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Бас редактор: Қуанышбаев С. Б., география ғылымдарының докторы, Ахмет Байтұрсынұлы атындағы ҚӨУ, Қазақстан.

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РЕДАКЦИЯ АЛҚАСЫ

Әлімбаев А.Е., философия докторы (PhD), А.Қ. Құсайынов атындағы Еуразия гуманитарлық институты, Қазақстан.

Емин Атасой, PhD докторы, Улудаг университеті, Бурса қ., Түркия.

Зоя Микниене, докторы, (PhD) Литва денсаулық туралы ғылым университеті, Каунас қ., Литва Республикасы.

Качев Д.А., философия ғылымдарының кандидаты, тарих магистрі, «Челябі мемлекеттік университеті» ЖББ ФМБББМ Қостанай филиалы, Қазақстан.

Ксембаева С.К., педагогика ғылымдарының кандидаты, «Торайғыров университеті» КЕАҚ, Қазақстан.

Лина Анастасова, элеуметтану ғылымдарының докторы, Бургас еркін университеті, Бургас қ., Болгария.

Медетов Н.А., физика-математика ғылымдарының докторы, «Ш. Уалиханов атындағы Көкшетау университеті» КЕАҚ, Қазақстан.

Мишулина О.В., экономика ғылымдарының докторы, «Челябі мемлекеттік университеті» ЖББ ФМБББМ Қостанай филиалы, Қазақстан.

Соловьев С.А., биология ғылымдарының докторы, Новосібір мемлекеттік экономика және басқару университеті, Ресей.

Скороходов Д.М., техника ғылымдарының кандидаты, «Ресей мемлекеттік аграрлық университеті – К.А. Тимирязев атындағы Мәскеу ауыл шаруашылық академиясы» ЖББ ФМБББМ, Ресей.

Сычева И.Н., ауыл шаруашылығы ғылымдарының кандидаты, «Ресей мемлекеттік аграрлық университеті – К.А. Тимирязев атындағы Мәскеу ауыл шаруашылық академиясы» ЖББ ФМБББМ, Ресей.

Ташев А.Н., экология бойынша биология ғылымдарының кандидаты, орман шаруашылығы университеті, София қ., Болгария.

Уразбоев Г.У., физика-математика ғылымдарының докторы, Ургенч мемлекеттік университеті, Өзбекстан.

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Заместитель главного редактора: *Жарлығасов Ж.Б.*, кандидат сельскохозяйственных наук, КРУ имени Ахмет Байтұрсынұлы, Казахстан.

РЕДАКЦИОННАЯ КОЛЛЕГИЯ

Алимбаев А.Е., доктор философии (PhD), Евразийский гуманитарный институт имени А.К.Кусаинова, Казахстан.

Емин Атасой, доктор PhD, Университет Улудаг, г. Бурса, Турция.

Зоя Микниене, доктор (PhD), Литовский университет наук здоровья, г. Каунас, Республика Литва.

Качеев Д.А., кандидат философских наук, магистр истории, Костанайский филиал ФГБОУ ВО «ЧелГУ», Казахстан.

Ксембаева С.К., кандидат педагогических наук, НАО «Торайгыров университет», Казахстан.

Лина Анастасова, доктор социологии, Бургасский свободный университет, г. Бургас, Болгария.

Медетов Н.А., доктор физико-математических наук, НАО «Кокшетауский университет им. Ш.Уалиханова», Казахстан.

Мишулина О.В., доктор экономических наук, Костанайский филиал ФГБОУ ВО «ЧелГУ», Казахстан.

Соловьев С.А., доктор биологических наук, Новосибирский государственный университет экономики и управления, Россия.

Скорыходов Д.М., кандидат технических наук, ФГБОУ ВО РГАУ-МСХА имени К.А. Тимирязева, Россия.

Сычева И.Н., кандидат сельскохозяйственных наук, ФГБОУ ВО РГАУ-МСХА имени К.А. Тимирязева, Россия.

Ташев А.Н., кандидат биологических наук по экологии, Лесотехнический университет, г. София, Болгария.

Уразбоев Г.У., доктор физико-математических наук, Ургенчский государственный университет, Узбекистан.

