the listeners, assaulting their state of mind.





Figure 5. An example of a guillotine which was used to record industrial music

The initial moments of mystery are replaced by the complete destruction and collapse of all veils of secrets. Listener experience real despair and confusion, complete destruction of their mental states, filling in with thoughts of failures and pain. It is worth saying that the sound of the guillotine, being the leading and loudest, occupies almost the entire space of the piece, which is noticeable when considering the soundtrack of the work (fig. 6):



Figure 6. Soundtrack of the piece by A Place to Bury Strangers – The Falling Sun

Nurse with Wound – *Tune Time Machine*. The last (but not least) composition can be said to be an intermediate between the previous two examples. In it, the main emphasis is still on radio and TV interferences in addition to the use of the screeching of old mechanisms and motors. These are used as instruments, not as loud as other sounds, but used for their specific qualities, taking up almost the whole time of the piece, except for the beginning which features a brief monologue without recorded sounds. All the sounds


of the composition sound noticeably quieter relative to the other two examples. An example of the distribution of interference sounds is presented below (fig. 7).

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Figure 7. Soundtrack of the piece by Nurse with Wound – *Tune Time Machine*, the lower track shows the interference sounds, the upper track the piece in its entirety

By themselves, the interference sounds introduce a person into a state of alertness or even fear. But on the other hand, hearing human voices in these interferences, albeit slightly altered, provides a certain relief and a feeling that the listeners are not alone here, giving them strength.

Emotional IMPACT

The noise of Industrial music often carries a feeling of complete frustration and the inevitability of failure. The music seems to be trying to crush its listener morally and kill the last hope for success. This can be clearly seen in the work of such groups as Nurse With a Wound and Wolf's Eyes. Despite this, some compositions try to strengthen the spirit and give motivation to the listener to overcome life's obstacles. This is most noticeably reflected in the work of A Place to Bury Strangers and Boredom.

As we mentioned earlier, the composition *Psyche Rock* consists of an extraordinary combination of sounds, so the melody is quite dynamic, therefore it causes a sense of freedom and lightness. However, since almost all tracks contain beats, creaks and other harsh sounds, the emotional condition of a person listening to compositions in the Concrete style is for the most part quite disturbing, lost. Most of the melodies are associated with wartime, hustle and chaos. The composition *Prosopopee 2* leads to a condition of anxiety and danger.

Of course, the sounds that we can hear in various compositions of the Dark Ambient direction cause a huge palette of emotions. Consider, for example, the same loud sounds of a circular saw, a jackhammer and a grinder. As a rule, they are present at the very beginning of the track. These sounds carry a feeling of anxiety, anxiety, fear, some kind of fuzziness – the feeling that something dark and terrible will happen. Low-frequency sounds of heavy machines or fans have an absolutely different effect on a person. Such



sounds seem to calm people, tell them that everything bad is over, helping them sort things out. That is why, most often, they are used at the end of the track.

Aggro does not exist to amplify negative emotions. Some groups, such as Ministry, promote revolutionary ideas in their creations, seeking to awaken people's motivation and desire for future victories. Aggro sounds differently to everyone, yet each track exerts this power over the listener's consciousness.

Finally, Percussion Industrial compositions which are using such a type of mechanical sounds as beats, leave a mixed impression on the listener. A dull and distant sound leads to confusion, causing our thoughts to acquire an anxious state. The peculiar rhythmicity of the blows of a mechanical hammer drives our consciousness into a trance state, the so-called "zombie effect." Because of its specific sound, the style almost does not exist in its pure form, but it creates an emotionally confusing atmosphere in compositions of such bands as the Gasoline Department, the Testing Department, Pulsating Cartilage.

The Era of Technological Sounds

Industrial music combines the sounds of machines from different eras. According to history, the transition from an agrarian society to an industrial one came by way of the scientific and technological revolution. This turning point for humankind has led to the mass propagation of various mechanisms and devices, driving the process of industrialization. The composition Falling Sun by A Place to Bury Strangers is associated with the work at a certain enterprise or factory, because it uses the sounds of guillotine metal cutting and the blows of a jackhammer. Similar to this composition is Trigger *Warning* by Die Krupps in which factory press, hammer blows, and emergency alarms are heard. If these belong to the early phase of industrialization, for sounds that are closer to our times one cannot refer only to machines for industrial production, but include those for public use and leisure. Thus, in the composition Time Machine by A Nurse With a Wound one can hear radio or teleprompters as well as the grinding of various mechanisms. But it is also worth noting the improvement of the so-called tools of labor. Here the track Corridor of Chambers by the Testing Department utilizes the clearly audible sounds of a circular saw. However, one can also hear absolutely modern technological sounds that are familiar to all of us. Untitled by Broom is a twenty-minute composition that works with the sounds of a microphone and an industrial fan.

CONCLUSION

In a genre of music such as Industrial, machine sounds are most often found in the form of broadband as well as color noise – in other words an inhomogeneous, multi-level structure of mechanical noise which stands in opposition to any other system. Noise is understood as a chaotic sound that interferes with orientation in the cultural space. But there is not only industrial sound penetrating the sphere of traditional music, there is at the same time music invading human industrial life. The result of our work is a study of the sounds of technology in Industrial music, comparison and contrasting various types of noise. The sounds of machines differ in volume and rhythm, they speak different



languages. Compositions include the sounds of mechanical and electrical devices, machine tools and other types of equipment. The effect of each sound on the musical piece is unique and unrepeatable. The emotional state of listeners depends on sound associations. Loud stomping, scraping metal and other sounds evoke a sense of alarm, while, for example, the sound of a hair dryer or radio interference plunge us into the rhythm of everyday life. However, the life of society is changeable, which is perfectly reflected in Industrial music. While industrial sounds penetrate music, music aspires to become an industrial way of human life. From the sounds of the guillotine to the sound of the microphone it reveals the chronology of the development of industry and technology. Music, filled with a chaotic jumble of machine sounds, becomes widespread and comprehensible. It symbolizes openness, uncertainty, and strength, and it conveys the spirit of the masses, huge industrial complexes, cars, airplanes. This explains the growing popularity among common people of machine noise in our turbulent days.

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On the Non-Universality in Mathematical Language

Abstract

The authors analyze examples of the manifestation of non-universality in mathematical language. The identified inconsistencies are due to both cultural differences between national mathematical schools and differences in approaches in different scientific schools, regardless of their cultural background. Currently, university teachers of math pay insufficient attention to analysis of inconsistencies. At the same time, the formation of students' competencies in this area will ensure their successful professional communication in international environment in future. Authors split the analysis results into four groups. The first group includes discrepancies in Russian and English concepts describing various mathematical categories. Knowledge of these inconsistencies greatly simplifies the professional communication of mathematicians in the international aspect. The second group includes differences in the designation of "nominal" mathematical objects in Russian, English, French and German. These discrepancies are not critical in intercultural communication, because the correspondence is easily established based on graphs and formulas. The authors form the third group of inconsistencies between Russian and English mathematical terminology arising due to cultural differences in the development of math sections in scientific schools in different countries. In this case, establishing correspondences requires a lot of effort, since there are no equivalents for a number of terms, while others differ due to differences in approaches to their justification. Accordingly, teachers should pay special attention to the formation of intercultural competencies of students in this area. Finally, the fourth group includes inconsistencies in the interpretation of some mathematical phenomena, both in Russian and in English, resulting from variations in the approaches of various scientific schools. The authors give two striking examples from Probability Theory. Students' awareness of these differences undoubtedly contributes to the development of their critical thinking and cognitive abilities in general.

Keywords: Language of mathematics; Intercultural communication; Probability theory; Mathematical statistics; Terminology mismatch

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УДК 51:81 <u>https://doi.org/10.48417/technolang.2022.03.06</u> Научная статья

О неуниверсальности языка математики

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Аннотация

Авторы анализируют примеры проявления неуниверсальности математического языка. Выявленные несоответствия обуславливаются как культурными различиями национальных математических школ, так и различиями в подходах в разных научных школах вне зависимости от их этнической принадлежности. В настоящее время университетские преподаватели математических дисциплин уделяют анализу несоответствий недостаточное внимание. В тоже время формирование компетенций студентов в этой области обеспечит в будущем их успешное профессиональное общение в международной среде. Результаты анализа можно разделить на четыре группы. К первой группе относятся расхождения в русских и английских понятиях, описывающих различные математические категории. Знание об этих несоответствиях существенно упрощают профессиональную коммуникацию математиков в международном аспекте. Ко второй группе относятся различия в обозначении "именных" математических объектов в русском, английском, французском и немецком языках. Эти расхождения не являются критичными при межкультурной коммуникации, потому что соответствие легко устанавливается с опорой на графики и формулы. Третью группу составляют несоответствия русской и английской математической терминологии, обусловленные культурными различиями путей развития разделов математики в научных школах разных стран. Для установления соответствий в этом случае требуется затрачивать большие усилия, поскольку эквиваленты ряда терминов отсутствуют, а другие различаются в сиу различия подходов к их обоснованию. Соответственно, преподаватели должны обращать особое внимание на формирование межкультурных компетенций студентов в этой области. Наконец, в четвертую группу выделены несоответствия в трактовках некоторых математических феноменов, как в русском, так и в английском языках, происходящие от вариации в подходах различных научных школ. Авторы приводят два ярких примера из Теории Вероятностей. Осознание студентами этих различий, несомненно, способствует развитие их критического мышления и когнитивных способностей в целом.

Ключевые слова: Язык математики; Межкультурная коммуникация; Теория вероятностей; Математическая статистика; Терминологическое несоответствие

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INTRODUCTION

We know the statement of Galileo Galilei (1623/1960) who claimed that our Universe "cannot be understood without first learning to comprehend the language and know the characters as it is written. It is written in mathematical language, and its characters are triangles, circles and other geometric figures, without which it is impossible to humanly understand a word; without these one is wandering in a dark labyrinth." The language of mathematics is a language consisting of words, symbols, tokens, as well as graphic schemes. Mohan Ganesalingam (2013) considers the most striking feature of mathematical language is the way in which it mixes material that looks as if it is drawn from a natural language with material built up out of idiosyncratically mathematical symbols (p. 17). At all times, experts in various scientific fields extolled the language of mathematics as the most accurate and devoid of the shortcomings of natural languages, such as fuzzy definitions. Burt Williams Horatio noted that "mathematics is both a body of truth and a special language, a language more carefully defined and more highly abstracted than our ordinary medium of thought and expression" (Horatio, 1927). It means that a natural language, becoming a part of a mathematical language, automatically becomes a part of a formalized system. Mathematics serves as a model for the discussion of linguists about the construction of a metalanguage.

When people talk about the exact sciences, they mean, first, mathematics. Indeed, mathematics reflects the fundamental patterns of the world order. Therefore, it should be least dependent on the socio-psychological, including cultural, context. Thus, in simple terms, mathematicians from different communities who have reached a similar level of education are simply obliged to understand each other without question. This is true, since the basis of mathematics – numbers as well as the formulas and abstract representations connecting them – bear a clear imprint of universality.

There are quite a few studies devoted to the language of mathematics, the authors of which consider the language, first, in the aspect of teaching mathematical disciplines. Researchers study the use of words in the language of mathematics, and some of them assign an important role to the linguistic features of the vocabulary (Dobie & Sherin, 2021; Moschkovich et al., 2018; Wilkinson, 2018). Other researchers focus on sentence construction (Ganesalingam, 2013; Morgan, 1996) and on challenging students' language skills in learning mathematics, including bilingual ones (Clarkson, 1992; Jenlink, 2020; Jorgensen & Graven, 2021; Riccomini et al., 2015). However, researchers practically ignore the multilingual aspect of mathematical language, and this study represents the beginning of discussion about the specific features of the language of mathematics in a multilingual world.

