

Online interaction of teachers in the system of formation of research skills of students with special educational needs

Interacción en línea de los docentes en el sistema de formación de habilidades investigativas de estudiantes con necesidades educativas especiales

Nataliia Ivanytska

Institute of Pedagogical Education and Adult Education named after Ivan Zyazyun of the National Academy of Sciences of Ukraine, Ukraine

ivanytska@bigmir.net

<https://orcid.org/0000-0002-1422-1176>

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Correspondencia:

Nombres y Apellidos: Nataliia Ivanytska

Correo electrónico: ivanytska@bigmir.net

Dirección postal: Ucrania

Abstract

The article describes the features of creating and using an electronic educational environment for online interaction of teachers. The well-founded importance of online experience exchange between teaching staff for the organization of research activities of students involved in inclusive education. The content of electronic educational modules for teacher collaboration in Google Class is described. The stages of the "World Cafe" as a modern form of interaction between teachers and a practical psychologist in an educational institution, which involves taking into account the educational opportunities of students with different nosologies, are revealed. Based on the results of diagnosing the professional competencies of the teachers of the control and experimental groups, the

effectiveness of the proposed online interaction of pedagogical workers with the psychological service of the educational institution was determined.

Keywords: Interaction of teachers, Google Class, "World Cafe", research activities, inclusive education.

Resumen

El artículo describe las características de la creación y uso de un entorno educativo electrónico para la interacción en línea de los docentes. Se fundamenta la importancia del intercambio de experiencias en línea entre el personal docente para la organización de actividades de investigación de estudiantes involucrados en la educación inclusiva. Se describe el contenido de los módulos educativos electrónicos para la colaboración docente en Google Class. Se revelan las etapas del "World Café" como una forma moderna de interacción entre docentes y un psicólogo práctico en una institución educativa, que implica tener en cuenta las oportunidades educativas de los estudiantes con diferentes nosologías. Con base en los resultados del diagnóstico de las competencias profesionales de los docentes de los grupos de control y experimental, se determinó la efectividad de la interacción en línea propuesta entre los trabajadores pedagógicos y el servicio psicológico de la institución educativa.

Palabras clave: *Interacción de docentes, Google Class, "World Café", actividades de investigación, educación inclusiva.*

The ratio of offline and online interaction of teachers for the purpose of organizing research activities of students with special educational needs.

According to current sanitary and hygienic requirements, the maximum time an adult spends at a computer should not exceed 4 hours. Modern online courses for teachers are aimed at assimilating information structured according to relevant thematic modules. They include a variety of theoretical and practical tasks (taking tests, writing essays), familiarization with educational video materials, interactive glossaries, participation in forums for discussing problematic issues, communication with colleagues, the opportunity to ask questions to teachers and course experts, etc. The advantage of online interaction of pedagogical workers through educational sites is that access to online materials is open to anyone at any time, from any device with the appropriate software (smartphone, PC, tablet, laptop). Among the shortcomings in the organization of current online courses is the inability of the developers of the proposed materials to take into account the specifics of each educational institution regarding the training of students in research activities. This is explained by the uneven material and technical support of educational institutions: the presence (or lack thereof) of STEM classrooms with modern digital equipment or digital measurement complexes, robotics classrooms,

Lego classrooms, etc. It is also important for an educational institution to have students involved in inclusive education and take into account their nosology's for the organization of research activities. Accordingly, the determination of the ratio of offline and online interaction of pedagogical workers for the purpose of sharing experience is individual for each educational institution. In the absence of the necessary material and technical support, preference will be given to the use of online laboratories and remote interaction of pedagogical workers for the purpose of mutual learning of research activities of students, including children with special educational needs.

The need for methodical provision of the formation of research competences of participants in the educational process.

