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Научно-исследовательские кейс-задания по развитию речи у детей в подготовке магистрантов по курсу «Физиология высшей нервной деятельности и сенсорных систем»

Практико-ориентированные кейс-задания в курсе «Физиология высшей нервной деятельности и сенсорных систем» для магистрантов (MA students) имеют значительный потенциал не только с точки зрения получения определенного объема новых знаний, но и в развитии необходимых навыков для применения этих знаний в профессиональной деятельности.

Целью данной работы является оценка эффективности кейс-технологии в формировании и совершенствовании исследовательских компетенций студентов магистратуры по профилю «Логопедическое сопровождение детей и взрослых» (Логопедия) в Мининском университете. Предварительное исследование по кейс-проблемам было проведено в детском саду № 2 Володарского района Нижегородской области.

Целевая группа состояла из двадцати детей 4-4,5 лет. В исследовании использовались как теоретические, так и эмпирические методы, например, метод наблюдения, анкетирование, педагогический эксперимент и т. д.

Результатом нашего исследования было создание комплекса артикуляционных и физических упражнений для детей с неправильным звукопроизношением. На основе исследования, проведенного в детском саду, мы создали адекватные кейс-задания для студентов магистратуры, будущих логопедов. Также мы отметили высокие достижения в формировании и овладении исследовательскими компетенциями: 90% студентов магистратуры достигли оптимального и допустимого образовательных уровней овладения компетенциями. Отзывы студентов магистратуры были положительными.

Ключевые слова: кейс-задания, формирование научно-исследовательских компетенций, магистранты, развитие речи у детей дошкольного возраста, общая и речевая моторика

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Research case-tasks for children's speech development in training of the MA students in "Physiology of Higher Nervous Activity and Sensory Systems" course

Practice-oriented case-tasks for the course "Physiology of Higher Nervous Activity and Sensory Systems" for the Master of Arts (MA) students have a significant potential not only in terms of obtaining a certain amount of new knowledge, but also in developing the necessary skills to apply this knowledge in professional activities.

The goal of the paper is the assessment of the case-technology effectiveness in the formation and enhancement of research competences of MA students majoring in "Speech Therapy Support for Children and Adults" (Logopedia) at the Minin University. Preliminary study of the case-problem was carried out at kindergarten No 2, Volodarsky district of the Nizhny Novgorod region.

The target group consisted of twenty 4-4.5 year old children. In the study we used both theoretical and empirical methods, for example, the method of observation, questionnaires, pedagogical experiment, etc.

Our field study resulted in the making up of a complex of articulation and physical exercises for children with mispronunciation. On the basis of the kindergarten's study we created adequate case-tasks for MA students, future speech therapists. Also we received characterize high achievements in the formation and mastery of the research competences MA students: 90% reached optimal and admissible educational levels. The Master of Arts students' feedback was positive.

Keywords: case-tasks; formation of research competences; MA students; preschool children's speech skills; general and speech motoricity

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1. Introduction

The paper addresses, on the one hand, some issues of existing concepts, methodologies and applications in the study of speech development and its deformity, and, on the other, a significant potential of the case-study technology not only in obtaining of new knowledge by Masters of Arts (MA) students but also in developing the necessary competences defined in the Federal State Educational Standard as a professional competence PC-11: the readiness to analyze and systematize the results of research work, to prepare scientific papers and publications and use them in professional activities.

A case-study technology, according to K.S. Yadryshnikov et.al., "is very fruitfully used in management, but insignificantly, in the Humanities" [18, p.307]. We can partially agree with this statement because the list of works on the theme is pretty short. Yet, we would support G.M. Gadzhikurbanova, who wrote "the potential of case-technology allows it to be turned into a real means of forming the research competencies of a future teacher" [4, p.4].

This paper is an attempt to bridge the gap between the requirements of the Federal State Educational Standard for direction 44.04.03 Special (Defectological) Education with major in "Speech Therapy Support for Children and Adults" and the existing syllabus.

The central problem of our research is to define adequate case-tasks which could stimulate research activities and form professional competences of MA students in the course "Physiology of Higher Nervous Activity and Sensory Systems".

The subject of this study is a research potential and effectiveness of the case-study technology in the enhancement of MA students' research competences, so much so, that the BA students were exposed to the technology in the course-block "Medical and Biological Foundations of Speech Therapy", but the task of developing research skills was not yet the goal.