Mathematics teachers reproduce the mathematical knowledge based on the traditions of the scientific schools to which they belong. While analyzing mathematical courses in colleges and universities the authors found numerous manifestations of the phenomenon of the non-universality of the language of mathematics. There are several



stereotypes about mathematics and its teaching that support the myth of the universality of the mathematical language. Below, the authors show how these stereotypes are blurring through detailed analysis supported by examples.

First, whatever the ways of teaching mathematics, the results in the form of mathematical competencies of kindergarten, university or high school graduates turn out to be comparable to some degree of approximation. Perhaps this is true for arithmetic and elementary geometry. But there are significant discrepancies even in mathematical analysis, differential equations and probability theory (Adoniou, 2014). Mathematical disciplines that are in their infancy, such as graph theory, discrete mathematics, mathematical statistics, and others, allow discrepancies both in language and in meaning.

Secondly, the universal nature of mathematical competencies also requires a universal, maximally abstracted approach to the presentation of mathematical ideas. At the same time, researchers say that the language of mathematics itself is difficult for students (Bulaon, 2018). Visual images can aid understanding of theoretical positions. However, the abundance of examples and graphs is considered not a virtue, but a vice of "theoretical" math courses. Moreover, many teachers, especially at universities, give examples in lectures, but do not include them in printed or electronic manuals to avoid condemnation of colleagues. There are also works criticizing the "excessive" enthusiasm for practice-oriented tasks related to the professional activities of graduates. As a result, currently one of the problems of engineering and economic training at universities is the low level of competencies in the field of mathematical modeling in the professional field. With regard to the problems of this work, this means that in professional intercultural communication, graduates will be deprived of the most important auxiliary means of establishing mutual understanding with their foreign colleagues.

Thirdly, the orientation towards rigor in teaching makes mathematicians adhere to the approach underlying this or that course, determined, as a rule, by the scientific school in the womb of which these mathematicians received their professional education. The study of various variant concepts is usually discouraged. In secondary school, all mathematical operations are strictly prescribed, and deviation from them is punished (Lucas et al., 2014). The university environment is quite loyal to the differentiation of techniques, however, theoretical excursions into "parallel mathematical worlds" are absent simply due to lack of time, or they are masked by this lack. As a result, the study of mathematical courses in this manner does not contribute to the formation of critical thinking, which is one of the components of the fundamental training.

In connection with the development of globalization of world processes, both education and professional realization of university graduates have a steady tendency towards internationalization. Namely, getting an education in one country and absorbing its mathematical culture, a graduate could work in another country or in an international company. In this case, successful professional communication requires broader ideas, in particular, about mathematics, than those that can be given by a certain, albeit a very strong, scientific school.



The above reasoning leads to the purpose of this study, which is to identify inconsistencies in the definition and description of mathematical objects in various scientific schools, primarily national ones. The presented examples of the nonuniversality of the mathematical language, integrated by teachers into mathematical courses, will help university graduates in successful professionalization in an international environment.

RESEARCH METHODS

The main research method is the analysis of a large scope of teaching materials for university mathematical courses in Russian and English, both in the form of printed manuals and in the form of electronic educational resources. In materials of this kind, the authors reveal elements of inconsistency between the formulations of concepts and statements. The authors consider both Russian and English texts separately and in comparison. If necessary, terminology typical of German and French mathematical sources is also used.

Based on a preliminary analysis, the authors found that a significant number of inconsistencies are observed in the courses of probability theory and mathematical statistics, which the authors focus on. These discrepancies are largely due to the fact that the development of statistics from the beginning to the second half of the 20th century in Russia and Western countries proceeded in isolation. Thus, in the Soviet Union, it was customary to distinguish between "bourgeois statistics" as the basis for manipulating public consciousness, and "Soviet statistics" as the basis for a planned socialist economy (Dumnov, 2019). At present, it is obvious that neither the elements of the free market, nor the strict regulation of economic mechanisms provide ways for optimal development (Eliseeva, 2011). The globalization of world processes subjected to storms indicates the need for the development of critical thinking of specialists who will have to build constantly transforming models that reflect the ever-changing reality.

Usually, the authors of educational materials adhere to a certain point of view when presenting controversial statements in the spirit of the mathematical school that formed them or in the spirit of the existing mathematical environment. This is probably correct for constructing a coherent mathematical theory within a certain mathematical school. However, the professional activities of graduates are likely to proceed in conditions of communication with representatives of other schools. Therefore, acquaintance with other variants of debatable mathematical statements will undoubtedly contribute to the development of their critical thinking, as one of the most important soft skills.

The authors focus on a number of identified contradictory phenomena, the awareness of which will allow students to have tools for a more flexible approach to the construction and analysis of mathematical models.



FINDINGS AND DISCUSSION

The authors divided the results of the analysis into four groups. The first group includes the most common discrepancies in the English and Russian languages of mathematics. The authors have collected in the second group terms in different languages, which are named after prominent mathematicians. The third group consists of terms that have essentially different names in Russian and English, which cannot be "guessed" in intercultural communication without knowing the correct correspondences. The fourth group focuses on examples of different interpretations of the same mathematical objects in different scientific schools.

The examples of the first group concern several general facts noted when comparing Russian and English languages of mathematics. These remarks belong to the category of the metalanguage of mathematics, i.e. describe the primary constructions that precede the actual mathematical content. They are significantly related to their own cultural context, and therefore are not perceived by native speakers as something that presents difficulties in intercultural contact. The authors give two examples of terms, the direct translation of which in mathematical context can cause mutual misunderstanding between the parties. The notion of "attributes" ("properties"), beloved by Russian mathematicians, in English sources can most often be compared with "rules," for example, "rules of addition," "rules of integration." Teachers should pay some attention to these constructions in lectures. Further, the concept of "characteristics," depending on the context, can mean either "parameters," "attributes" or something else. For example, "numerical parameters" in the English version of Probability Theory more accurately reflect the essence of the object than "numerical characteristics" in its Russian version. Typically, characteristics in the English mathematical and natural science context are associated with processes, for example, "volt-ampere characteristic." In general, to avoid misunderstandings, the term "characteristics" should be avoided in mathematical reasoning. Once again, it will be quite difficult to reach the correct interpretation of the meaning of communication, especially if English is not the native language for both communicators.

The second group of examples of inconsistencies includes the use of proper names to denote equations, conditions, theorems, formulas, etc., for example, "Navier–Stokes equations," "Moivre–Laplace formula," "Cauchy theorem." In most cases, the nominal designations of objects are the same in mathematical courses in different languages. In some cases, categories acquire mobility, for example, "Cauchy–Riemann conditions" and "Cauchy–Riemann equations" refer to the same object of the Theory of Functions of Complex Variable. It is possible to state the phenomenon of "avoidance of names," as well as "avoidance of "foreign" names," which is illustrated in Table 1 by some examples in Russian, English, French and German. The most frequent names in each of the languages are given.



Table 1. Examples of avoidance and transformation of nominal designations of mathematical objects.

Object	Russian	English	French	German
$\iint \vec{f} \cdot \vec{ds}$ $= \iiint div\vec{f}dv$	Theorem of Ostrogradski– Gauss (Dubik, 2015)	Divergence theorem (Silhavy, 2009) / Gauss theorem (Xiaolan, 2011) / Gauss divergence theorem (Benci & Baglini, 2014)	Théorème de Green– Ostrogradski (Robbes et al, 2010)	Gaußsche Gesetz (Scheibenzuber & Schwarz, 2011)
$\int_{a}^{b} f(x) dx$ = F(b) - F(a)	Theorem of Newton–Leibniz (Trefilova, 2018)	Fundamental theorem of calculus (Sobczyk & Leon Sanchez, 2008)	Théorème fondamental de l'analyse (Bahra, 2020)	Fundamentalsatz der Analysis (Weitz, 2018)
	Gauss curve (Ter- Martirosian et al., 2021)	Bell curve (Klinck & Swanepoel, 2019)	CourbedeGauss(Bru,2006) / Courbeencloche(Catinet2008)	Gauß-Kurve (Schreven & Hammer, 2019) / Gaußsche Glockenkurve (Mossig, 2012)

From the examples given in Table 1, we can see that in mathematics in Russian, names in denominations are used more widely than in the main European languages. It should be noted that in intercultural communication these discrepancies are established quite easily. Communicators simply write a formula or draw a sketch of the corresponding graph.

The third group combines examples of Russian mathematical terms that either lack direct analogies in English, or their equivalents are not obvious, which is difficult for professional intercultural communication. The identified terminological discrepancies in Russian and English sources with a conditional breakdown by sections of mathematics are shown in Table 2. The terms of the "Russian version" of mathematics are given in equivalents or transliterations in English. We write the transliteration in
broken brackets>.



Term or concept in	Term or concept in	Remarks
Russian Bro Calculus		
Elementary functions (x^n , e^x , logarithm, trigonometric and inverse trigonometric functions)	The term is not available in English	When it is necessary to refer to an indication of such functions, English-speaking authors use descriptive constructions such as "the easiest functions."
tg x, ctg x, arctg x, arcctg x	$\tan x$, cot x, arctan x ($tan^{-1}x$), arccot ($cotan^{-1}x$)	In connection with the development of computer systems focused on English, English equivalents began to appear in Russian sources, but you cannot find them in textbooks on "classical" mathematics.
<pokazatel'naya> function <i>a^x</i></pokazatel'naya>	Exponential function a^x	In Russian sources, the English term is applicable only for a particular case e^x .
<pokazatel'no> power function / Power <pokazatel'naya> function $a(x)^{b(x)}$</pokazatel'naya></pokazatel'no>	The term is not available in English	If necessary, in English sources, the function is defined through the exponent $a(x)^{b(x)} = e^{b(x)\ln(a(x))}$.
Complex function / Function superposition / Function composition	Function composition	In English sources, the term does not appear in the "Pre-Calculus" section, but you can find it in the "Calculus" section and more complex sections, such as "Theory of Operations," "Discrete Mathematics."
Calculus		
Replacing infinitesimal values / functions with equivalent ones	Chain rule for infinitesimal quantities / functions	
Complex Function Differentiation	Chain rule for derivatives	
Necessary extremum condition	First derivative test	In English sources, the terms "necessity" and "sufficiency" are
Sufficient extremum condition	Second derivative test / higher-order derivative test	mainly used in the "Mathematical Logic" section
Differential Equations		

Table 2. Comparison of Russian and English mathematical terms



Total differentials equation	Exact equation	P(x,y)dx + Q(x,y)dy = 0, $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$
Probability and Statistics		, ,
Quadratic mean deviation	Standard deviation	In connection with the internationalization of education and the spread of computer statistical products of American origin, the term "Standard deviation" began to appear in Russian-language sources (Narkevich et al., 2016).
Absolute deviation $\frac{1}{n} \sum_{i=1}^{n} x_i - Med_x $	$\begin{array}{ll} \text{Median} & \text{absolute} \\ \text{deviation} \\ & \frac{1}{n} \sum_{i=1}^{n} x_i - Med_x \\ \text{Mean absolute deviation} \\ & \frac{1}{n} \sum_{i=1}^{n} x_i - M_x \\ \text{Mode absolute deviation} \\ & \frac{1}{n} \sum_{i=1}^{n} x_i - Mod_x \end{array}$	Russian-language sources mainly use the absolute deviation from the median. Some authors introduce other types of absolute deviations without defining them as separate point estimates.
Variation series / Ordered statistics	Ordered sample	You can meet the term "Series" in English-language sources in
Statistical series	Distribution / Statistical distribution	relation to statistics only in the "Time series" section. From the point of view of the authors, the Russian-language terms are arbitrary and archaic; if possible, they should be replaced with equivalents of English-language terms, which is already being done in many sources (Savchenko, 2011).
Correlation moment / Covariance	Covariance	Recently, the term "correlation moment" has been ousted from Russian-language sources (Zheleznyak et al., 2014) due to the depreciation of the moment approach, which has not been developed in American statistics. From the point of view of the authors, the term "Covariance" is more consistent with the essence of the concept.