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**SULTANGAZINA, G.Zh., ODZHAKHVERDIYEVA, S.V.
TAXONOMIC ANALYSIS OF THE KOSTANAY URBAN FLORA**

The article presents the results of taxonomic analysis of urban flora of Kostanay, 562 species, 80 families, 277 genera were identified, and tables of the taxonomic structure of the urban flora of Kostanay were compiled, identifying the leading families and genera, with the number of species established for each family and genus. The obtained family and genus spectra reveal the typological characteristics unique to this urban flora. Taxonomic analysis of the flora uncovered the biological diversity of plants in the study area, highlighting the richness and uniqueness of the local flora. The study results indicate that the dominant families in the city are Asteraceae, Rosaceae, and Poaceae, with prevalent genera including Astragalus, Artemisia, Ranunculus, and Carex.

Key words: urban flora, taxonomic analysis, species richness, urban environment, Kostanay.

Сведения об авторах:

Сұлтангазина Гүлнара Жалелқызы – к.б.н., и.о. профессора кафедры биологии, экологии и химии, Костанайский региональный университет имени Ахмет Байтұрсынұлы, г. Костанай, Республика Казахстан.

Оджахвердиева Саида Вахидовна – магистрант 2 года обучения ОП 7М05101 – Биология, Костанайский региональный университет имени Ахмет Байтұрсынұлы, г. Костанай, Республика Казахстан.

Сұлтангазина Гүлнара Жалелқызы – биология ғылымдарының кандидаты, биология, экология және химия кафедрасының профессорының м.а., Ахмет Байтұрсынұлы атындағы Қостанай өңірлік университеті, Қостанай қ., Қазақстан Республикасы.

Оджахвердиева Саида Вахидовна – 7М05101-Биология мамандығының 2 курс магистранты, Ахмет Байтұрсынұлы атындағы Қостанай өңірлік университеті, Қостанай қ., Қазақстан Республикасы.

Sultangazina Gulnara Zhalelovna – Candidate of Biological Sciences, Acting Professor of the Department of biology, ecology and chemistry, Akhmet Baitursynuly Kostanay Regional University, Kostanay, Republic of Kazakhstan.

Odzhakhverdiyeva Saida Vakhidovna – 2nd-year Master's student, “7M05101 – Biology” educational program, Akhmet Baitursynuly Kostanay Regional University, Kostanay, Republic of Kazakhstan.

UDC 372.853

Tastanov, M.G.,
Candidate of Physical and Mathematical Sciences,
Associate Professor, acting Professor
of the Department of mathematics and physics,
Akhmet Baitursynuly Kostanay Regional University,
Kostanay, Republic of Kazakhstan
Kurmangaliyeva, A.A.,
2nd year Master's student,
“7M054080 – Physics” educational program,
Akhmet Baitursynuly Kostanay Regional University,
Kostanay, Republic of Kazakhstan

THE ROLE OF BICS AND CALP IN THE INTEGRATION OF LANGUAGE AND CONTENT LEARNING IN THE PHYSICS LESSONS IN ENGLISH

Abstract

The article discusses the importance of using the Quadrant Model to integrate linguistic and content skills in physics lessons. The Quadrant Model helps structure educational tasks, developing both Basic Interpersonal Communicative

Skills (BICS) and Cognitive Academic Language Proficiency (CALP), ensuring a gradual transition from simple tasks with visual support to independent analysis of complex concepts. The article also provides recommendations for teachers on how to use the Quadrant Model to plan lessons and improve student performance in a bilingual environment.

Key words: *integration of BICS and CALP, bilingual education, physics in English, Quadrant Model, cognitive skills, language skills.*

1 Introduction

Teaching physics in English in the context of integrated subject and language learning (Content and Language Integrated Learning, CLIL) requires consideration of both academic and communicative language skills of students. The concepts of BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency), proposed by Jim Cummins (1979), play a key role in creating an effective language environment conducive to mastering both physics and English. Cummins argued that BICS includes basic communication skills that students use in everyday situations, whereas CALP refers to the ability to operate in the academic language needed to analyse and interpret complex concepts and texts. Understanding and applying these concepts in the teaching of physics makes it possible to eliminate the barriers that students face when studying complex scientific disciplines in a foreign language.[1]

Within the framework of the CLIL approach, the "Cummins Quadrant Model" (Cummins, 1981) becomes an important tool, which structures learning tasks along two axes: cognitive complexity and contextual saturation. According to this model, all learning tasks can be classified into four quadrants: from cognitively simple and contextually rich (Quadrant 1) to cognitively complex and contextually poor (Quadrant 4). Cummins argued that in order to successfully develop academic language skills, students should move from Quadrant 1 (for example, tasks with illustrations and support) to Quadrant 4, where completing the task requires maximum independence and the use of academic language without additional contextual supports.[2]