The tasks:

- 1) obtaining and systematization of the material necessary for case-tasks connected with preschool children's speech development;
- 2) choice of adequate methods to assess the level of general and speech motor skills (motoricity); diagnostics of the neurological state and children's speech skills (aged 4-4.5 years);
- 3) case-tasks on the topic "Physiological Basis of Children's Speech Skills" in the course "Physiology of Higher Nervous Activity and Sensory Systems".

2. Literature Review

2.1. Case-technologies in the educational process

It is common knowledge that various active methods are applied in teaching MA students at the University. One of such relatively innovative approaches is "the case-study method". For example, Yadryshnikov's paper considers: "case technology is a pedagogical technology that is a comprehension of a real life situation, the description of which reflects not only the practical problem, but also actualizes a specific set of knowledge that is to be learned when solving the problem" [18, p.307].

The use of case-technologies in the educational process is often accompanied by communicative methods that is teamwork. For example, we can quote Kameronova G.S.

et.al.: "In teaching future health and safety school teachers they perform the activities in the process of communication while mastering professional instructing competences. The activities are a fundamental property of teacher's training education" [11, p. 3].

Mayasova T.V. and Nedelyaeva A.V., in addition to teamwork, successfully use contextual tasks and case-technologies in the "Neurophysiology" course [13].

The choice of adequate training methods for the MA students in "The Speech Therapy" profile is determined by the requirements of the dynamically developing world of modern people. The future speech therapist, along with professional knowledge, ought to get a thorough idea of different age physiological peculiarities, with particular attention to the preschool age, when the child's speech skills and the processes of socialization are most active.

We think that the use of the case method in the course "Physiology of Higher Nervous Activity and Sensory Systems" allows us to give future speech therapists practical knowledge on the diagnosis of the state of the nervous system and the children's motor skills. The development of general and speech motoricity has an enormous effect on the formation of preschool children's speech. When creating case-tasks for the course, it is necessary to take into account that the methods of assessing the nervous system's state and motoricity of school children will differ from those of preschool children, what is more, to obtain a complete picture of "speech disorders of preschool children, we must also pay attention to the mimic muscles state and the state of articulation motoricity" [14, p. 23].

2.2. Preschool children's speech skills

The overall level of children's development in the present period is far ahead of their peers in the 20th century. However, some researchers state that many kindergarten teachers point out weaknesses in the preschool children's development as well: poor physical health and development, insufficient skills of coherent speech.

According to modern theories about the mechanisms of the formation of cortical speech zones, "speech develops in a child during ontogenesis in parallel with physical and mental development" [14, p. 5].

The process of audio perception of speech and the process of sound articulation occur according to the laws associated with the analysis and synthesis of simple and complex stimuli or "in accordance with the principle of differentiation with the release of the main (phonemic) and inhibition of non-essential features" [14, p. 5]. This process is carried out by the secondary divisions of the auditory cortex associated with the cortical zones of articulation analysis.

Mayasova T.V. et al. also note that significant violations of binaural hearing can be observed in some children 4-6 years old [12, p. 2334].

The ability to speak, that is, motor speech, is associated with areas located in the posterior regions of the inferior frontal gyrus of the left hemisphere, the so called Broca's area. Speech understanding is associated with the sensory area of speech which was described by the German scientist Karl Wernicke. "Wernicke's area is located in the superior temporal lobe in the dominant cerebral hemisphere. It is involved in the comprehension of written and spoken language" [2, p. 1754].

Guediche S. writes: "the left middle temporal gyrus and the superior temporal gyrus are of great importance" in the ability to understand speech [8, p. 706].

The Russian scientist Gvozdev A.N. pointed to the role of the motor sphere in the assimilation of the phonetic side of speech: "The motor sphere includes both the motor

center of speech in the brain and the speech apparatus"[7, p. 20], the development of the speech sphere determines the rapid mastering of phonetics.

Thus, we may say that this connection makes it possible to develop speech not only with the help of certain pedagogical methods and communication with the child, but also through training his speech producing apparatus, as well as developing fine motor skills of the fingers.

Physical exercises do not only normalize the motor function of the "lagging systems of the brain, but also involve compensating brain systems" [7, p. 30], and improve the articulation and the child's musculoskeletal systems.