Significance level	Significance
General totality	Population
Sample volume	Sample size
Mechanical sampling	Systematic sapling
Full group of events	Collectively exhaustive events
Dispersion	Variance
Statistical hypotheses verification	Hypotheses test

The information given in Table 2 shows the greatest discrepancies between Russian and English terms in the statistical sections of mathematics. The authors can explain this by the fact that modern statistics has received a powerful development in the United States. In the 1920s, 1930s and 1940s, statistics was predominantly applied science. It served as a tool of analysis in psychology and genetics. However, these areas of science were not recognized in the USSR, which is why even the terminology of "Soviet" statistics differs from the terminology adopted in the countries of the Western world (Krasnoshchekov & Semenova, 2020). Statistics is of great importance in medicine, demography, and economics. At the same time, during the Soviet period, most of the statistical data was not in the public domain, which also did not contribute to the development of statistics as a science in the USSR. In this case, the authors believe that it is necessary to bring the Russian statistical terminology in line with the generally accepted in world science, since the discrepancies are explained not by national tradition, but by the subjective circumstances of the development of statistics in Russia.

The last group of examples concerns inconsistencies in the fundamental concepts of probability theory, generated by various approaches cultivated by scientific schools. The authors obtained these materials from the analysis of open educational sources, both in Russian and in English, such as Wikipedia, DPVA.net, Math Help Planet, exponent.ru, TeorVer-online, SlidePlayer.com, StackExchange, Academic and others.

The first example concerns the distribution function of a discrete random variable. By definition, the value of the distribution function of a random variable X at the point x is equal to the probability that the variable takes a value less than x: F(x)=P(X < x). The plot of the distribution function of a discrete random variable is a step function that experiences a jump at each isolated value. According to modern views, interval estimates are more important than point estimates, so it is necessary to know whether the end point belongs to a given interval or not. If the end point does not belong to the interval, then this is indicated by an arrow on the graph. This means that the boundary value of the probability is not taken into account in the total value of the probability in this interval. The graphs presented on mathematical sites do not give an unambiguous answer about whether the end points belong to one or another interval (Fig. 1).





Figure 1. Variants of graphs of the distribution function of a discrete random variable.

The left and right graphs in Fig. 1 differ in the direction of the arrows, which means the inclusion or exclusion of the end of the interval. What causes such inconsistency? For example, the probabilities in the range of x from 45 to 47 in the left and right graphs differ by 30%, which is quite a lot, for example, when predicting financial risks or emergencies.

The second example considers the uniform distribution mode. The graph of the uniform probability density is shown in Fig. 2.



Figure 2. The probability density of a continuous uniform distribution.

The mode of a continuous distribution is the maximum of its probability density. This is one of the main parameters of the location of a random variable. According to the theory of extrema, if all points of the interval (a; b) are maximum points, such a maximum is called non-strict one. However, 80% of the sites claim that there is no mode of uniform distribution, and only 20% claim that each point of the interval (a; b) is the mode. Moreover, some scientific schools introduce the concept of antimodal distribution, but not all of them classify the uniform distribution as the antimodal one.

The authors recommend teachers to acquaint students with similar inconsistencies found in probability theory. However, the teacher should not insist on the fairness of one of the alternatives. The fact is that graduates in their professional activity can fall into the orbit of a scientific school that adheres to a different alternative. In this case, their tough position could lead to a conflict in which both sides would have arguments based on authoritative opinions. Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



CONCLUSION

The authors analyzed some of the phenomena associated with the non-universality of the mathematical language. One part of these inconsistencies in the names and descriptions of concepts reflects the cultural characteristics of mathematical schools in different countries. Differences in the approaches of scientific schools within the same culture explain the other part of inconsistencies. In connection with the internationalization of education and the globalization of the labor market, university graduates are more likely to work in international communities. The authors divide examples of discrepancies into several groups. The authors analyzed the grounds for the discrepancies found, as well as proposed mechanisms for facilitating mutual understanding in intercultural communication in the professional field.

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The Stages of Developing a Discourse-Oriented Virtual Learning Environment Model

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Abstract

The article aims at describing the stages of developing a model of Virtual Learning Environment (VLE) for teaching English professionally-oriented discourse. To achieve this goal, the author systematizes the existing approaches to developing various distance learning models. As a result, the most extensive didactic approach to creating a VLE was detected and chosen for further adaptation to the discourse-oriented language instruction. Next, each stage of developing a VLE model was refined based on the key methodological implications of the discourse approach in Linguodidactics. Finally, the example of the Discourse-Oriented VLE (DO-VLE) model for training IT specialists in professionally-oriented English discourse is provided as the result of following the suggested VLE development stages. Thus, the study describes the discursive approach to developing a VLE and exemplifies this process by tackling specific IT discourse. In addition, the methodological approach to DO-VLE creation, lying within the synergetic scope of Digital Didactics and the discourse approach in Linguodidactics, can be applied in developing various distance learning activities. The scientific value of the study, therefore, consists in describing the stages of developing a DO-VLE as well as in outlining some theoretical grounds for a shift from VLE to DO-VLE concepts in Linguodidactics.

Keywords: Virtual Learning Environment, Professional Discourse, English Discourse Teaching, Distance Learning, Discourse Approach

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Стадии разработки модели дискурсориентированной виртуальной образовательной среды

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Аннотация

Целью исследования является описание этапов разработки модели виртуальной образовательной среды (ВОС) для обучения англоязычному профессионально-ориентированному дискурсу. Для достижения заявленной цели автором были систематизированы существующие подходы к созданию моделей дистанционного обучения. В результате был установлен методологический подход, наиболее полно описывающий стадии разработки моделей ВОС. Далее содержание каждой из выявленных стадий было уточнено с учетом ключевых положений дискурсивного подхода к обучению иностранным языкам. Кроме этого, в статье представлен пример дискурсориентированной BOC (ДО-ВОС) для обучения ИТ-специалистов англоязычному профессионально-ориентированному дискурсу. Таким образом, в исследовании рассмотрен дискурсивный подход к разработке моделей ВОС на примере конкретного ИТ-дискурса. В дополнение лежащий в основе разработки методологический подход, находящийся на пересечении цифровой дидактики и дискурсивного подхода в лингводидактике, может быть реализован при проектировании различных учебных событий в онлайн формате. Таким образом, научная ценность исследования заключается в описании стадий дискурс-ориентированного подхода к разработке ВОС, а также в уточнении некоторых методологических оснований, указывающих на целесообразность перехода от концепта ВОС к концепту ДО-ВОС в лингводидактике.

Ключевые слова: Виртуальная образовательная среда, Профессиональный дискурс, Обучение англоязычному дискурсу, Дистанционное обучение, Дискурсивный подход

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Special Topic: *Technologies in a Multilingual World* Тема выпуска *"Технологии в мультилингвальном мире"*



INTRODUCTION

The continuous digitalization of the educational sphere gives rise to many scientific papers dedicated to establishing the ways of efficient integration of information and communication technologies (ICT) into the educational process.

One such way is creating and implementing a model of the Virtual Learning Environment (VLE), which is understood as a specifically constructed multi-faceted didactic system of integrated ICT for attaining educational goals (Weindorf-Sysoyeva et al., 2018).

In the current study, we refer to VLE as a distance learning model. Other models include the integration of offline and online classes (blended learning), autonomous distance education courses, virtual schools and universities (network learning), the integration of the Internet and case-based technologies, video conferencing (Polat, 2020, p.78).

Substantial research specifically on the modeling of Virtual Learning Environments was done by Weindorf-Sysoyeva et al. (2018), the scientific school of Polat (2020), Ravanelli (2020), and others. The construction of different models of distance and blended learning in Linguodidactics was undertaken in the works of Titova (2018), Solovyeva (2019), Sysoyev (2020), and others.

At the same time, no attempt has been previously made to highlight the implications of VLE creation and implementation in the discourse approach to language teaching. The approach considers human communication as a multifaceted phenomenon, which includes not only linguistic but also extra-linguistic factors, consideration of which is necessary for the process of teaching intercultural communication in online environments (Tarnaeva & Lyubshina, 2018). The discourse-oriented language teaching relies heavily on the results of discourse analysis, which determine not only the syllabus but also means and instruments of instruction.

Consequently, we assume that the process and principles of creating the discourseoriented VLE (DO-VLE) should derive from a revisited methodological basis to constructing and implementing distance learning models.

Hence, the current research aims at describing the stages of developing and implementing the model of DO-VLE for teaching English professionally-oriented discourse.

PROBLEM STATEMENT

As the discourse approach in linguodidactics is gaining popularity along with continuous digitalization of education, there is a demand to study the ways of creating an adaptable, multifaceted DO-VLE. While substantial research has been previously done in the field of defining and describing the process of creating and implementing various distance learning models (including VLE), as indicated by Bannink & Van Dam (2021) and Arantes (2022), little analysis has been carried out in terms of adapting this process to the discourse approach. The current article presents a synergetic scientific standpoint as a result of approaching two research areas. In particular, we assume that the results of



the discourse analysis that are used to define the syllabus, forms and means of language instruction outline specific features of the DO-VLE on each stage of its construction.

The following shows that the relevance of the research lies in developing a highly adaptable VLE model for discourse-oriented foreign language instruction based on an indepth methodological grounding of the underlying construction principles.

RESEARCH AIMS

The main objective of the research is to define and describe the stages of creating and implementing the DO-VLE. This objective determined a set of research subtasks:

• to define the VLE construction stages most frequently referred to in scientific papers;

• to reveal the peculiarities of implementing the construction stages in the discourse-oriented framework;

• to provide an example of DO-VLE (by the example of the DO-VLE for teaching English professionally oriented IT discourse).

RESEARCH METHODS AND MATERIALS

At the first stage of the research, the content analysis method is used to determine the stages of distance learning models construction that are referred to in scientific resources. The main category of the analysis is represented by the dedicated 'stage of creating the model.' If the study describes the order of VLE components that students attend in their study rather than the sequence of their creation from the instructor's perspective (for instance, in the study conducted by Titova (2018)), the order of the components is interpreted as a correspondent sequence of construction stages. The final objective of the content analysis is to build a cross-tabulation chart to detect the most extensive concept of the VLE model (see Table 1).

The materials for the content analysis include various theses, scientific articles, and e-learning guidebooks, including "Pedagogical Technologies of Distance Learning" by Polat (2020), "Theoretical Approaches to the Design of Electronic Educational Environment in Technology Education" by Weindorf-Sysoeva et al. (2018), "Information and Communication Technologies in Pedagogical Education" by Kiselyov & Bochkova (2020), "The Cambridge Handbook of Multimedia Learning" by Mayer & Fiorella (2021), "Distance Education for Teacher Training: Modes, Models, and Methods" by Burns (2011).

The second stage of the research aims to describe the implications of the discourse approach to language teaching at each stage of the VLE creation process. This stage integrates both scientific literature analysis and discourse analysis methods. The literature review showed that the sociolinguistic approach to discourse analysis is considered most appropriate for application in Linguodidactics as it allows defining pragmalinguistic characteristics of speech activity under certain conditions (e.g., in the process of software development) (Karasik, 2004). The further analysis of discourse components (participants, roles, genres, strategies, values, chronotopes) was necessary to define the component composition of a DO-VLE model as well as to select the necessary types of



electronic educational resources (EER) as the technological basis of the model. The procedure and the results of the discourse analysis, however, are not discussed in this article in detail.