Scientific research confirms the effectiveness of the Quadrant Model in teaching natural sciences. For example, studies (Coyle, Hood, & Marsh, 2010) have shown that students whose physics education is structured according to quadrants demonstrate a deeper understanding of conceptual content and better develop cognitive skills. In their work, Mehisto, Marsh and Frigols (2008) emphasize that the use of tasks covering all four quadrants contributes to the gradual transition of students from simple communication tasks (BICS) to complex analytical tasks (CALP), which is especially important when teaching technical disciplines in English.[3][4]

However, as Linares (2015) notes, the successful application of the Quadrant Model requires careful selection of learning tasks and the use of special techniques that allow students to effectively transition from BICS to CALP. Linares suggests adapting the content and language of assignments depending on the level of language training and cognitive complexity of the material, which is especially important when teaching physics, where not only knowledge of the academic language is often required, but also the ability to interpret mathematical models and laws of nature.[5]

Thus, the purpose of this article is to analyse the role of BICS and CALP in the integration of language and subject learning in physics lessons in English and to study the effectiveness of the Cummins quadrant model for the development of academic language skills.

2 Materials and methods

BICS and CALP Concepts.

Differences and Integration The concepts of BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency), proposed by Jim Cummins (1979), are fundamental for understanding differences in the development of language skills in bilingual students. BICS refers to basic communication skills that are used in everyday communication, such as informal conversations, discussions, and social interactions. These skills are usually developed during the first two years of learning a new language and provide basic communication in social

contexts (Cummins, 1979). CALP, by contrast, covers cognitively rich language skills that are necessary for successful academic assignments such as writing essays, interpreting texts, discussing scientific concepts, and solving complex problems.[1]

Cummins (1980) argued that BICS and CALP develop on different timelines and require different learning approaches. If BICS is sufficient to maintain social contacts and mutual understanding, then CALP requires considerable time and effort to master, as it involves the use of specialized vocabulary, the formation of scientific hypotheses and the application of cognitive strategies in an academic context (Cummins, 1980). This division is especially relevant in the context of teaching in a foreign language, where basic communication skills do not provide an adequate level of understanding of academic material such as physics and other natural science disciplines.[2]

In order to structure the process of developing language skills, Cummins (1981) proposed a Quadrant Model that helps evaluate tasks according to two parameters: cognitive complexity and contextual saturation. These parameters are used to classify learning tasks and help teachers develop learning materials focused on both basic and academic language development.[2]

The model includes four quadrants:

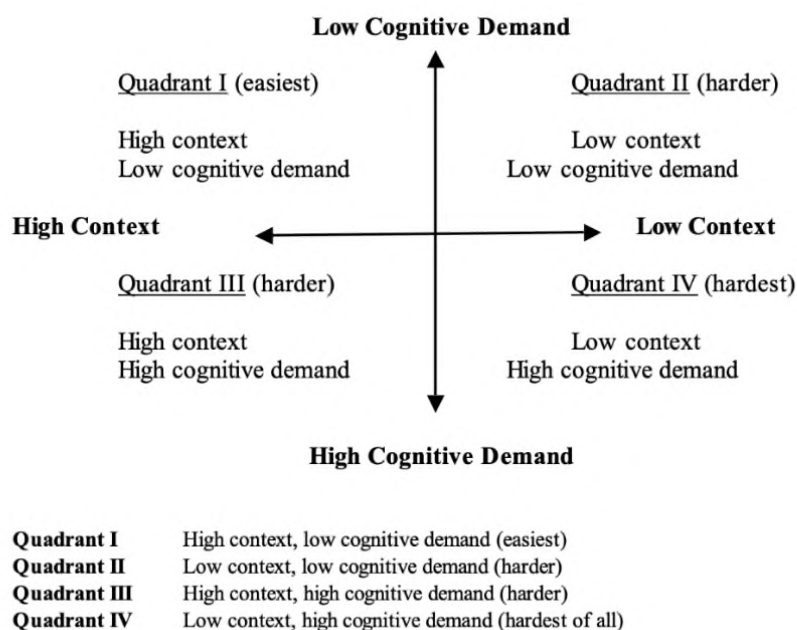
Quadrant 1: Contextually rich and cognitively uncomplicated tasks.

Quadrant 2: Contextually intense and cognitively challenging tasks.

Quadrant 3: Contextually poor and cognitively uncomplicated tasks.

Quadrant 4: Contextually poor and cognitively challenging assignments.

Picture 1. – «Quadrant Model Cummins»[7]



Using this model helps teachers effectively move students from Quadrant 1 to Quadrant 4, gradually developing their language and cognitive abilities. Cummins argued that such a sequence allows for the development of both BICS and CALP, creating the basis for in-depth academic study in a foreign language.