The presence of an electronic educational environment is important for the formation of research competences of teachers and students involved in inclusive education. It creates conditions for remote interaction of teaching staff. Within the framework of our chosen study - the interaction of teachers in the system "teacher - psychological service of the school". Since the electronic educational environment must take into account the specifics of the educational institution, it is advisable to choose the official website of the educational institution as the basis for its creation. Its purpose is to ensure interaction in synchronous and asynchronous modes for the formation of research competencies of students, including those involved in inclusive education. To ensure such interaction of pedagogical workers, a section is proposed on the school website (Fig. 1), which provides for the placement of online educational courses developed by creative groups of teachers of the educational institution, taking into account its peculiarities.

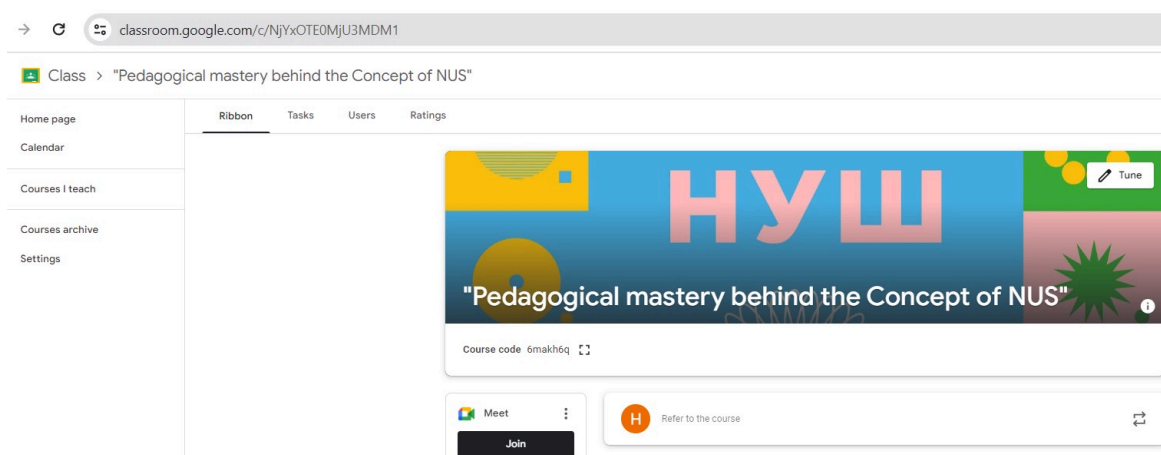


Fig.1. Google Class for online interaction of teachers
Source: author's picture

The content of online courses includes the presence of students involved in inclusive education, school-wide projects and the participation of students and teachers in them, the involvement of students in the creation of robotic devices based on Lego, etc. The electronic educational environment is based on the observance of a number of principles: openness, resource redundancy, integration, dynamism and interactivity. It takes into account the following requirements for electronic resources: functionality, reliability, stable operation, availability of a feedback system, ease of use, availability of access, perspective.

For this, remote technologies are used in the GSuite for Education system, which provide opportunities for synchronous and asynchronous interaction of teachers who work with students involved in inclusive education. To do this, teachers are united in specially organized Google Classes for them. The Google Class page contains the following headings: "Ribbon", "Tasks", "Users", "Ratings". The "Ribbon" heading displays the content of the tasks that must be completed by pedagogical workers in a given chronology. When creating tasks, the following technical capabilities of the GSuite for Education system are provided: downloading materials from Google Drive, You Tube; creation of documents, presentations, tables, drawings, Google Forms (Fig. 2), for conducting surveys, tests based on the use of Blank Quiz; adding calls to electronic resources.