The third stage of the research is based on describing the DO-VLE model, including revealing different interconnections of its components, the correlation between the model and the discourse analysis, and highlighting the underlying principles of selecting EER and distance interaction forms for each component. The process is exemplified by the DO-VLE for teaching English professional IT discourse.

FINDINGS

At the first research stage, the content analysis of scientific works was conducted. The aim of the analysis was to detect the most extensive approach to defining the stages of creating and implementing VLE in modern Didactics. The general approach to the content analysis and data collection is presented in Table 1.

The analysis has shown that the scientific school of E. Polat most extensively describes the stages of distance learning models development, which include: a) selecting the learning theory, (b) selecting the technological basis for the distance learning model, (c) determining the component composition of the model, (d) assigning the content, methods, and means of distance interaction, and expected learning outcomes of each component of the model, (e) defining types, forms, and means of monitoring learning achievements (Polat, 2020).

Therefore, to comply with the methodology of the research, the concept of VLE modeling stages provided by the scientific school of E. Polat was chosen as the basis for further adaptation to the discourse-oriented teaching framework as it appeared to provide the most extensive methodological basis in the context of the current study.

At the second stage of the research, the specifics of creating a VLE model for discourse-oriented language teaching were revealed and combined with each of the five stages:

1. Selecting learning theory (methodological stage) implies the synergy of the discourse approach with other linguodidactical approaches (e.g., discourse-oriented communicative-cognitive approach to language teaching) or assigning the discourse approach to language teaching as the main one. In a very general way, as indicated by Tarnaeva & Plekhova (2018), the discourse approach is based on taking into account the socio- and pragma-linguistic features of a certain discourse. An important component of the approach, inter alia, is mastering the students' knowledge about universal and nationally specific features of a discourse functioning sphere (e.g., business culture), which must be reflected in the DO-VLE model. The discourse approach is grounded in the processes of analysis, synthesis, and interpretation of intercultural information, considering all characteristics of a communicative situation. Consequently, the discourseoriented approach implies not only teaching oral communication skills to students and mastering their language skills, but also teaching them how to implement and recognize various speech strategies and tactics in the process of decomposing pragma- and sociolinguistic environments (Buzila, 2019; Elkouti & Kouti, 2022). The DO-VLE model,



therefore, must be constructed as a socio-linguistic subsystem comprising all the discourse components' features. For instance, in the case of IT discourse, the metainformation component (see Figure 1) is considered essential as it had been revealed that IT specialists share professionally related information continuously in an asynchronous mode (Balyshev, 2021). Including the metainformation component to address the IT specialists' needs in language training aims to increase both the learner autonomy and the level of integrating the DO-VLE in a wider system of professional communication.

Authors Stages	D.G. Soloranzo	Titova S.V.	Akimova I.V. et al.	Scientific school of Polat E.S.
1. Methodological	Choosing the pedagogica l approach	-	Analyzing aims of VLE development	Selecting the learning theory
2. Technological	Setting the interface features	Representing the syllabus using web-resources	_	Selecting the technological basis
3. Structuring	-	Selecting ICTs for educational content presentation and student collaboration	Determining the component composition of the model	Determining the component composition of the model
4. Specifying	Assigning the forms of online activities	Creating modules with the information about the author and additional information	Programmin g and approbation	Assigning the content, methods, means, and learning outcomes of distance interaction
5. Controlling	Evaluating the learning outcomes	Evaluation of the web course	Adjustments and refinement based on the feedback	Defining types, forms, and means of monitoring learning achievements

Table 1.	The stages	of creating a	VLE model: the	e results of the	content-analysis
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2. Since the discourse approach suggests providing students with a variety of tasks to detect and produce different speech strategies and tactics, as well as master their discourse language and speech skills and acquire a set of knowledge about the sphere of discourse functioning (e.g., intercultural business communication), a DO-VLE must meet the abovementioned requirements by comprising a set of didactically relevant ICT of various types and with specific technological features (Bamrara, 2020). The set of ICT that is considered sufficient to implement the discourse approach in constructing online environments is represented in each component of the DO-VLE model in Figure 1 and includes basic, substitutive, constructive, communicative, and integrative EER (Solovyova, 2019).

As described by Solovyova (2019), basic EER include mainly textual resources, which are not sufficiently integrative and polysensory, created within such basic applications as MS Words, Pages, etc. This type of EER is used in the DO-VLE mainly for delivering asynchronous instructions and posting announcements in the instructional component. Substitutive resources represent a wide range of hypertext-based audiovisual materials that provide feedback. These include multimedia training courses, textbooks, software simulators, etc. This type of EER is applied for delivering authentic texts as sources of universal and nationally specific traits of a discourse functioning sphere in the authentic texts component. The feedback option is used for presenting self-assessment tasks to students. Constructive EER allow the teacher to develop audiovisual and interactive content using the tools and templates offered by the resource. This is the main group for VLE modeling as it allows teachers to adapt educational materials for distance learning, usually without special programming skills. This type is widely used to build online exercises in discourse skills development component of the DO-VLE. Communicative EER are intended for organizing distance oral and written speech learner interaction in a foreign language. Finally, integrative resources enable the functioning of different types of EER as a unified system within the framework of the DO-VLE. We consider such resources to be mainly distance learning management systems such as Canvas LMS, Blackboard, Google Classroom, Edmodo, etc.

The methodological principles of EER selection include such traditional didactic principles as the principle of hypermedia visualization, the principle of developing learning autonomy, the principle of maximum individualization and differentiation, the principle of interactivity, and others (Leontieva et al., 2017; Mayer & Fiorella, 2020).

Despite the technological stage being widely investigated in various studies, we consider it necessary to introduce the new principle for modeling the DO-VLE specifically. It is the principle of considering the discourse components.

For instance, having analyzed IT discourse in its 'participants' component led to revealing a number of participants roles that use different speech strategies and tactics (e.g., frontend developers, techsupport, scrum-masters, sysops, etc.). In this particular case, the communicative EER included in the DO-VLE must have break-out rooms for assigning communicative partners to collaborate together based on their leading discourse roles. For other discourses, however, the break-out rooms feature might appear redundant as the participants roles can be limited to very few (e.g., personal psychotherapeutic discourse).



Introducing this new principle, therefore, results in a more precise approach to selecting EER at the technological stage of creating a DO-VLE.

3. Considering the implications of the methodological and technological stages, and based on the analysis of different approaches to determining the component composition of VLE models (Doneva et al., (2007); OECD, (2017); Scherbina et al., (2020)), it has been disclosed that the DO-VLE must comprise the following set of components for minimal sufficiency:

• instructional component (for an overall student orientation in the VLE, delivering instructions, posting announcements, and developing goal-setting skills).

• authentic texts component (for providing students with authentic texts as sources of information about universal and nationally specific traits of a discourse functioning sphere and as samples of professional communication that reveal most frequent speech strategies and tactics).

• discourse skills development component (for developing skills of identifying and implementing speech strategies and tactics in professional discourse).

• assessment component (for assessing (including self-assessment and peerassessment) skills in identifying and implementing discourse speech strategies and tactics in various professionally oriented communicative situations).

• meta-information component (for hosting extra materials and organizing continuous professionally related communication in the foreign language).

The interconnectivity of the DO-VLE components as well as their relation to the sociolinguistic discourse components are shown in Figure 1 (on the example of IT discourse).

As it will be discussed further, the structuring stage of the DO-VLE creation might imply different components with their structure and interconnection being dependent on the specific discourse. In our case, the structure is based on the sociolinguistic analysis of IT discourse that had been carried out for six components: participants, values, genres, chronotopes, values, goals (Karasik, 2004; Balyshev, 2021). It should be stated that despite highlighting some of the discourse analysis implications for developing a DO-VLE further at the specifying stage, discussing the extended results of the discourse analysis is not included in this article.

4. At the fourth stage of developing a DO-VLE, it is necessary to assign the content, methods, means, and learning outcomes of distance interaction within each component.

Applying the discourse approach at the specifying stage suggests the following implications.



Goals and values of ITdiscourse participants

Figure 1. The DO-VLE model for training IT specialists in English discourse





As it is shown in Figure 1, the instructional component contains announcements, instructions on how to work in the DO-VLE, class schedules, reference material, an online course calendar, etc. The content of the instructional component is implemented through such ways of distance interaction as online discussions, interactive discussions, and placing links to reference material. Learning outcomes of the component include developing goal-setting skills, skills of searching and allocating information, etc.

Although the contents of the instructional component do not differ much from similar materials in non-DO-VLEs, the ways of online interaction and correspondent EER depend a lot on a specific discourse. In our case, the indicated ways of distance interaction reflect the main values of the participants in IT discourse, which include the openness of all subsystems of professional communication, the relevance of the professional tasks, the collegial approach to solving issues, etc. (according to the results of the discourse analysis by Balyshev (2021)). An exemplary task in the instructional component is given below.

Task: The oncoming class will be dedicated to IT workplace rules. Range the following rules in Miro in the order from the least significant to the most significant one according to your opinion. Explain your choice and comment on your colleagues' explanations using the comments section (see Figure 2).



Figure 2. Instructional component task aimed at activating the skill of anticipating the subject matter and the general structure of the next lesson

The authentic texts component of the DO-VLE includes authentic texts as samples of professional communication implementing speech strategies and tactics that are frequent in IT discourse. Besides, the component contains texts as sources of information



on universal and nationally specific traits of business culture (Almazova et al., 2018; Mewald, C. & Czasny, 2019; Skiada, 2021).

Texts about business culture can be delivered to students asynchronously with interactive text tasks to check understanding of various business culture traits. The discourse approach implies creating different text tasks or adding links to additional material depending on what knowledge of discourse functioning sphere is most relevant to different participants roles. The means of content delivery are substitutive EER (video and audio podcasts (https://goo.gle/developers), polycode texts (e.g., in MS Sway), etc.) and constructive EER (resources for creating interactive videos with embedded text questions and feedback functions (e.g., https://en.islcollective.com/video-lessons/)). An exemplary task of the component is provided below.

Task: Watch the interactive video "Humor and culture in international business | Chris Smit | TEDxLeuven" and answer the questions. The questions will appear automatically at certain points. If you need to re-watch the part of the video before the question, press the 'Rewatch' button. If the highlighted words are not known to you, click on them to get the definition (see Figure 3).

• Which sense of humor is self-deprecating according to Chris Smit? (Options: British, Dutch, German)

• Which sense of humor tends to be blunter and sexually connotated? (Options: British, Dutch, German)

• If it's a not good idea to start a business meeting with a joke, then you are having a meeting with ...? (Options: the British, the Dutch, the Germans)

• In which of the two countries the answer "I don't know" is quite alright to be heard from the management stuff? (Options: in France, in the US)

• If you work in a team of mostly UK professionals, would you feel stronger or weaker hierarchy as compared to "all-Russians" teams? (options: stronger, weaker)



Figure 3. Interactive text task aimed at acquiring knowledge about nationally specific traits of IT discourse functioning sphere

The text component is inseparably connected with the discourse skills development component, and with the help of basic (document in Microsoft Word, Adobe Acrobat),



constructive (https://app.wizer.me/) and substitutive (https://lingua.com/businessenglish/reading/) EER it provides authentic texts of English IT discourse as samples of business communication that are used to form, improve, and develop speech skills necessary for participation in the English-language professional IT discourse.

The ways of distance interaction in the discourse skills development component are conditioned by a specific set of discourse-oriented tasks and exercises (which is not reviewed in the article in detail). The means of implementation include communicative (Zoom, Skype), constructive (Etreniki, Wizerme, Perusall), and communicativeintegrative (Webroom) EER. The expected outcomes include forming and developing the speech skills necessary to implement speech strategies and tactics of English professional IT discourse.