The CLIL (Content and Language Integrated Learning) methodology is an approach to learning in which the study of language and subject content occurs simultaneously. In this context, the use of the quadrant model allows us to take into account both the development of language skills and the development of academic material. Linares and Morton (2015) note that the choice of assignments should correspond to the level of language training of students and their cognitive

readiness in order to stimulate the development of both BICS and CALP. For example, when studying physical concepts, you can start with simple tasks (Quadrant 1), such as using visual cues and discussing basic concepts, and gradually move on to more complex ones (Quadrant 4), including the formation of scientific hypotheses and analysis of experimental results.[5]

The application of the Cummins Quadrant model in the process of teaching physics in English helps teachers structure lessons and assignments in such a way as to ensure the development of both communicative and academic skills. According to Gibbons (2002), the transition between squares allows students to consistently master both basic language skills and more complex forms of academic interaction. This is especially important in natural science disciplines, where a clear understanding of specialized vocabulary and the ability to operate with abstract concepts are required [6].

Thus, using the concepts of BICS, CALP and the Cummins quadrant model in the context of the CLIL provides an integrated approach to the development of academic skills, which makes it possible to successfully integrate language and subject learning in a bilingual education environment.

Principles of building a physics lesson using Quadrant Models

The quadrant model includes four types of learning tasks that gradually increase cognitive load and reduce contextual support. Below is a table describing each quadrant and examples of tasks for physics lessons:

Table 1 – Quadrant descriptions

Quadrant	Characteristics	Examples of Physics Lesson Tasks
Quadrant 1	Contextually rich and cognitively simple tasks	Using illustrations to explain Newton's laws, discussing object trajectories based on images
Quadrant 2	Contextually rich and cognitively complex tasks	Laboratory work with analysis of results, discussion after experiments using diagrams and graphs
Quadrant 3	Contextually poor and cognitively simple tasks	Independent reading of theoretical texts, performing terminology exercises without visual support
Quadrant 4	Contextually poor and cognitively complex tasks	Writing a scientific report, explaining abstract concepts, critical analysis of theoretical principles

The stages of integration of BICS and CALP in physics lessons

Stage 1: Introduction of new material (Quadrant 1)

At the first stage, visual support is used to explain simple concepts. The teacher introduces basic terminology and key concepts using pictures and diagrams, which reduces cognitive load and develops BICS. For example, the study of the concept of force can begin with illustrations demonstrating how different objects interact with each other.

Stage 2: Academic Skills Development (Quadrant 2)

After mastering the basic terminology, students move on to more complex tasks, such as conducting experiments using physical devices and subsequent analysis of the results. For example, they can measure the speed of falling objects and compare the data obtained with theoretical values. In this case, contextual support is provided through laboratory instructions, which helps students use academic language to describe phenomena and formulate conclusions.

Stage 3: Reading and Interpretation (Quadrant 3)

At this stage, the use of contextual support is decreasing. Students read physics texts and complete reading comprehension tasks. For example, they may be invited to analyse complex texts on the topic of "Energy and Work", after which they discuss the main ideas using academic vocabulary.

Stage 4: Self-study (Quadrant 4)

At the last stage, students complete tasks of a high level of complexity, such as writing a report or a presentation on the topic "The effect of friction on the movement of objects." They

should independently analyse the theoretical aspects; summarise the data obtained and argue their conclusions based on academic terminology.

Table 2 – Table of examples of tasks for integrating BICS and CALP in physics

Type of Task	Objective	Description
Group discussion of concepts	Development of BICS	Discussion of basic physics concepts, such as "force" and "acceleration," using simple sentences
Laboratory work	Development of CALP	Measuring the falling speed of objects and analysing results using terms, graphs, and tables
Independent reading and analysis	Transition from BICS to CALP	Reading scientific articles and discussing their content with minimal contextual support
Critical analysis and essay writing	In-depth development of CALP	Writing an essay on the topic "The Importance of Newton's Laws in Real Life," focusing on the use of scientific terminology

The application of these stages and types of tasks in physics lessons allows students to systematically develop both communicative and academic skills, creating a solid foundation for their academic success in a bilingual learning environment.

3-4 Results and discussion

Application of the quadrant model in the curricula in physics lessons

To successfully integrate BICS and CALP into teaching physics in English, the Quadrant Model allows you to structure assignments in such a way as to develop both basic communication skills (BICS) and academic language skills (CALP). In this part of the article, specific examples of the application of the quadrant model in physics lessons will be considered, based on two curricula that cover the topics of electromagnetic waves and solving problems based on signals and their modulation.