The image shows a Google Form interface. At the top, there is a decorative header with four colored circles (red, white, red, yellow) and a grid pattern. Below the header, the form title is "TEST. 5. Application of teaching aids - special means of correction of psychophysical development." followed by a text input field with the placeholder "Enter your text here." Below that is a sharing link: "nivanytska@ch-school35.ukr.education Change account" with a "No sharing" icon. A red asterisk indicates a "Required question". The form has two input fields: "Name *" and "E-mail address *", both with "My answer" placeholder text. The main question is "1. Correction means a specially organized pedagogical process aimed at: * 1 point" with four radio button options: a) comprehensive development of the child; b) overcoming physical disabilities; c) joint work of secondary school teachers with parents; d) weakening, overcoming developmental deficiencies, preventing them and promoting the child's development in general with the aim of as close as possible to the norm.

Fig.2. Google Form for test teachers who work with students involved in inclusive education

Source: author's picture

The development of tasks for teaching staff takes into account the possibility of conducting an assessment for all participants or a selective assessment based on the school itself. The electronic resource allows you to set evaluation criteria and the deadline for submission of materials. The section "Users" unites a class of registered teachers in Google based on the automatic import of data from the school website. The rubric "Evaluation" allows the course coordinator (head of the group of teachers) to see the general or summary table of evaluations of all participants for the entire period of study, to receive information about the average evaluation of the group, to make certain samples. For synchronous interaction, the electronic resource provides for the use of the Google meet service for video meetings and calls. The technical capabilities of the GSuite for Education system for the interaction of teachers who work with students involved in inclusive education are directly related to modern digital didactics. In the research of I. Slipukhina, N. Polihun, I. Chernetskyi¹ says that digital didactics is the result of the interaction of psychological-pedagogical, information and digital technologies based on an integrative approach using the method and result of training by all participants of the educational process. According to the modern researches of I. Slipukhina, N. Polihun, I. Chernetsky², the concepts of "electronic learning" or "e-learning" and "instrumental digital didactics" are not identical. E-learning involves the use of structured content (presentations, videos, text, etc.), embodied and presented in the form of a sequential training course on an electronic platform. It offers active use of analytical capabilities of software products: mathematical tables, programs for video analysis, tools and software for measurements. E-learning requires the participants of the educational process to possess analytical tools, which are included in the educational tools. Online interaction of pedagogical workers based on the creation of online groups of teachers in Google Class takes into account the fact that group work is combined with their individual work, which is due to the peculiarities of self-education and self-development of teachers. The use of educational modules gives teachers the opportunity to follow an individual educational trajectory at their own pace, to self-monitor the learning outcomes of students involved in inclusive education. We agree with V. Bondar's³ opinion that the educational module is a part of the educational activity and an information node that unifies the approach to structuring the whole into parts.

¹ Сліпухіна І.А., Поліхун Н.І., Чернецький І.С. Педагогіка ХХІ століття: формування цифрової дидактики. Педагогічні науки : зб. наук. пр. Херсон : ХДУ, 2018. №83. Т.1. с. 231 – 237

² Чернецький І.С. Фізика. Прикладні методики інструментальної цифрової дидактики : навч.-метод. посіб. / І.С. Чернецький, І.А. Сліпухіна, Н.І. Поліхун. – Київ : Національний центр «Мала академія наук України», 2020. – 204 с.

³ Бондар В.І. Теорія і практика модульного навчання у вищих закладах освіти (на матеріалі дидактики) / Бондар В.І. // Освіта і управління. – 1999. – Т.3. – №1. – с.19 – 40.

At the same time, in the educational module (Fig. 3), the material is divided into logically complete parts, according to which a package of necessary didactic techniques for learning the educational material is developed.

TOPIC 2: Features of the organization of the initial activities of students with special educational needs.

- get acquainted with theoretical material
- pass the test

2. Features of the organiz...
Word

Google Forms: Sign-in
<https://forms.gle/PynVna5X8bMI>

Video. Features of the org...
YouTube video • 2 minutes

H

Add a comment...