Overall, the discourse approach has no direct universal implications for the specifying stage in the discourse skills development component. However, as it has been stated earlier, applying the discourse analysis method ensures searching for specific features of the EER. In the example of the DO-VLE for IT specialists, important properties of the EER selected for this component are the abilities to organize paired and group interaction when completing exercises (e.g., Webroom), and to provide virtual rooms for swapping communicative partners (e.g., Zoom). These technical capacities allow taking into account the network form of professional communication and the



collegial approach to dealing with professional tasks. Another important feature of the EER in the discourse skills development component is the ability for a teacher to upload functional schemes as the basis for implementing speech strategies and tactics of a specific discourse. An exemplary exercise is provided below.

Task: Work in groups of three. You are going to have a brainstorm meeting. The aim of the meeting is to elaborate on the ideas for the new delivery mobile service. Follow the structure of the meeting presented on the white board. Make use of additional Useful Language (see Figure 4).

The meta-information component is allocated, firstly, for reflecting on the educational activities in group online discussions, debates, and by completing interactive polls. Secondly, the meta-information component represents a database of professional materials in the foreign language, which is expanded by the students themselves and involves teacher-initiated (but almost unsupervised) pair and group online discussions of professionally significant topics in synchronous and asynchronous modes. The meta-information component also contributes to the development of learner autonomy, because in the process of discussion students can identify their needs to study certain aspects of the topic and with the help of their colleagues aim at finding the necessary information (Hu & Zhang, 2017; Elshareif & Mohamed, 2021). An exemplary task inside the meta-information component is presented in Figure 5.



Figure 5. Providing links to additional self-study materials in Google Classroom as an integrative EER

The technological implementation of this component is based on basic, integrative, and communicative EER. These resources allow students to share and discuss important



professional information in the foreign language (links to professional articles, high-tech news, etc.), using speech strategies and tactics of professional discourse. The expected outcomes include students' reflection on learning activities, application of speech strategies and tactics in professionally relevant communication, activization of students' independent foreign language learning skills, and supporting individual educational trajectories (Soldatov & Soldatova, 2021).

In addition, the meta-information component serves as an object of the teacher's analysis that provides information of interest on the level of learners' expertise in various professional spheres. This is necessary for organizing efficient educational interaction within the rest of the components and adjusting the content, tasks, and instructions, which ensures the dynamics and adaptability of the DO-VLE.

In the discourse approach to creating a VLE model, the meta-information component can include different variables depending on the specific professional discourse. For example, the discourse of health care providers might demand extra links to laws and regulations in Russia and other countries. At the same time, the metainformation component might appear unnecessary for teaching personal (as opposed to institutional) discourse.

Finally, the entire model functions at the expense of integrative EER that integrate the resources of all components into a single system, making it possible to organize a manageable learning process (Google Classroom, Edmodo, Canvas LMS, etc.).

5. The description of the assessment component refers to the controlling stage (determining the forms, types, and means of control when creating a VLE model). The individual form of control in the DO-VLE can be carried out both by using substitutive EER (pre-prepared sets of lexical and grammatical exercises: https://www.perfect-english-grammar.com/, https://www.englisch-hilfen.de, etc.), and with the help of constructive EER for creating individualized tasks (Coreapp, Wizerme, LearningApps, etc.). For pair or group forms of control, it is reasonable to use virtual rooms with built-in test tasks for pairs or groups of learners at the expense of communicative-integrative resources (e.g., Webroom). Communicative EER serve to control the development of speech skills that are necessary for the implementation of speech strategies and tactics. An exemplary assessment activity is given below.

6. *Task*: Sort out business culture peculiarities into three columns: those belonging to Western business culture, Russian business culture, or both (see Figure 6).

The discourse approach delivers different implications that need to be considered when developing a DO-VLE in its assessment component. For instance, the value component of discourse analysis is of high importance. In the case of IT discourse one of the most prominent results was to detect the hierarchical organization and open communication of different participants roles in everything that is connected to professional activity and education (Balyshev, 2021 p.20-37). This led to assigning EER with open access for collaboration, editing, and commenting when rating students' projects and portfolios (e.g., Notion, Confluence, etc.).



• Western business culture	• Russian business culture	 Universal
•	•	•

• More intense gesticulation, weaker hierarchy, respect towards culture and traditions of a business partner, some mixture of personal and business, stronger hierarchy, teamwork as the highest value



Figure 6. An assessment task in Etreniki (constructive EER)

The choice might differ for specialists trained in, for example, legal industry, military, or civil service discourses.

CONCLUSION AND DISCUSSION

The DO-VLE model described in the article might be adjusted to a specific group of learners based on the presented methodological approach that is closely connected with the growing relevance of the discourse analysis method (explored by Fairclough (2013), Van Dijk (2019), and others) and the discourse approach in Linguodidactics.

The research, however, does not exhaust the whole variety of theoretical and practical problems of creating and implementing DO-VLE models for organizing distance foreign language teaching. Further research into the psychological foundations and cognitive aspects of distance discourse-oriented learning is needed as it belongs to the issues of considerable scientific interest.

Nevertheless, the results obtained contribute to further research on implementing the discourse teaching approach in distance and blended learning environments.



The DO-VLE model might also serve as the theoretic basis for developing discourse-oriented language web courses or structuring online language classes.

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Convergence of Foreign Language and Engineering Education: Opportunities for Development

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Abstract

Significant changes are taking place in the modern post-industrial world both in the technological sphere and in society. These changes require a review of the professional skills of future engineers. Critical thinking, well-developed communicative skills, creative approaches for professional problem solving, ability to independently set and solve production tasks and interdisciplinary research gained significance. The article analyzes the process of forming professional skills of future engineers to meet the requirements of modern society. Based on our working experience, creativity and critical thinking are quite difficult to form within the framework of teaching/learning one or more engineering disciplines. However, it can be facilitated by a closer interaction of the humanitarian and engineering disciplines in the tertiary educational environment. A blended teaching approach of integrating a foreign language into the engineering study is proposed. The foreign language contribution to stimulating critical thinking skills and maintaining learning motivation is crucial for future engineers' training, which requires detailed consideration. The article highlights the importance of integrating the English language into a technical university curriculum based on the principle of problematization and verbalization of learning, using reflection exercises (reflection in action) and professional vocabulary acquisition. The authors present the results of professional vocabulary acquisition by students during the implementation of a pilot integrative course within one semester for international student competition training in the theory of mechanisms and machines.

Keywords: ESP; Engineering; CLIL; Cognitive Development; Critical Thinking; Motivation

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Иностранный язык и инженерные дисциплины в техническом вузе: Возможности для личностного роста

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Аннотация

В современном постиндустриальном мире происходят значительные изменения как в техносфере, так и в области социальных отношений. Эти изменения требуют пересмотра профессиональных навыков будущих инженерных кадров. К этим навыкам можно отнести критическое мышление, развитые коммуникативные умения, креативность подхода к решению профессиональных задач, способность самостоятельно формулировать и решать производственные задачи, проводить междисциплинарные исследования. В статье анализируется процесс формирования профессиональных навыков будущих инженеров необходимых в современном мире. Исходя из опыта работы, в рамках преподавания/изучения одной или нескольких инженерных дисциплин креативность и критическое мышление сформировать достаточно сложно. Однако этому может способствовать более тесное взаимодействие дисциплин гуманитарного цикла и инженерных дисциплин в учебном процессе. Вклад иностранного языка в стимулирование мышления и поддержания мотивации к обучению будущих инженеров является важным аспектом обучения и требует детального рассмотрения. Целью данной статьи является анализ методических приемов по интеграции иностранного языка и инженерных дисциплин направленных на стимулирование навыков критического мышления и поддержания мотивации к обучению. В статье отмечается важность построения учебного процесса по иностранному языку в техническом вузе с учетом проблемности и вербализация обучения, включения упражнений по размышлению (рефлексия в действии) и освоению профессиональной лексики. Авторы приводят результаты освоения студентами иноязычной профессиональной лексики в ходе реализации интегративного курса в рамках одного семестра по подготовке к международным студенческим соревнованиям по теории механизмов и машин.

Ключевые слова: Профессионально-ориентированное обучение иностранным языкам; Инженерные дисциплины; CLIL; Критическое мышление; Мотивация; Проблемность обучения

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INTRODUCTION

By the beginning of the 21st century, it was clear to educators that engineering students need to develop competences not only in technical matters, but also in humanistic and social concerns. "This doesn't mean that an engineering student would merely take a few extra courses in the humanities or even that he or she would need to take a double major. Rather, it means that educating the next generation of engineers must, at its core, bridge the gap inherent in the reductionist paradigm" (Kastenberg, 2007, p. 1497).

Basically, an engineering education should provide students with the competences of the following specialists:

- analyst (analysis of past ideas and experience, discovery of open problems and challenges),
- researcher (understanding of operation, performance, economics, interaction of systems),
- designer (creation of alternative and innovative solutions),
- computing engineer (simulation, estimation of systems, modeling using relevant software sets).

At the same time, the education program should encourage such qualities as social responsibility, effective communication (both oral and written, in native and foreign language), teamwork (collaborative way of professional activity) and open-mindedness (thinking outside national frame, long-life education) (Balyakin & Krylov, 2019, p. 39; Goldfarb et al., 2016, p. 3).

In recent decades, new social and technological challenges have emerged that have an impact on the economy, industry and education. The challenges such as increasing level of complexity of engineering systems, control systems based on the elements of artificial intelligence, significant human and environmental impacts of manmade disasters, communications revolution, economy globalization, ageing of population demand for a new post-industrial technology possessing three fundamental aspects: complexity, uncertainty and ambiguity. In this context, W.E. Kastenberg, G. Hauser-Kastenberg and D. Norris claim that "complex systems can have one or more of the following characteristics: holistic/emergent – the system has properties that are exhibited only by the whole and hence cannot be described in terms of its parts, chaotic – small changes in input often lead to large changes in output and/or there may be many possible outputs for a given input, and subjective – some aspects of the system may not be describable by any objective means" (Kastenberg et al., 2007, p. 1499).

The challenges mentioned above inevitably lead to a strategic reassessment of the goals of engineering education. One of the biggest questions discussed among the educators and the experts from the industry is how to ensure relevance of the skills and suitable resilience of the personalities developed by university courses to meet increasingly complex, interdependent needs of the society and industry.

Rugarsia et al. note that the volume of information that engineers are called upon to know is increasing far more rapidly than what engineering curricula can cover. One solution proposed is that the focus in engineering education must shift from the simple



presentation of knowledge toward the integration of knowledge and the development of critical skills needed to make appropriate use of it (Rugarcia et al., 2020, p. 16).

There is a growing consensus among engineering educators that future engineers will need such skills as creativity and communication, critical thinking and problemsolving, as well as the ability to innovate across disciplines (Benson et al., 2010, p. 1042). Borrego & Newswander (2008) suggest that the way an individual understands and appreciates the nature of knowledge affects the way he or she collaborates with colleagues in different academic disciplines, and suggest ways of successful cross-disciplinary engineering education collaborations (p. 123). A perspective for establishing this collaboration is to provide students tools to read the world around them based on problematization and investigation. Mendes & da Silva (2018) propose "a teaching-learning process of mathematics grounded on the relationships between society, cognition, and culture, in the way of practices that exercise multiple readings of reality and give meaning to mathematical construction as learning of culture, through culture" (p. 41).

Learning a foreign language is an important aspect of a new holistic engineering curriculum. For an engineering graduate, a fluent foreign language opens the door to international databases, publications, provides independent sources of information. It helps the graduate a good deal to be incorporated into the international professional society and get better opportunities for job and carrier.