Picture 2. – Lessons’ plans

Beginning of the lessons

The image shows two side-by-side lesson plans for 'Short-term lesson plan' from the 'Physics and Mathematics (or Kazakh)' department at Nazarbayev Intellectual Schools, Grade 12. Both plans are approved by Kurmangaliyeva A.A., Head of Department.

Left Lesson Plan (Beginning of the lessons):

- Long-term plan unit:** Electromagnetic oscillations and waves
- Theme of the lesson:** EM oscillations and waves. Solving problems
- Learning objectives that are achieved at this lesson (Subject Programme reference):** 12.1.1.1 - know and describe forced and free electromagnetic oscillations; 12.1.1.2 - describe sources of electromagnetic oscillations; 12.1.1.13 - give examples of the use of electromagnetic waves;
- Success criteria:** Students have achieved the objective if they are able to:
 - describe the conditions of free and forced electromagnetic oscillations
 - solve problems about electromagnetic oscillations using formulas
 - identify the wavelengths and frequency of the main types of electromagnetic waves
 - give examples of the uses of electromagnetic waves;
 - describe the effects on human organism and the conditions of appearance of electromagnetic waves;
- Language objectives:** Subject-specific vocabulary & terminology: Infrared, Ultraviolet, X-ray, Gamma ray, Capacitor, capacitance, Inductor, Inductance. Useful sets of phrases for dialogue and writing: A resistor is a conductor (a piece of wire for example) that has resistance. The resistance of a wire is the ratio of the potential difference across its ends and the current flowing through the wire. A capacitor is an electric device that stores electric charges. Capacitance of a capacitor is the ratio charge stored and the potential difference across it. An inductor opposes change of current through it. Inductance is the property of a coil (solenoid) to resist change of current through it.
- Values instilled at the lesson:** Taking responsibility for one's own work, working independently and mutual assistance of each other as part of a learning community
- Global Citizenship:** The discovery and application of electromagnetic waves was a technological advancement that allowed for the development of television, the Internet, and other information technologies.
- Authenticity of learning:** EM waves are used in everything from radios to radiation therapy. During this lesson, students will study the applications of EM waves to various types of technology they have experienced in their own lives.
- Cross-curricular links:** Mathematics (periodic functions), IT (radio transmitters and receivers), biology (effects of EM waves on living organisms)
- Previous learning:** Students have studied EM oscillations in LC and RLC earlier in the term, and have studied magnetic induction and the EM spectrum in grade 10. This lesson is designed to revise students' knowledge and prepare them for the internal summative assessment.
- Course of the lesson:** Planned stages of the lesson: Beginning of LI; Planned activities: Starter; Resources: Presentation

Right Lesson Plan (Solving problems: Communication channels, Signal Attenuation):

- Long-term plan unit:** Electromagnetic oscillations and waves
- Theme of the lesson:** Solving problems: Communication channels, Signal Attenuation
- Learning objectives that are achieved at this lesson (Subject Programme reference):** Know the frequencies and wavelengths used in different channels of communication; Understand that information may be carried by a number of different channels: wire-pairs, coaxial cables, radio and microwave links and optic fibres; Understand the term modulation and be able to distinguish between amplitude modulation (AM) and frequency modulation (FM);
- Success criteria:** Students have achieved the objective if they are able to:
 - describe and compare different channels of communication;
 - call the relative advantages and disadvantages of channel of communication in terms of available bandwidth, noise, cross-linking, signal attenuation;
 - calculate signal attenuation in dB and dB per unit length.
 - Distinguish between amplitude modulation and frequency modulation.
- Language objectives:** Subject-specific vocabulary & terminology: signal, attenuation, amplification, noise, bel, decibel, amplifier gain. Useful sets of phrases for dialogue and writing: In order for a signal to be detected, the power of the (transmitted) signal must be a minimum number of times greater than the noise power; When a signal is amplified, the output of the amplifier is a certain number of times greater than the input; Because the ratios between signal and noise can be very large, it is convenient to compare these power levels using a logarithmic scale.
- Values instilled at the lesson:** Working cooperatively in pairs.
- Global Citizenship:** The ability to amplify signals in different communication channels allows us to communicate with people very far away from us instantaneously. The ability to do this (i.e. the networks that create this connectivity and the infrastructure to amplify the signals in them) requires the maintenance of infrastructure. What role do governments have in building and maintaining this infrastructure? Students will complete a task that connects the topic with themselves, their town, their country and their world.
- Authenticity of learning:** Students will be given problems about geostationary satellite is used by one country to broadcast information to a different country.
- Cross-curricular links:** Mathematics (solving logarithms) and ICT (signal attenuation and amplification, different communication channels)

Example 1: Solving problems on the topic "Electromagnetic waves and oscillations" (Lesson Plan "EM oscillations and waves")

In this lesson, students study the characteristics and applications of electromagnetic waves, as well as solve problems related to oscillations in the LC circuit. The lesson includes several stages that cover different quadrants of the model and allow students to effectively develop both communicative and academic skills.