▶

Fig.3. The of the educational module "Features of the organization of the initial activities of students with special educational needs"
Source: author's picture

When organizing online training for primary and basic school teachers, it is advisable to coordinate the content of educational materials that are intended for them to learn during offline interaction. The didactic purpose of using electronic educational modules is propaedeutics of joint research activities of primary and basic school teachers for their further offline interaction. We believe that for the content of educational modules it is advisable to choose the material that is the most difficult for offline assimilation by pedagogical workers. Such material requires a long time, multiple repetitions, including on the basis of watching educational videos (Fig. 4) on the organization of research activities of students involved in inclusive education.



Fig.4. Fragment of a video on teaching students with cerebral palsy research activities (soil weighing). Source: author's video

Mutual learning of pedagogical workers takes place using the "inverted classroom" technology - in the format of anticipatory learning, which involves their independent assimilation of material at a certain level, which will be reviewed again during offline group interaction.

Consideration of technical and health-saving requirements for the organization of online training of teachers.

The choice of components of the electronic educational module must meet the needs of pedagogical cooperation of teachers in the "teacher-psychological service of the school" system. This involves taking into account technical, sanitary and hygienic (health-preserving), educational or didactic requirements. Let's consider the educational module "World Cafe" as a propaedeutic stage for further offline participation of pedagogical workers in the system of partnership interaction "teacher - psychological service of the school". The tutor is the author of the educational module - a practical psychologist of the educational institution. The purpose of online interaction of primary and basic school teachers is to ensure continuity in the organization of research activities of students involved in inclusive education. Members of the team of psychological and pedagogical support, teachers who teach children with special educational needs and teacher assistants are involved in the online group of pedagogical workers. The importance of theoretical training of teachers in working with children involved in inclusive education is confirmed by the practices of education research abroad.

According to the researches of N. Avsheniuk, L. Dyachenko, K. Kotun, M. Marusynets, O. Ogienko, O. Sulima, N. Postrygach⁴ pedagogical education in Austria and Canada involves studying the methods of work of teachers with the specified category of students. The number of group members is up to 20 people, which is due to their subsequent division into subgroups during further offline interaction in the "World Cafe".

The first stage of teachers' work with the electronic educational module "World Cafe" consists in theoretically familiarizing the group members with the most typical nosologies that exist in the educational institution and their characteristics.

The individual task of the group members is to determine the peculiarities of the organization of educational activities of students involved in inclusive education in accordance with the indicated nosologies. When performing educational tasks, a child with mental retardation is infantile, is not interested in complex tasks, and cannot exert willpower. Such students are characterized by a decrease in mental endurance, work capacity, development of thinking, attention and memory, sensorimotor coordination.

For them, it is recommended to use game activities that perform the following didactic functions: educational and corrective and developmental. The goal of engaging students with mental retardation in game activities is to implement corrective tasks, develop their curiosity and active cognition, help in mastering the methods of environmental research (Fig. 5).

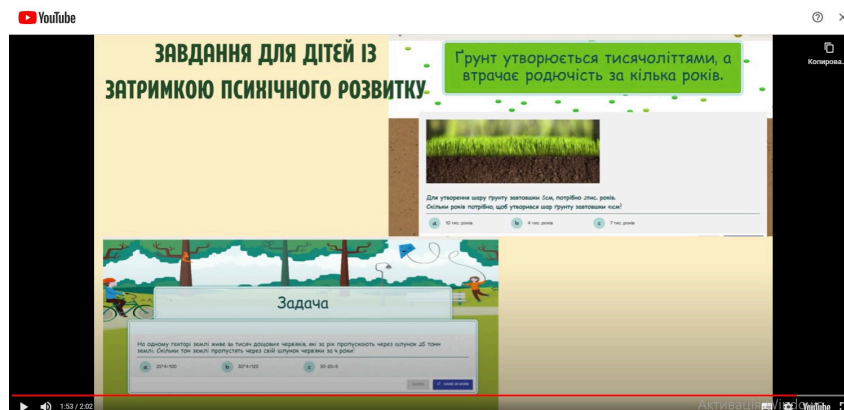


Fig.5. The game research tasks of integrative content on an online platform wizer.me. Source: author's video

⁴ Зарубіжний досвід професійної підготовки педагогів: аналітичні матеріали / Авшенюк Н. М., Дяченко Л. М., Котун К. В., Марусинець М. М., Огієнко О. І., Сулима О. В., Постригач Н. О. Київ: ДКС «Центр», 2017. 83 с.