Thus, the purpose of the research is to identify whether the convergence of teaching foreign language and teaching engineering stimulate students' thinking and contribute into the inspiration for personal development.

METHOD

We consider students' cognitive development, ability to think critically, and awareness both in the subject area and foreign language as the core of holistic engineering study programs. Mina & Moore (2010) note that mental representations, perception, and attention all present great challenges in the learning process. One way to address these challenges is communicating effectively with students during the stages of cognition because self-aware students will be more likely to think critically and operate meaningfully (p. F3G-1).

Very often engineering classes focus on the repetition of examples and solutions. As a result, many students do not distinguish between definitions and concepts, and the examples designed to teach the concepts. Consequently, students memorize methods and steps of particular solutions rather than learn the underlying concepts of problems (Mina & Moore, 2010, p. F3G-2). This mode of teaching/learning is also popular in foreign language classes. A typical general English university course provides grammar and vocabulary drills, texts skimming, scanning tasks and listening comprehension activities. Implemented ESP course focuses on professional needs. In fact, in many cases it is merely a compendium of introductory information related to some basic engineering things followed by professional text reading and translation and maybe how to behave at a conference.



In both cases, these learning-by-example classes contribute very little to students' cognitive development and critical thinking. Learning a foreign language through engineering and learning engineering through a foreign language provides better opportunities.

The basic components of professional competence are knowledge and skills of applying this knowledge in the situations of theoretical analysis and practical activity. Terminology is at the core of engineering knowledge. Concepts are of utmost importance for the language of any profession, since facts, ideas, methods, models are condensed, concentrated and fused into a single unit, which then becomes something we call a concept.

Concepts often seem familiar to students while being just a facade that hides facts, ideas that elude students' consciousness. Being involved in the kaleidoscope of study subjects, overloaded with assignments, projects, and presentations, and limited in time, students try to find the easiest way to solve problems and follow teacher's samples. In order to provide students with a room for thinking, the teacher has to stop and ask them questions about even the simplest ideas, concepts that are relevant to the subject. Questioning and reasoning are in the core of the **problematization**. Students should focus on developing skills for analyzing information and basic concepts.

In particular, students have difficulty discovering the idea of a *constant* as one of the basic engineering notions. The following is a typical dialogue in a class with junior students:

Teacher (*T*): *Time derivative of speed is zero, what about the speed? Student* (*S*): *It does not change (speed).*

T: What do you mean by it doesn't change?

S: Speed is a constant.

T: What does constant mean?

S: It doesn't change.

(after a few rounds of searching for the right word, the dialogue reaches a new level) *T: What do you mean by the speed doesn't change*?

S: So it keeps the same value.

T: Which value?

S: The one that it had initially, the **initial value**. Constant speed at any time keeps its initial value.

The definition of the *constant speed* concept took time and involved overcoming a difficulty using analysis, comparison, and categorization. The established concept is extremely important both for a particular problem and for many engineering applications in general.

Engineering education is impossible without solving problems; here we find another possibility for problematization in the teaching/learning process if it takes place in a foreign language. Authentic foreign-language texts of problems, questions, and tasks give rise to informational insufficiency, because of two reasons. First, students' foreignlanguage conceptual field is often poor and does not suggest easy-to-use scaffoldings. Second, the mother tongue and foreign tongue conceptual engineering domains are often



not the same; they can be expressed in different words. These reasons lead to the impossibility of using ready-made solutions, approaches, methods as generalized examples and models from experience. Students find themselves in a situation of a permanent choice: they may know elements of a solution, but need to identify them. Difficulties encourage students to compare, generalize, and synthesize, which contributes greatly in developing critical thinking skills.

The blended teaching/learning of a foreign language and engineering provides a number of opportunities for cognitive development via **verbalization**. Verbose speech patterns are not typical in the engineering communication where ideas are presented in concepts, have the form of equations expressed by numbers, diagrams, graphs and drawings. Yet the invasion of language into engineering courses unleashes a high potential of verbalization, since language exists and manifests itself through patterns of speech.

If a teaching mode tends to be very "solve this because" without necessary speculations and discussions, then new concepts are introduced as merely dull words and are memorized as words only. This disrupts the connection between the concept and what students are doing, and ends up with the students' imitating the samples without understanding.

Students will successfully acquire new information if it is presented to them in contrast to their previous knowledge, if the meaning of the information and its practical application are well understood. In many cases, mental operations of **comparison**, **generalization**, **classification**, and **categorization** are valuable for these purposes. This is particularly important for the conceptualization of notions and terms expressed in a foreign language.

Here we will consider only three possible scenarios: an exercise in reasoning, making a formula, and setting up a concept map.

Exercises in reasoning are very useful as a thought-provoking introduction to a topic. For example, *what is the difference between oscillatory motion and any periodic motion?*

Possible reasoning:

Any motion that repeats itself over and over again at regular intervals of time is called periodic motion. For example, the motion of planets around the Sun. If a body moves back and forth repeatedly about its <u>equilibrium position</u> (key word), its motion is said to be oscillatory or vibratory or harmonic motion. The swinging motion of the pendulum of a wall clock is an example. So every oscillatory motion is necessarily periodic but not every periodic motion is oscillatory. For example, the Earth completes one revolution around the Sun in one year but it does not move about a mean position. Therefore, its motion is periodic but not oscillatory.

Making appropriate formulas on the basis of verbal instructions is sometimes hard for engineering students. Students require repetitive training to develop the appropriate skills.

Example:

The first step: setting the scene, a problem question.



Angle φ for a rotating body is known to be proportional to the cube of time t. What formulas could satisfy the condition?

Students are given time for reflection and argument.

The second step: conclusions, generalization.

If we say that one quantity is proportional to another quantity, does this mean they are equal to each other?

No, $\varphi = kt^3$, we need a factor between φ and t.

Another example you will find with weight and mass of a body.

Setting up a concept map captures all mental operations together with the stages of making a conclusion.

For example, consider an object subject to air resistance while falling down in a vertical plane. The concept of *terminal speed* is to be introduced. As a rule, this phrase, *terminal speed*, says nothing to junior students. Necessary speculations and discussions concerning this concept can be organized around a concept map (see Fig. 1).

Cognitive development is also enhanced by the active use of foreign-language textbooks on study subjects. They often present the methods of analysis different from those used in national universities. For example, the *Willis method*, named after the American engineer, is used in Russian course of Machine and Mechanism Science to derive the gear ratio for a planetary gearbox. Most English-language international textbooks refer to it as "formula method" and not consider it as a basic methodology. An alternative method is used (essentially the same analysis of the relative motion of the toothed wheels) performed as an algorithmic sequence of operations that is formalized in the table, respectively, and called "tabular method". It is believed that specialists do understand that formula method, tabular method, and Willis method are merely different names for the same reality.



Figure 1. Concept map example



RESULTS

Content and Language Integrated Learning (CLIL) pedagogy is still far from the final stage of development in a worldwide university practice. Various projects explore different aspects of the methodology, such as achieving an optimal balance between language and subject material linking all kinds of speech activities to the thematic material, formation of professional thesaurus, motivation, and others. In a recent paper, the authors of this article discussed the conceptual problems of the language of mechanical engineering as a pedagogical phenomenon and gave an example of a CLIL-type course for undergraduate students (Krylov et al., 2021). The main goal of the two-semester course described in the paper was balanced formation of the components of foreign language and engineering professional competencies. The results of surveys and testing of students of the pilot group and the reference group indicate a significant success (p. 140–141).

However, students' critical thinking and stimulation of their creativity were beyond the project's objectives and, therefore, were not investigated. These issues are rather sophisticated, so piloting is required to reveal what the contours of future methodology should be. Students' high motivation and time limitations are seen as conditions to establish a close connection between intellectual development and the progress in engineering English. The impetus for a pilot course has come from the objective necessity of the mechanical engineering students' to participate in the international Olympiads on the theory of machines. Students under stress due to competition should be able to quickly navigate the thesaurus of the discipline, find solutions to contest problems and think critically about them. Preparation for the Olympiads is not in principle a mainstream training, so, unlike the project noted above, the number of participants of the piloting was limited.

The pilot methodology is based on the following key principles: problematization; verbalization; exercise in reasoning; scaffoldings and repetitive language patterns; setting up a concept map; the use of international textbooks.

One semester a blended course combining teaching English and teaching the elements of theory of machines was run for a pilot group of three sophomore students. In many aspects, this course is in the scope of CLIL pedagogy (Coyle, 1999, Coyle, et al., 2010, Gierlinger, 2017, Khalyapina et al., 2017). The most important aspects include: double focus on Language and Engineering; the use of foreign language as a teaching tool; Cognition, Culture, Content, and Communication as a foundation, impetus and guidance (Dalton-Puffer, 2011; del Pozo, 2016; Marsh, et al, 2005; Meyer, 2011; Pérez Cañado, 2016).

Since the course is focused on students' cognitive development, the "first C" is given special attention based on problematization, categorization, conceptualization, and verbalization. Therefore, this pedagogy is in fact merely a CLIL-like one. English scientific literacy is one of the main goals.

The essentials of the study course of theory of machines are fixed in Russian-English thesaurus, which discloses the structure of the course; provides two-language equivalents of basic concepts, notations, units, conversion factors; demonstrates typical



graphical models. The thesaurus is considered as a kind of a guide helping to catch the logic of the course, understand the information, and apply it in the relevant problems.

Student	Correct interpretation	Incorrect Interpretation	No interpretation
А	20	5	104
	(15.5%)	(3.9%)	(80.6%)
В	31	1	97
	(24.0%)	(0.8%)	(75.2%)
С	28	1	100
	(21.7%)	(0.8%)	(77.5%)

Table 1. Understanding concepts: before study course (total 129).

Table 2	. Understanding	concepts: after o	one semester course	(total 129).
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Student	Correct interpretation	Incorrect Interpretation	No interpretation
А	56	7	66
	(43.4%)	(5.4%)	(51.2%)
В	73	6	50
	(56.6%)	(4.6%)	(38.8%)
С	75	19	35
	(58.1%)	(14.7%)	(27.2%)

At the initial stage of the experiment, the students' acquisition of English concepts was under investigation. A total of 129 basic concepts were selected, and these were included in teaching modules. The students' acquisition before and after the course are shown in Tables 1, 2.

It can be seen that the degree of acquisition of foreign-language concepts has grown sharply. Interestingly, all students have increased the percentage of misinterpretations and errors in their native language translations. This could indicate a rise of degree of selfconfidence, which is essential for foreign-language communication.

The authors understand that the pilot group of only a few students does not allow definitive conclusions and recommendations. Yet, the results of this pilot course confirm the validity of the reasoning given at the beginning of the article and encourage designing the methodology of creative development within CLIL pedagogy.



CONCLUSION

Today the evolution of social life and technology calls for engineers capable of cognitive development, critical thinking and awareness, both in the subject area and in a foreign language. This is a challenge for the traditional ways of higher educational courses. Engineering education should not be reduced to some important facts and ideas shown in a "do as I do" manner. Learning from ready-made samples is not only boring, but often a waste of time.

At the same time, by the beginning of their studies at the university, students already have some linguistic knowledge and foreign language speech skills, and also have an idea of academic disciplines, engineering and technology. Integrative teaching of foreign language and engineering provides excellent opportunities for students' cognitive development. This is not just about the notorious double focus on language and engineering. Similarly, it is a double focus on experience and thoughts within the scope of native and international science expressed by means of native and foreign languages.

A teacher in an integrative CLIL-like course is expected to be able to teach students to reveal the connections between concepts, analyze information, and establish their own logical relationships within the systems of two languages.

In our opinion, problematization, categorization, conceptualization, and verbalization should be at the core of the two-language pedagogy focusing on understanding of engineering information and concepts, which also contributes to a significant improvement in foreign language proficiency.