Quadrant 1: Contextually rich and cognitively uncomplicated tasks

The introduction to the topic begins with a discussion of basic concepts and terms such as "electromagnetic waves" and "free oscillations". The teacher uses visual materials and presentations so that students can better understand new terms. For example, slides and videos are used when discussing Maxwell's theory or the characteristics of various types of electromagnetic waves (infrared, ultraviolet, etc.).

Quadrant 2: Contextually intense and cognitively challenging tasks

After getting acquainted with the theory, the students proceed to the practical solution of problems for calculating the oscillation parameters in the LC circuit. The teacher provides them with formulas and examples of solutions. The method of working in groups is used, where strong students help weaker ones to master formulas and methods for calculating the frequency of vibrations.

Quadrant 3: Contextually poor and cognitively uncomplicated tasks

At this stage, students read textual information about electromagnetic vibrations and solve simple tasks based on the data obtained. Contextual support is minimal, which encourages students to interpret the text themselves and find the necessary information.

Quadrant 4: Contextually poor and cognitively challenging assignments

The final task requires students to analyse in-depth and use their knowledge independently. Students are preparing a mini study on the application of various types of electromagnetic waves in technologies such as X-rays or radio waves.

Example 2: Solving problems on the topic "Signals and their modulation" (Lesson Plan "Solving problems: Communication channels Signal Attenuation")

This lesson is devoted to the study of various signal transmission channels and modulation characteristics. The assignments are distributed according to the quadrant model and cover both basic and academic language skills.

Quadrant 1: The introduction begins with the practice of describing various communication channels (coaxial cables, radio and microwave channels, optical fibre) using visual materials. Students work in pairs, describe each type of channel and discuss their advantages and disadvantages.

Quadrant 2: In the next stage, students solve problems for calculating signal attenuation and discuss modulation (amplitude and frequency). The teacher explains the formulas and demonstrates examples of problem solving, after which the students solve them on their own.

Quadrant 3: Students read a text about the principles of modulation and answer questions about the material they read. Contextual support is minimal, which encourages them to use academic language and analyse the text.

Quadrant 4: The final assignment includes project work where students develop a presentation on the effects of various types of modulation on signal quality. They should argue their conclusions and use specialised vocabulary.

Recommendations for the use of the square model

1. **Using interactive methods:** Start with visual support and discussions in pairs, and then move on to more complex tasks.

2. **Gradual complication of tasks:** The transition from quadrant 1 to Quadrant 4 should occur sequentially so that students have time to adapt to the increase in cognitive complexity.

3. **Differentiated approach:** Take into account the level of training of students and use multivariate tasks for groups with different levels of language proficiency.

Thus, using the quadrant model helps to effectively develop both communicative and academic language skills, ensuring successful mastering of physics in English.

Both lessons demonstrate the effective use of the integration of language and subject content, focusing on the development of both basic communication skills (BICS) and academic (CALP). The methodology is based on the quadrant model, which allows you to structure tasks from simple, with high contextual support (discussion of terms and concepts), to complex, requiring independent analysis and critical thinking (problem solving and project work).

In both lessons, there is a gradual increase in cognitive complexity and a decrease in the level of support, which corresponds to the goals of bilingual learning. The training tasks are adapted for different stages of mastering the material, starting with discussions in pairs and ending with independent research projects. Special attention is paid to reflection and self-assessment, which helps students to realize their strengths and weaknesses and develop metacognitive skills.

5 Conclusions

The use of the quadrant model in the integration of BICS and CALP in physics lessons provides a systematic approach to the development of language and cognitive skills in students. This model allows you to structure learning tasks according to the principle of "from simple to complex", helping students smoothly move from completing tasks with high contextual support to more complex tasks that require independent analysis and the use of academic vocabulary. This approach contributes to the effective development of the subject material and language content, creating conditions for successful teaching of physics in English.