3. Methods and materials of the research

To carry out the study, we made use of the following methods:

1) Theoretical (analysis of scientific literature, comparison of the data from different sources);

2) Empirical methods (observation, questionnaires, pedagogical experiments, etc.).

The results of our preliminary study conducted at kindergarten No 2 served as the basic data to formulate case-tasks on "Children's Speech Skills" in the course "Physiology of Higher Nervous Activity and Sensory Systems" for MA students majoring in the "Speech Therapy for Children and Adults" profile.

Observation Methods:

Children's sound pronunciation was assessed by the method of Fomicheva M.F. [3, p. 10]; the survey of phonemic perception and syllabic structure of the word was carried out according to the method of Ushakova O.S. and Strunina E.M. [17, p. 24].

The neurological assessment of the target group of children was carried out on the basis of the methodological recommendations for BA students of the Chair of Physiology Minin University. We most thoroughly considered both our observation of the children and the interviews and questionnaires of their parents. We also analyzed the state of the emotional vegetative sphere, the psychomotor sphere state, and behavioral responses. We assessed the level of children's motor development with the method of Mukhina A.Ya. [14, p. 77]. We carefully observed and estimated the state of general and speech motoricity, both mimic and articulator motoricity.

The target group consisted of 20 middle preschool children aged from 4 to 4.5 years (12 boys; 8 girls). It should be noted that the first gender division showed no difference in the speech skills of the children, thus we chose another criterium: children's health state. According to it, the group was divided into two subgroups: subgroup I - healthy children (13 children); subgroup II - children with organic and neurological pathologies (7 children).

Members of subgroup II (35% of the group), had either prenatal pathologies (often intrauterine hypoxia, mother's toxicity, etc.) or postnatal disorders (encephalopathy, mental retardation, etc.).

Materials obtained in the preliminary study served as a basis to define the case (mispronunciation of the consonants), create a series of articulatory and physical exercises and case-tasks for MA students. Later there were added: materials received from MA students' practice-oriented activities in kindergartens and other institutions for children of preschool age and results of the approbation of the first two case-tasks.

4. Results

4.1. Brief Characteristics of the Consonant "Trouble-makers"

As noted above, our preliminary study we conducted at kindergarten No 2. In this paper we describe in detail only the results of the consonant pronunciation disorders.

Consonants are speech sounds in the articulation of which the air does not pass through the mouth cavity freely because it meets an obstruction formed by the organs of speech. Consonants are produced by entirely or almost entirely stopping the stream of air coming from the lungs. Consonants can be voiced or voiceless. Sonorant sounds are unpaired voiced consonants which are pronounced without a "noise effect", e.g. [p, p'] (English "r, r' ").

According to the place of formation consonants are divided into labial, labio-dental, front-lingual, back-lingual and glottal. The place of formation and the character of the consonant play a very important role in the correct pattern of the sound production, e.g. back-lingual, glottal, sibilant and constrictive sounds need a physical effort to be produced.

Already the first contact revealed a most glaring picture of mispronunciation: only two children (10% of the target group of middle preschool participants of the study) had a standard articulatory pattern with the exception of the sounds [p, p'] [r, soft r] which was expected to happen because the Russian sound [p] ([r]) is one of the most difficult sounds for articulation, since it requires a sufficient mobility of the articulation apparatus muscles and the vibration of the front part of the tongue.

The "trouble makers" were identified on the basis of the method of Fomicheva M.F. [3, p. 10]. To verify *the clarity of pronunciation* the children were asked to name the objects depicted in the pictures, for example, рыба (checking the sonorant sound [r]) (fish).

We checked *the phonemic perception* by the presence or absence of the sound in a chain of sounds. *The syllabic structure analyses* was carried out through children's naming the objects in the pictures (these were the words with different syllabic structures).

The results of the analyses show that the pronunciation of sibilants was most difficult for children of this age group: 70% of the children replaced [ш] by [c], more than 70% pronounced the sound [з] instead of [ж], the sound [ч] was replaced by [т'] (30%). Twenty percents of the children could not cope with the sound [ц], the sound [щ] was [c'] in more than 50% of cases.