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Contributed paper



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Consensus without Consent

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Abstract

For a critique of media technologies this paper aims to utilize the Propaganda Model (PM) from the first chapter of the book by Edward S. Herman and Noam Chomsky *Manufacturing Consent: The Political Economy of the Mass Media* (1988) which centers on the hegemonic role and power of media in the political process. A synoptic review of the model and more recent scholarship along similar lines affords a revitalization of Herman and Chomsky's radical critique. Their project seeks to reveal that democratic practice is merely staged, since public participation, critical discourse and economic decisions are already filtered by the media. In particular, the PM highlights the dichotomous nature of media, and it predicts their persuasive performance and effects. Media communication technology tends to colonize and monopolize our economic power, and it reshapes continually the legitimizing practices and effects of democracy. Consent as a democratic quality is staged and engineered by elites and corporate owners. Modern democracy, therefore, is merely manufactured. Thus, media should be evaluated and rechecked as a social and political apparatus, even as an institution of power, which whenever left unchecked may cause some rupture in the democratic landscape.

Keywords: Propaganda Model; Media; Consent; Hegemony; Modern Democracy; Political process

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Аннотация

Для критики медиа-технологий в статье используется модель пропаганды, представленная в первой главе книги Эдварда С. Хермана и Ноама Хомского "Производство согласия. Политическая экономия массмедиа" (1988), в центре которой гегемонистская роль и власть СМИ в политическом процессе Краткий обзор модели и более поздние исследования на ту же тему позволяют оживить радикальную критику Германа и Хомского. Их проект направлен на то, чтобы показать, что демократическая практика является всего лишь постановкой, поскольку участие общественности, критический дискурс и экономические решения уже фильтруются средствами массовой информации. В частности, модель пропаганды подчеркивает дихотомическую природу СМИ и эффективность убеждения и воздействия. Технологии медиакоммуникаций имеют тенденцию колонизировать и монополизировать экономическую власть и постоянно видоизменяют легитимизирующие практики и эффекты демократии. Согласие как демократическое качество инсценируется и создается элитами и владельцами корпораций. Таким образом, современная демократия является просто искусственной. Таким образом, СМИ следует оценивать и перепроверять как социальный и политический аппарат, даже как институт власти, который, если его не контролировать, может вызвать некоторый разрыв в демократическом ландшафте.

Ключевые слова: Модель пропаганды; СМИ; Согласие; Гегемония; современная демократия; Политический процесс

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This essay is grounded in the critical assumptions of the Propaganda Model (PM) from Edward S. Herman and Noam Chomsky's book, *Manufacturing Consent*. The general assumption is that power, generated by the Propaganda Model (PM), is deliberately determined by moderately few privileged individuals and corporately owned business sectors. As such, this prompts a selectivity of reports, sorting out of information and sterilization of news stories with the goal that what reaches the public is just that which reinforces the motivation of those privileged elites and media owners to advance individual power and corporate benefit (Herman, & Chomsky, 1988, pp. xv, 4, 8, 10-14).¹ Public consent and individual decision are, therefore, manufactured (Herman, & Chomsky, 1988, p. xi; Mitchell & Schoeffel, 2002, pp. 16-17).²

The PM is a model framed and rooted in the critical-Marxist tradition of political economy and traditional media systems (Klaehn, & Mullen, 2010, pp. 10-11).³ The PM is a theory which holds that media, in general, and the political process form a dialectical relation wherein one consumes and subsumes the other.

For Herman and Chomsky, consent is (being) manufactured by the elite class or specialized group who owns powerful corporations and has substantial influence and power to dominate the culture industry and economic space, since these few profit-making owners and business venturers abjure the free flow of news and analysis that are against their corporate interest. Manufacturing of consent is necessary in order to elude public opinion and veer the public mind to less serious issues. Such recalibration of opinion or issues can only be handled by a "specialized class" who are keen enough to figure out what will be shown or heard by the people for public consumption (Chomsky, 2002, p. 15).

As opposed to a democratic model within which media play a suitable role to enhance deliberation, the PM is more efficacious in utilizing media communication technologies. The main idea of Herman and Chomsky's book is centered on the assumption that the "power-relation" in a media-centered society refers to relatively few elite groups and corporations, leading to the meticulous selection, filtering, and refining of important news stories with the end goal that what reaches the general public is only that which supports or fortifies the intentions and interests of the predominant private interests.⁴ In this context, media unremittingly shapes public opinion and the political process (Herman, & Chomsky, 1988, pp. 41-43).

¹ The more dominant media firms are those huge corporations that are owned and controlled by elite and wealthy people who forms symbiotic relations with the current government, leading banks, media organizations, academic institutions, and the like.

² Walter Lippmann first used the term the "manufacture of consent" in order to protect the "intelligent minorities" from the "bewildered herds."

³ See also Shemelis (2017). In an interview by Chomsky with James Peck, the former found the common reading of Marxist literature quite bleak and dreary. He prefers the left-wing Marxist tradition, i.e., something unorthodox or a more dissenting approach in understanding social theory.

⁴ In this case, I use "power relation" as a dialectic term that mediates ideology and communicative power in a vertical relationship. This vertical relation of power corresponds to the social model of class stratification. Concerning the PM of media, it marks the intersection of communicative power and political economy in modern capitalist society. In contrast, for Foucault this term alludes to the horizontal immanence of power. It enables us to see the horizontal relations of various procedures in disputes on



Mass delusions in a democratic society can happen when the strategies of control of a PM are effectively deployed. The PM implies creating fantasy enfranchisements. This "necessary illusion and emotionally potent oversimplification" (Chomsky, 1989, p. 33) achieves the rhetorical persuasion by media apparatuses in the public sphere.

Political propaganda is one of the two main reasons why "fake news" or "deep fakes" spread like a brushfire. Former US President Donald Trump coined the phrase "fake news" to describe assaults by the news media. However, fake news is infiltrating conventional media via Weibo, WeChat, and other Chinese-language social media platforms. According to Shanghai International Studies University journalism professor Peiqin Chen, when someone posts erroneous information on Weibo, it may be repeated by a prominent publication using a Weibo account. Other major media outlets have picked up on it since then. She also stated that mainstream press in China performs the most critical part in verifying and disseminating misleading news.⁵

On the other hand, according to Gifty Appiah-Adjei from the University of Education in Ghana, the purpose behind fake news is not necessarily political. For her, it is propagated usually for economic advantage or financial gain from increasing internet traffic, or merely for amusement, and other individuals make up stories simply for the pleasure of it (Schoeman, 2019).

As critical viewers, according to Schoeman, we must learn the difference between "misinformation" and "disinformation." Misinformation is defined as false information disseminated without the goal of causing harm. The goal of disinformation is to propagate misinformation and influence people. Media misinformation regarding migration, climate change, and Brexit, for example, was categorized as "probably true," "mainly false," "unfounded," or "unverifiable" (Schoeman, 2019). However, not everyone is critical about this since in our present time, journalists and media personnel are treated like TV personalities in some countries, such as the Philippines. When they reach a certain level of prominence and social media presence, the majority of them run for political office. For this reason, there is a proliferation of the banality of TV celebrities even in politics. I call it the "cult of celebrity spectacle."

According to French philosopher, Guy Louis Debord, the general mindset of the public and public opinion is charmed by celebrity personalities. In his book, *Society of the Spectacle* (1977), he said, the image and lifestyle of the celebrities, as the spectacular representation of modern living, promote the banality and illusion of equitable opportunity to the totality of consumption and provide a point of identity with the shallow-appearing lifestyle that must substitute for the fragmented meaningful specializations of the present life. For him, "They embody the inaccessible results of social labor by dramatizing the by-products of that labor which are magically projected above it as its ultimate goals: power and vacations – the decision-making and consumption that are at the beginning and the end of a process that is never questioned" (Debord, 1977/2002, §60,

resources and benefits. For him, there are no pregiven social characters that dominate since it is not a relation of domination but self-determination in the very fabric of the social life. See Foucault, 1978, pp. 82-85; 1985, pp. 6-7.

⁵ Lynee Schoeman. 2019. "Training journalists in the era of fake news." AFP News. July 16, 2019. <u>https://news.yahoo.com/training-journalists-era-fake-news-033742201.html?fr=sycsrp_catchall</u>



p. 26). More so, "The real consumer has become a consumer of illusions. The commodity is this materialized illusion and the spectacle is its general expression" (Debord, 1977/2002, §47, p. 21).

Media communication technologies, more than just informing and disseminating news for the public, operate as a business enterprise and function as a commercial space. Without the right ethos to regulate this corporate practice, any form of business can be debased, and any saleable product can be (re-)directed merely for profit-making. Having this as media's reference, any news and information can be altered or distorted from its initial form. For Herman and Chomsky, such phenomena in mass media can be traced to the use of media filters. For them, there are five systematic operative filters that create the impression of objectivity of news, namely media ownership, advertising, the media elite, flak, and anti-communism or another common enemy (Herman & Chomsky, 1988, p. 2). For them, media communication technologies are propelled by these interrelated filters (Mitchell & Schoeffel, 2002, p. 13). These filters largely determine how business rules play out especially in the hands of advertisers (Mitchell & Schoeffel, 2002, p. 24-30).

The present relation between the media and the political process can be likened to a dialectical dynamic where one devours the other. For Herman and Chomsky, it is the media-mediated system that gobbles up the political process. In so far as media is owned and managed for the most part by a few elite groups and corporate tycoons, no news and reports will ever be unfiltered or unbiased, since it will and must always serve the system and not the individual, or personal profit and not the productive organization of human passion. According to Shemelis, the government is the main source of news and the reporters are efficiently utilized by the government to organize the crowd (Shemelis. 2016, p. 1; Herman & Chomsky, 1988, p. 21). News is interesting to the audience when it fascinates their imaginations or teases their sensibilities. Media injects its message to the audience in a straightforward fashion and shapes its point of view considerably (Rahman & Marjan, 2013).

The traditional Jeffersonian understanding of the role of media as a "watch-dog", counterweight, and critical check on the power of the government, allowing for better participation in the political process, has significantly shifted to an ideological market force which targets the political economy and supports market strategies (Jebril et al., 2013, pp. 6-7). According to Shemelis (2016), the PM provides the framework within which mainstream media should be assessed. Capitalism is at its peak when there is increasing privatization of properties and an expansion of power among the elites (Taylor, & Harris, 2008, p. 16). Media is the "necessary evil" to fortify the market ideology. Media marked the proceedings, landmarks, and background upon which cultural populism⁶ is possible and cultural industry⁷ becomes inevitable.

⁶ Social scientist Jim McGuigan (1992) scrutinized active viewers for exaggerating human agency in media and underplaying political, social, and monetary variables. He describes this 'cultural populism' as completely fanciful and ideologically credulous.

⁷ The "culture industry" is the commercialization of culture which highlights mass production of goods, services, and products. Amidst a diversity of cultures, this industry tends to homogenize and standardize the mode of production and impose rigorous schemas to maintain social control and regulate antagonism in society (see Adorno. 1991, p. 98-106). Adorno conceived the notion of 'culture industry' as



Democracy and freedom of the press are crucially dependent on each other: If there is no free press there is no democratic practice (Howard, 2004). According to the PM, the current state of affairs in most dominant and progressive media corporations is characterized by the mutually compounding interventions into the spectrum and presence of media by the government and other major stakeholders, namely elite groups and their experts. Direct suppression, social coercion, psychological manipulation, and the like move into focus in the democratic space once the government and media fuse their relation (Coliver & Merloe, 1997, p. 19).