Among the practical tips for teachers on teaching children with mental retardation: reminding the child of the rules of behavior; cooperation with the team of psychological and pedagogical support; identifying strengths in the child's education and creating a situation of success; eye contact; change in the student's activity; taking turns in the lesson of relaxation and rest.

Complex speech disorder is manifested as untimely or insufficient development of all components of the speech system. Tasks for students with the specified nosology should be aimed at developing their coherent speech: short expression of reasoning based on simple sentences (Fig. 6).



Fig.6. Integrative tasks of a research nature on the topic "Soil" for the development of students' speech. Source: author's video

With children's cerebral palsy, tactile perception is impaired, which affects writing skills and requires training of tactile sensations in students. Coherence of hand and eye movements is important for the formation of subject-practical and cognitive activities. In such children, as a result of damage to the motor sphere, as well as the muscular apparatus of the eyes, these movements are insufficiently coordinated. Children cannot follow their movements with their eyes. This hinders the development of manipulative activity, construction and drawing, inhibits the formation of educational skills of reading and writing, cognitive activity, disruption of spatial analysis and synthesis. The joint discussion by teachers in a group based on Google meet of the results of the task involves the collegial identification of the peculiarities of the organization of educational activities of students involved in inclusive education and the possibilities of adapting research tasks in accordance with the indicated nosologies. The tutor's role at this stage is to provide methodical assistance when formulating the conclusions of pedagogical staff about the organization of work with students with different levels of preparation for research activities.

The second stage of teachers' work with the electronic educational module "World Cafe" involves the performance of a number of tasks. The first individual task of teachers is to get acquainted with materials that are adapted and modified to the relevant nosologies of students studying in primary school, when organizing their research activities during their study of integrated natural courses. The second individual task of teachers consists in the development, in accordance with the specified nosology, of research tasks for elementary school students, adapted and modified to educational programs for integrated natural science courses. For students with a complex speech disorder, when they organize research on the topic "Water purification", integrated tasks can be offered, which, taking into account the students' nosology, include the following research activities: using a microscope to examine drops of filtered and unfiltered water, explain the observed difference between them; complete the sentences ("Water is ...", "Water has the following properties ...", "When heated, water ...", "It dissolves in water ...", "Water pollution occurs due to ..."). A joint online discussion by teachers in a group based on Google meet of the results of the task requires the group members to take into account the possibilities of the modern educational space of the educational institution to activate their cognitive abilities when using teaching aids. According to D. Kosenko's research, the didactic role of the modern educational space is the leading one in the education of students involved in inclusive education⁵. It is based on a combination of two principles: flexibility (allows you to quickly change the space depending on the needs of the educational process, implement various forms of work) and stability (ensures continuity of learning; consistency of perception and activity; controllability of students' research activities).

The tutor's role at this stage consists in making adjustments regarding the practical application of the mentioned methods. The third stage of work with electronic educational modules "World Cafe" involves the independent development by teachers of integrative tasks, including the use of electronic educational resources, for elementary school students on a given topic in accordance with the specified nosology. For example, taking into account the peculiarities of the education of students with cerebral palsy, when organizing research on the topic "Properties of materials", teachers can offer integrated tasks that involve the following research activities of students:




- Make a paper cup. What will happen if you pour water into each glass? Explain why?
- Lower each object into a glass of water, explain what happens to each object (rubber, wooden stick, stone, metal key). What these objects are and what material they are made of?