Among the sonorant sounds, the greatest problem as it was predicted was presented by the sounds [p], [p'] because 88% of the children either did not pronounce them, or replaced them with a hard [л] sound or a soft [л'] sound (so-called Russian lisp). Among the back-lingual sounds there was a certain difficulty with the pronunciation of the glottal sound [x]. Instead of [x] we could clearly hear the sound [κ] from 10% of the children; two children (10%) could not clearly pronounce the labiodental [φ] sound.

We could see a difference in the sound pronunciation in the subgroup No 1 and the subgroup No 2: the percentage of children with difficulties in sound pronunciation of consonants increased sharply in the group of children with neurological disorders, e.g. sounds [ш] were mispronounced in 100%, [щ] – in 86% (subgroup II) and in 62% (subgroup I).

In general, we found that the number of mispronounced sounds in subgroup I (healthy children) averaged 3.7 ± 0.8 (i.e., children incorrectly pronounced from 3 to 4 sounds), while that of subgroup II (children with neurological pathology) averaged 8.4 ± 2.0 . The reliability of data differences between the two groups was $p < 0.05$.

4.2. Target group motor skills and neurological state survey

To diagnose the case, we carried out a survey of the state of general motor skills on the basis of the analysis of several simple exercises like throwing a ball upwards, a hand's circular movements with a ribbon overhead, etc. We evaluated the state of the fine motor skills with the help of the following tasks, e.g. putting together mosaics, buttoning on clothes, etc.

Also we defined the state of mimic muscles and articulation motoricity. Facial expression activity was checked with the help of the following tests: raise your eyebrows, puff out and pull in your cheeks, etc. Articulatory motoricity was assessed according to such tests, as: fold your lips into a "tube", smile, etc.

The rest of the children in subgroup I aged 4 to 4.5 years showed adequate results. In contrast to subgroup I, disorders of general and fine motor skills could be observed in 70% of the children from subgroup II. These children could not do most of the physical exercises, they were often tense: we could observe stiffness of movements, poor locomotor coordination, etc.

We also found that almost 50% of this subgroup children could do mimic muscles exercises correctly, as for articulation motoricity only 30% of them could do only one of the tasks determining its state. They were the children who had significant sound pronunciation disorders.

The analysis shows the correlation between the neuropsychological state of the children and their neurological status (pre- and postnatal disorders). We also considered the state of the emotional vegetative sphere, disorders of the autonomic nervous system, the state of the psychomotor sphere and behavioral reactions. According to the parents' information (questionnaires), general background mood in subgroup I was good (70%), mood fluctuations were observed only in 30% children. In the group with neurological disorders (subgroup II), the general background mood was assessed as good in 57% of cases, and 43% of children often had mood fluctuations (as stated the questionnaires). Parents also reported night fears of darkness, monsters, and other horrors in children - 70% of the children in subgroup I; and 85% in subgroup II. In subgroup I behavioral reactions in unfamiliar surroundings were assessed as adequate in 54% of children, 38% of children in these surroundings showed some constraint ("closed" state, the children did not want to communicate); behavioral responses were rated as "disinhibited" in 8% of the children.

As for subgroup II, 70% of the children with neurological pathology had adequate behavior, and disinhibited reactions were observed in 30% of children. Pathological habits (biting nails, sucking fingers, etc.) were observed in 15% of the healthy children (subgroup I) and in 30% of children with neurological disorders (subgroup II).

4.3. Motor Skills Improvement Lessons and Speech Development Exercises

To development speech skills of the middle preschool children, we proposed a set of exercises which could improve general and articulatory motor skills.

Integrative approach to the effectiveness of training as an overall process in the development of physical activity in children and adults is described in detail in the paper by Skitnevskiy V.L. et.al. The article claims that "the system of integral scoring of training exercises indicators makes it possible to generalize different characteristics of training activity, such as pedagogical, medical-biological, psychological and other, in their organic compound" [16, p. 85].

We developed a set of gymnastic exercises to improve overall motility on the basis of the integrative assessment of the health and locomotion system of the

child. Indicators of the training exercises' success can be correctness of movements, improvement of coordination of movements, children's positive motivation to do gymnastic exercises, etc. This complex of physical exercises was accompanied by articulatory skills development drills.

One of the complexes for the articulatory motor skills development consisted of the following exercises: "make a fence of your teeth", "fold the lips into the tube", "imitate a swing with your tongue", "make a little cup at the tip of your tongue", "lick your lips with your tongue", etc.