According to Audra Diers (2011), we must redefine our traditional conceptualization of media merely as the dissemination of information and move to a more analytic engagement with social reality. Media is not merely an operational tool but a mode of engagement where public approval and contestation is vital for the socio-political growth of the state.

Herman and Chomsky's assumption is conditioned as an aftermath of the industrial revolution, capitalism, and material possession of properties. When the government, the private sector, or the media elite which owns and manages large corporate shares of the media take the market economy, commercial production, and political process into their hands, then the whole enterprise of democratic practice is compromised.

Media has a macro-political influence, and it penetrates our micro-social behavior. In politics, this is called hegemony. In religion, it is called homogeneity. In critical theory and social philosophy, we call it populism. In mass media and now also social media, we call it the propaganda model. Its conceptual nuances are interwoven in a dynamic and systematic structure of preserving power and sustaining the capitalist mentality of control over individual and personal choices. Media as such is not disinterested in its functional behavior rather it is a predisposed apparatus. To create a tolerable sense of reality, media needs to feed the public mind with their heart's desire and content, eventually to isolate from political debate, that is, to paralyze them, making them believe that participation means isolation.

For example, Facebook, Instagram, Twitter, and similar social media sites create an appearance of political discussion while, in fact, presenting only a minimal segment, if not a fictitious display of the actual range of contestation. The discussion that takes place may seem plausible at times since these media implicitly serve as a political platform that restricts relevant information to safely debatable topics. For example, who would read the business news in some major newspapers nowadays especially since "the market for news about money and stocks is much greater than the market to news about issues which matter to working people" (Herman & Chomsky, 1988, p. 122).

The PM is premised on three interrelated assumptions. First, there is indeed a consensus but only in so far as it is an elite consensus on certain issues. This does not mean that the general public needs to be aware of this consensus, rather it needs to be distracted or redirected to peripheral matters, since its "voices" do not really contribute to consensus-formation, despite the open space sharing and collection of opinions in social

an enticing structure that produces cultural wares for mass spectators, while supporting predominant political and financial interests. Ponzanesi (2014) attempts to underscore the confusing and conflictual dynamic functions of the cultural industry (p. 2).



and media networks (Herman & Chomsky, 1988, p. 19; Klaehn & Mullen, 2010, p. 12). Second, in the liberal democracies Herman and Chomsky are thinking about, public media work under corporate control and management, not entirely a government jurisdiction. Media assume an elitist perspective, the opinions and decisions of the people are already influenced and downplayed by the selected options of the few (Herman & Chomsky, 1988, p. 18; Klaehn & Mullen, 2010, p. 12-13). Third, the media embody corporate and elite interests. The outcomes of major and crucial public decisions relating to these interests should remain within the boundaries that accord with their privileged status in society. This involves a general articulation of what sort of information needs to be fed to the public, since "Only the corporate sector has the resources to produce public information" (Herman & Chomsky, 1988, p. 21). While one tolerates diverse opinions from the public, one still needs to satisfy the needs and interests of consumers, traders, and the market. The PM is thus essentially the mode of being of modern media.

It is crucial to comprehend what kind of medium is employed in this scenario of eluding political power while maintaining elite control over the masses. McLuhan (1964) emphasizes that "Medium is the message" (p. 7). For him, "it is the medium that shapes and controls the scale and form of human association and action. The content or uses of such media are as diverse as they are ineffectual in shaping the form of human association" (McLuhan, 1964, p. 9). Disagreements and pluralistic opinions make an essential contribution to the political arena. The medium upon which differences of ideas are conveyed is crucial in the exercise of political will and rational consensus. McLuhan offers an optimistic view of media, but Herman and Chomsky are apprehensive of its essential nature and deterministic tendencies especially in exercising political power.

At the dawn of the century of media enfranchisement, this manufacture of consent penetrates our social and political system rapidly – unwittingly shaping the way we settle on how we should experience our lives. This radical engineering and (re-)formation of modern tools heightens our interest in anything spectacular or unnatural, while the commodification of cultural values comes within reach. To this effect, certain groups of individuals would capitalize and upgrade the utilization of technologies to rule the private and public mind and create an ambiguous picture of reality – a reality that is duplicitous and hedges power.

The use of media communication technology is the modern imperialist's mode of recalibrating and maneuvering the political economy. In liberal democracies, the political space is at odds with itself with financial managers, corporate technocrats, and business capitalists in power, and the media enhancing their own power through a systematic and invisible web of filters.⁸

⁸ Democracy demands active involvement of the citizenry. Normatively speaking, public media should enable citizens to participate in the business affairs of the government by educating, informing, and organizing them.



In connection with the progressive practices of democracy, modern media tend to create a homogenized language which brings into open the tendency to marginalize others in actual discourse.⁹

This global phenomenon¹⁰ gives rise to the emergence of a global village – a village where modern media hegemonize our political and economic decisions both in the public and private sphere.¹¹ Modern media creates a landscape of multiple possibilities and a plethora of exigent problems. Media tends to expand human needs through unnecessary wants. Moreover, the hegemony of public media emphasizes their unresolved dominance, elusive power-steering, and fluid recalibration in the decision-making process of individual and public opinion in general (Herman & Chomsky, 1988, p. 303). In a society where new technologies have emerged and where these are considered a lifestyle, the communicative power and the usage of modern media tools shares a rhizomatic character (Deleuze, & Guattari, 1984, p. xi-xii, pp. 3-4).

The initial conception of the PM does not entirely disregard the increasing popularity and radical progress of media systems, like social and digital media. In the meantime, social networking sites have grown exponentially which translates into massive business enterprises (Lim, 2008). The PM provides a critical perspective on the nature, behavior, and repercussions of media in the democratic process, grounding the assumption that they work like corporations, capitalizing their designs through advertising and other filtering mechanisms.

In this context, news and information becomes distorted and reformatted from its initial state, framed according to plan and placed within a framework of interpretation that is provided by a selection of experts. Chomsky mentions that "This process of creating the needed body of experts has been carried out on a deliberate basis and a massive scale [since] ... their work was funded and their outputs were disseminated to the media by a sophisticated propaganda effort" (Herman & Chomsky, 1988, p. 24). News reports presented by media outlets are already filtered and sterilized before they reach the general public (Herman, & Chomsky, 1988, pp. 23-24). For this reason, consent does not emerge from political and economic decisions of citizens anymore, instead, it is manufactured. The greater the disparity between wealth and power, the more prominent and effective becomes the PM in the deliberative space of any democracy.

In a world of concentrated wealth and major conflicts of class interest, the interest to protect personal and corporate wealth requires systematic propaganda. It is much more difficult to see a propaganda system at work where the media are private in the first place and formal censorship is not required.

⁹ Modern media here include but are not limited to mass media, since these have diverse models (viz., social media and digital media) while resembling each other in terms of the media apparatus. For the sake of consistency in this discussion, I will be referring to the general idea and varieties of mass media.

¹⁰ "Globalization is the result of powerful governments" who push beyond the boundaries of reasonable business exchange and commerce in order to dominate the economic and political landscape. (Chomsky, 1999, p. 13)

¹¹ The term 'global village' means a world viewed as a community in which distance and isolation have been dramatically reduced by electronic media such as television and the Internet. This term was popularized in the 1960's by Marshall McLuhan (1964) found in the book, *The Gutenberg Galaxy: the making of typographic man* (p. 31).



A propaganda model focuses on this inequality of wealth and power and its multilevel effects on mass-media interests and choices. It traces the routes by which *money and power can filter out the news fit to print* [italics added], marginalize dissent, and allow the government and dominant private interests to get their messages across to the public. (Herman & Chomsky, 1988, p. 2)

... A propaganda approach to media coverage suggests a systemic and highly political dichotomization in news coverage based on serviceability to important domestic power interests. (Herman & Chomsky, 1988, p. 35)

In the media context, it is not the information itself that is crucial but the implication of the information that we get. Media organizations, print media and other media platforms recognize assorted strategies for distributed impact over our political and economic decisions. These strategies shape how we view the world, help envision social issues, and direct our interest to social matters that are deserving of consideration. Thus, the media play a critical role in the political and economic life of the citizens.

Mass media provide the landscape and context within which social, political, and economic issues are publicly discussed. Currently, for the most part, they define the public sphere. Media set their own acceptable boundaries and tolerable limits in the arena of public debate and opinion.

On the one hand, traditional media usually report and convey vital information to the general public. Here they serve as an ideal platform to exercise our constitutional rights, basic privileges, and individual achievements. It provides an effective communicative (re)channeling of information which acts as a conduit to raise and discuss moral concerns, political issues, economic matters, or even personal questions. As such, media amplifies the exercise of the democratic spirit. On the other hand, in the current state of media practice, it tends betray its original position when it tends to filter the news, to isolate and segregate the real issue from public interest.

For Herman and Chomsky, mass media generally control the social-political atmosphere in a dynamic and impenetrable system of manufacturing consent. It tends to (re-)construct certain news or stories to control general perceptions and reactions of the public, to muster, and redirect the public mind to more extraneous issues. Some news and information tend to exaggerate or sensualize the story to divert public opinion to a more trivial matter. Lastly, it can also produce mass hysteria to paralyze or steer the general public by fetishizing mass demonstrations and genuine public contestations.

For these reasons, deliberative practice in liberal democracies has become distorted, if not a mere parody of itself, based on the rhetorical use of power relations between the government, the powerful shadow elites, and business moguls, which delimit the framework of political life. The hegemonic specter of modern communication technologies undermines the core values and spirit of democracy, which is embodied in the strategic and radical engineering of media consent – a consent without real consent (Chomsky, 1999, p. 43).

Consent is best realized in a democratic society. Real democracy will flourish dynamically if consent is unshackled from dominant interests. But the kind of democracy one typically experiences in the current setting is merely a parody. It is a parody in so far



as it highlights the preservation of a privileged minority as against the impoverished majority and redirects public interests away from the most pressing issues.

In a democratic society, people or the majority are expected to act as "participants," expected to constantly engage in the political process. However, with the advent of private and corporate ownership, people are reduced to mere "observers" indulging their uncritical fascination with anything intriguing and trivial (Herman & Chomsky, 1988, p. 17). According to the PM, this has become possible by way of rhetorical control by ruling interests.

If it wants society to thrive and flourish, the primary economic responsibility of the government will be grounded in control of public opinion and safe-guarding of the interest of the few. The more popular any government is, the easier for it to manage-control the public mind. Privileging the few and marginalizing the majority is the mode of production of modern media. This majority in a capitalist society is either voiceless or dissuaded to engage or participate in the political process. Genuine and healthy democratic practice is possible if there is constant and diverse questioning or contestation of power across all segments of society, without the façade of a benevolent appeal to authority or pity.

It is therefore the arduous task of philosophy to reconcile opposing forces or find a way out to reasonably explain the ambivalence of democratizing modern media in the public sphere.¹² For this reason, "It is the responsibility of the intellectuals to speak the truth and to expose lies" (Chomsky, 1987, p. 60). He added that "[i]ntellectuals are typically privileged; privilege yields opportunity, and opportunity confers responsibilities" (Chomsky, 2016, p. 21).¹³

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¹² This term figures centrally in the works of Jürgen Habermas (1991), see chapter II (4, 5 & 7), chapter III (8), and chapter VI (20). The latter chapter speaks of the public sphere as a platform for advertising. This is briefly discussed also in chapter VIII of Habermas (1996).

¹³ In the first chapter of this book, he identified two categories of intellectuals, viz., the "valueoriented intellectuals" and the "technocratic and policy-oriented intellectuals." As Chomsky said, "The distinction between the two categories of intellectuals provides the framework for determining the responsibility of intellectuals" (Chomsky, 2016, p. 9).



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СВЕДЕНИЯ ОБ АВТОРЕ / АВОИТ ТНЕ АИТНОК

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