The quadrant model helps to overcome language barriers and eliminate problems associated with an insufficient level of academic language training. Developing lessons based on this model allows you to plan assignments in such a way that students can simultaneously develop interpersonal communication skills (BICS) and academic language competencies (CALP) necessary for successful research and critical analysis. Teachers are advised to follow the following principles when planning lessons:

1. Step-by-step increase in cognitive complexity of assignments

Teachers should start with simple tasks in Quadrant 1, such as discussing terms and concepts with visual support, in order to develop basic communication skills in students, especially those for whom English is a second or third language. As students master basic terminology and concepts, assignments should gradually move into Quadrant 2, where there is high contextual support and cognitive complexity increases (for example, performing laboratory work and group studies).

2. Using multimodal support in the initial stages

Contextual support in the first stages (Quadrant 1 and 2) plays a key role in reducing cognitive load and forming a language foundation. It is recommended to actively use visual, graphical and digital resources such as diagrams, graphs and simulations so that students can match visual images with new terms and concepts.

3. Systemic reduction of contextual support

As students move towards Quadrant 3, it is important for the teacher to gradually reduce contextual support, giving students more opportunities to interpret texts and solve problems on their own. It is important to introduce exercises for reading scientific texts, independent problem solving and written assignments that will help develop skills in working with academic vocabulary.

4. Creating conditions for independent analysis and critical thinking

Tasks from Quadrant 4 should include complex tasks and projects that require the integration of theoretical knowledge and the ability to critically evaluate information. These can be tasks such as writing scientific reports, conducting research projects, and presenting results. These assignments should encourage the use of academic language and a deep understanding of subject concepts.

5. A variety of task formats and active student engagement

Teachers should plan a variety of learning activities, including group discussions, laboratory work, project research and role-playing games. It promotes the formation of interpersonal communication skills (BICS) and stimulates the use of academic language in a real context (CALP).

6. Regular reflection and self-assessment

At each stage, it is important to provide reflection and self-assessment to monitor the level of understanding and language training. Using methods such as self-assessment scales, discussions in pairs and groups, as well as regular tests, will help students assess their progress and adjust learning goals.

Following these recommendations will allow teachers to effectively plan lessons and achieve successful integration of students' language and academic skills as part of teaching physics in English.

References

- 1 Cummins, J. (1979). Basic interpersonal communicative skills and cognitive/academic language proficiency. *Working Paper on Bilingualism*, 19, 121-129.
- 2 Cummins, J.: 1980, 'Psychological assessment of immigrant children: Logic or intuition?', *Journal of Multilingual and Multicultural Development* 1, 97-111.
- 3 Coyle, D., Hood, P., & Marsh, D. (2010). *CLIL: Content and Language Integrated Learning*. Cambridge University Press.
- 4 Mehisto, P., Marsh, D., & Frigols, M. J. (2008). *Uncovering CLIL: Content and Language Integrated Learning in Bilingual and Multilingual Education*. Oxford: Macmillan Education.
- 5 Llinares, A., & Morton, T. (2015). The role of different tasks in CLIL students' use of evaluative language. *System*, 54, 69-79.
- 6 Gibbons, P. (2002). *Scaffolding language, scaffolding learning: Teaching second language learners in the mainstream classroom*. Portsmouth, NH: Heinemann.
- 7 Broward County Public Schools. (n.d.). *Cummins Quadrants Model*. Retrieved.
- 8 From [http://www.broward.k12.fl.us/esol/Eng/ESOL/PDF/Handbook/Appendices/Appendix%20L CumminsQuadrants.pdf](http://www.broward.k12.fl.us/esol/Eng/ESOL/PDF/Handbook/Appendices/Appendix%20L%20CumminsQuadrants.pdf)

ТАСТАНОВ, М.Ғ., ҚУРМАНҒАЛИЕВА, А.А.

АҒЫЛШЫН ТІЛІНДЕГІ ФИЗИКА САБАҚТАРЫНДА ТІЛДІК ЖӘНЕ МАЗМҰНДЫҚ ОҚЫТУДЫ ИНТЕГРАЦИЯЛАУДАҒЫ BICS ЖӘНЕ CALP РӨЛІ

Мақалада физика сабақтарында лингвистикалық және мазмұндық дағдыларды біріктіру үшін Квадрант Моделін қолданудың маңыздылығы талқыланады. Квадрант Моделі негізгі Тұлғааралық Коммуникативтік Дағдыларды (BICS) және Когнитивті Академиялық Тілді Меңгеруді (CALP) дамыта отырып, білім беру міндеттерін құрылымдауға көмектеседі, қарапайым тапсырмалардан визуалды қолдаумен күрделі ұғымдарды тәуелсіз талдауға біртіндеп көшуді қамтамасыз етеді. Сондай-ақ мақалада мұғалімдерге Сабақтарды жоспарлау және екі тілді ортада оқушылардың үлгерімін жақсарту үшін Квадрант Үлгісін пайдалану бойынша ұсыныстар берілген.