We have proposed to develop children's oral speech through description of picture, retelling a story, learning verses by heart, logotales, enacting different characters, etc.

Thus, we have proposed a number of methodological tools for better development of the children's speech and improvement of the state of their articulation motoricity.

4.4. Case Technology in Diagnosis of the Level of General and Speech Motoricity and the Neurological State of Preschool Children

Our preliminary study conducted at kindergarten No 2 resulted in the creation not only a series of speech and physical exercises for preschool children but also case-tasks for MA students on the topic "Physiological Basis of Development of Children's Speech" in the "Physiology of Higher Nervous Activity and Sensory Systems" course for future speech therapists. It should be noted that the list of tasks suggested in this paper is intended for future speech therapists who are going to work with preschool age children. For school-age children the teaching methods which will be used for speech development should be different (according to the age group).

To solve a real case problem, we offered *case-task No 1* (see the list of case-tasks), then *case-task No 2* for the use and approbation by Irina Medvedskaya (teacher, kindergarten No 2) and MA students of the Minin University. Later several more case-assignments based on her experience and the feedback of other student-teachers were added to the list. Thus, case- assignments to build up and enhance MA students' research competences now include 5 options.

The list of case-assignments:

You work as a speech therapist at a kindergarten or another children's center.

No 1. Do a mini-research on the techniques that can be used to evaluate sound pronunciation.

No 2. Do a mini-research on the techniques to assess the neurological state and development of preschool children. Which of them seems most effective?

No 3. Do a mini-study on the methods of general and speech motoricity assessment. Which of them is the most suitable in your case?

No 4. Do a mini-study on the peculiarities of development and speech disorders of healthy children and children with prenatal and postnatal pathology.

No 5. Do a mini-study. Prove that development of children's speech goes in parallel with their mental and physical development on the data from the field of neurophysiology and physiology of higher nervous activity (case-task No 5 can be divided between 2 MA students).

The structure of a case-task includes: 1) description of the case; 2) target group; 3) problem to be solved/special task; 4) planned educational results; 5) visuals or illustrative materials; 6) final report on the case-tasks (a paper or/and Power Point Presentation); 7) criteria for evaluation of the case- tasks (in scores).

Creation of a case-assignment is the task of the lecturer. In our case we based all the assignments on various scientific sources, our own publications and experience, feedback of the co-author Irina Medvedskaya and other MA students majoring in speech therapy.

The process of creation a case-task is based on the research of G.M. Gadzhikurbanova, I.V. Gladkikh and other [4, 5]. We also went through 3 stages to create the tasks: 1) search, 2) constructive 3) technological.

To grade the results of the MA students mini-studies we used the 100-score rating system of assessment adopted at the Minin University. The University lecturers make up a rating plan for each course in which scores are recorded for every single item of the student's work.

Criteria for case-tasks evaluation is similar to the one which was used in the assessment of contextual tasks in the "Neurophysiology" course by Mayasova T.V. and Nedelyaeva A.V. [13]. The form to grade the case-tasks was an evaluation tool of assessing the learning results. The following indicators served as criteria for assessment: 1) the degree of the problem solution completeness, a scientific approach to solve the problem (from 0 to 2 scores), 2) the degree of mastering the information on the issue (from 0 to 2 scores), 3) argumentation of the choice of the way to solve the task, its practical application (from 0 to 2 scores).

Based on the sum of scores, the degree of competence mastering can be the following: the optimal level (6-5 scores), the admissible level (4.9-4.0 scores), the critical level (3.9-3.0 scores), the inadmissible level (less than 3 scores).

When we received the results of our preliminary research at kindergarten No 2 and the first two case-tasks were ready we offered them to our co-author, teacher at the same kindergarten for approbation and MA students at the University as educational assignments.

The MA students were expected to prove that development of children's speech correlates with their mental and physical development (on the data from the field of neurophysiology and physiology of higher nervous activity) and then evaluate the neurological state and development of the middle pre-school age children (on the basis of their practice).

The MA students were to prepare their reports in the form of presentations. Assessment of the results of their mini-research showed that 90% of the participants of the experiment successfully passed the critical level of mastering PC-11 competence. The figures that we received characterize high achievements in the formation and mastery of the research competences: optimal level – 60%, admissible level – 30% (critical level – only 10%). The MA students' feedback was positive, even complimentary.