⁵ Косенко, Д. (2018). Як створити освітній простір, що мотивуватиме учнів навчатися. URL: <http://surl.li/awalr>



When organizing research "Properties of air" for students with a complex speech disorder, teachers can offer students a task to establish the correspondence (air condition - pollution level) or supplement the missing words based on the use of the online service liveworksheets (Fig.7).

Введіть своє прізвище і ім'я Клас
Тема: «Дослідження чистоти повітря у своєму населеному пункті»

1. Розглянь малюнки. Напиши, як людина використовує повітря.

2. Розглянь малюнки і вибери, де повітря чистіше.

3. Встав в оповідання пропущені слова.

Люди, звірі та птахи вдихають _____
Фабрики і заводи викидають зі своїх труб, а автомобілі виділяють _____
Все живе на Землі задихнулося б, якби не _____
Дерева жадбно поглинають _____

Fig.7. Research "Properties of air" with liveworksheets. Source: <http://surl.li/mrdfs>

The tasks chosen by the teachers are aimed not only at the development of speech in students, but also at the formation of their elementary experimental skills (explaining the properties of bodies). A joint online discussion in a group in Google meet of the results of the teachers' performance of the task provides the group members with the expected learning outcomes of students involved in inclusive education based on their research activities. The role of the tutor at this stage is to provide pedagogical staff with advisory assistance based on the determination of the levels of formation of students' research competences. The tutor also acquaints group members with the possibilities of multimedia equipment: an interactive whiteboard for educational work, an interactive floor for organizing an interactive game space, an interactive LCD or LED panel for corrective and developmental classes.

Analysis of the obtained results based on the results of online teacher training

To determine the effectiveness of online interaction of teachers based on electronic educational modules, experimental group (EG) and control group (CG) of teachers were created. The EG included 35 teachers and CG included 34 teachers of Chernihiv Secondary School No 35. For each of the groups of teachers, the levels of formation of their professional competences were diagnosed. According to the results of the diagnosis of the EG of teachers, it was established that a significant indicator corresponds to a high level of formation of the component competencies: STEM-integrative - in 15 teachers (42.90%); psychological and digital - 16 teachers (45.76%); monitoring-dynamic - 18 teachers (51.48%); organizational and digital - 22 teachers (62.92%); communication and digital - 22 teachers (62.94%); communication and digital - 22 teachers (62.94%). For the CG of teachers, it was found that the following components were formed mainly at the average level: differential-psychological - in 25 teachers (73.50%); monitoring-dynamic – 22 teachers (64.68%); methodological - 25 teachers (73.50%). Based on the method of mathematical statistics, the levels of formation (low, medium, high) of EG and CG of teachers' professional competences were determined (Table 1).

Table 1

The value of the χ^2 -criteria for the formation of teachers' competences

Levels of formation of teachers' competencies	f_e' %	f_k' %	$f_e' - f_k'$	$(f_e' - f_k')^2$	$(f_e' - f_k')^2 / f_k'$
low	4,36	14,26	-9,9	98,01	6,87
average	53,5	64,56	-11,06	122,32	1,89
high	42,14	21,18	20,96	439,32	20,74

The value χ_{emp}^2 is calculated using the formula:

$$\chi_{emp}^2 = \sum (f_e' - f_k')^2 / f_k'$$

f_e' – sampling rate for EG (%), f_k' – sampling rate for CG (%). Taking into account that $\chi_{emp}^2 \geq \chi_{krit}^2$ ($\chi_{emp}^2 \approx 18,05$) this means that performance is higher for EG.

Conclusion

The alternation of individual and group online interaction of teachers ensures an increase in the effectiveness of joint activities. Therefore, it is effective to make collegial decisions through the combination of individual opinions of pedagogical

workers when they are involved in various types of professional interaction. Online interaction of teachers based on electronic educational modules in Google Class contributes to the formation of differentiated-psychological and psychological-digital components of professional competences in teachers, their psychological and digital professional integration during online participation in the "World Cafe".

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