Түйінді сөздер: BICS және CALP интеграциясы, екі тілде білім беру, ағылшын тіліндегі физика, Квадрант Моделі, танымдық дағдылар, тілдік дағдылар.

ТАСТАНОВ, М.Ғ., ҚУРМАНҒАЛИЕВА, А.А.

РОЛЬ BICS И CALP В ИНТЕГРАЦИИ ИЗУЧЕНИЯ ЯЗЫКА И СОДЕРЖАНИЯ НА УРОКАХ ФИЗИКИ НА АНГЛИЙСКОМ ЯЗЫКЕ

В статье рассматривается значимость применения модели квадрантов для интеграции языковых и предметных навыков на уроках физики. Модель квадрантов помогает структурировать учебные задания, развивая как базовые коммуникативные навыки (BICS), так и академические навыки (CALP), обеспечивая поэтапный переход от простых заданий с визуальной поддержкой к самостоятельному анализу сложных концепций. В статье также даны рекомендации для преподавателей по использованию модели квадрантов для планирования уроков и повышения успеваемости учащихся в билингвальной среде.

Ключевые слова: интеграция BICS и CALP, билингвальное обучение, физика на английском, модель квадрантов, когнитивные навыки, языковые навыки.

Information about authors:

Tastanov Meirambek Gabdualiyevich – Candidate of Physical and Mathematical Sciences, Associate Professor, acting Professor of the Department of mathematics and physics, Akhmet Baitursynuly Kostanay Regional University, Kostanay, Republic of Kazakhstan.

Kurmangaliyeva Aimira Amantaevna – 2nd year Master's student, “7M054080 – Physics” educational program, Akhmet Baitursynuly Kostanay Regional University, Kostanay, Republic of Kazakhstan.

Тастанов Мейрамбек Габдуалиұлы – физика-математика ғылымдарының кандидаты, доцент, математика және физика кафедрасының профессорының м.а., Ахмет Байтұрсынұлы атындағы Қостанай өңірлік университеті, Қостанай қ, Қазақстан Республикасы.

Қурманғалиева Аймира Амантайқызы – 7M05408-Физика мамандығының 2 курс магистранты, Ахмет Байтұрсынұлы атындағы Қостанай өңірлік университеті, Қостанай қ, Қазақстан Республикасы.

Тастанов Мейрамбек Габдуалиевич – кандидат физико-математических наук, доцент, и.о профессора кафедры математики и физики, Костанайский региональный университет имени Ахмет Байтұрсынұлы, Костанай, Республика Казахстан.

Курманғалиева Аймира Амантаевна – магистрант 2 курса обучения образовательной программы 7M05408- Физика, Костанайский региональный университет имени Ахмет Байтұрсынұлы, Костанай, Республика Казахстан.

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Tastanov, M.G.,
Candidate of Physical and Mathematical Sciences,
Associate Professor, acting Professor
of the Department of mathematics and physics,
Akhmet Baitursynuly Kostanay Regional University,
Kostanay, Republic of Kazakhstan

Tuktubayeva, S.A.,
2nd year Master's student,
“7M054080 – Physics” educational program,
Akhmet Baitursynuly Kostanay Regional University,
Kostanay, Republic of Kazakhstan

THE INTRODUCTION OF PROBLEM-BASED LEARNING METHODS INTO THE PRACTICE OF A PHYSICS TEACHER AND THE STUDY OF THE EFFECTIVENESS OF THEIR USE IN THE DEVELOPMENT OF STUDENTS' RESEARCH SKILLS

Abstract

This article examines the introduction of problem-based learning (PBL) into physics teaching and analyzes its effectiveness in developing students' research skills. Problem-based learning encourages involvement of students in the learning process, development of critical thinking, independence, and teamwork skills. Special emphasis is placed on practical experiments and real-world scenario modeling, which helps students better understand theoretical material and apply it in practice. The study results include survey data, academic performance, and project task completion among students, confirming the positive impact of PBL on the learning process. The article also provides recommendations for further integrating PBL into the school curriculum and for teacher professional development to support more effective application of this method.

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Корректорлар: *Б. Сыздыкова, Т. Цай*
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