5. Discussion

As it was mentioned earlier, case-technologies are the workable tools of forming various competences of the future professionals in the sphere of education. Within the framework of the competence-based approach, a University student "should not only receive a certain amount of knowledge, but also be able to apply it in practice" [9, p.1002].

The Kazakh scientist Yousef Ibrahim Daradkeh highlights the effectiveness of the application of case-technologies in teaching the Kazakh language [1, p.73]. As the author notes, "a case study method - can be called a method of analysis of specific situations. Students are encouraged to comprehend the real life situation" [1, p.74].

It should be noted that the majority of the authors describing various versions of the use of case technologies do not set the task of developing students' research skills, with the

exception of G.M. Gadzhikurbanova. In this regard, our practice-oriented case-tasks have a significant potential.

The results of our study prove that it is possible to effectively use the case method to form and enhance the research competences of the future speech therapists.

Practice-oriented case-tasks created on the basis of our preliminary study carried out at the kindergarten, can serve as an example of teaching MA students in the "Speech Therapy" profile fundamentals of research competences.

The evaluation of the degree of the competence formation is also extremely relevant. In the article by Perevoschikova E.N. it was noted that modern evaluation tools of learning results should "provide information on the degree formation of competences and take information about the development of the student's professional and personal qualities" [15, p.9]. One of such evaluation tools is the scoring system for case-tasks which is based on certain criteria for adequate analysis of the competence mastery degree.

Our approbation of several case-tasks aimed at defining and solving a real problem of certain consonants mispronunciation showed that 90% of MA students reached optimal and admissible levels of research competence mastery (PC-11).

We paid special attention to the consonant sounds because of their semantic-separating function, for "human communication relies largely on the faculty of speech, supplemented by the production of certain sounds, each of which is unique in meaning. Vocal communication can be rendered difficult or impossible by deformities in the physical structures used in speech and sound production or by disorders affecting areas of the brain that process speech and sound" [6].

In the kindergarten we tested a set of articulatory and physical exercises to improve general and articulatory motoricity of the children and consonant pronunciation in the target group. At the same time, we also created case-tasks to form and enhance research competences of the future speech therapists. It should be noted that the case-study methods can be successfully applied both in research activities of BA and MA students in the "Speech Therapy" profile, and in their future professional activity.

Yet we cannot but agree with Yousef Ibrahim Daradkeh who writes about difficulties in the case-task creation. In our opinion, the difficulty of creating case-tasks lies in the fact that we have two objectives: to increase the effectiveness of the educational process dedicated to certain topics of the course, and also to set tasks for independent research work of MA students.

6. Conclusion

To obtain objective data which could serve as a basis for our case-tasks we defined several adequate techniques of sound pronunciation assessment. They made it possible to identify consonants' mispronunciation sibilant, sonorant, front-lingual, back-lingual, labio-dental and glottal sounds of 4-4.5 year old children. The sub-division into two groups according to the health status proved to be the right approach: in subgroup I (healthy children) the number of incorrectly pronounced consonant sounds was 2 times less than in the subgroup with neurological disorders.

In subgroup II (children with neurological pathology) 70% of the children suffered from general and fine motor disorders; their speech motoricity was 50% worse than in subgroup I.

As a positive outcome, the research helped to solve a real problem: improve sound pronunciation, general and motor skills of 4-4.5 year old children, as well as their oral speech through a series of articulation and physical exercises.

Today an increasing number of children with disabilities, including those with impaired brain functions, attend kindergartens and schools, and are not home schooled. In our case, among 20 children there were two with neurological disabilities, i.e. 10%. Such children require an individual approach.

Many other authors point out this problem too, for example, Ivenskih I.V. et.al. noted that "in preschool practice it is necessary to determine the organizational, technological, and substantive foundations and the development of psychological and pedagogical tools of teaching these children" for their successful adaptation [10].

Our study showed that techniques for speech development and motor skills improvement have a great potential and can be successfully applied both in research activities of Bachelor and Master of Arts students majoring in "Logopedia" ("Speech Therapy"), and in their future professional activities. We proved that practice-oriented case-tasks have high effectiveness in the development of MA students' professional competences.

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