

Researching the Possibilities for the Formation of Communication Skills and Dialogicity in The Process of Training in Technical Disciplines through Teamwork on Projects

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Abstract: Communication skills and dialogue are key competencies of the 21st century and a condition for successful implementation and personal development in general. This requires their formation to be the subject of purposeful educational activity. At the same time, their implementation in the learning process is a complex and difficult task, requiring a change in learning models, teaching competencies, and the organization of learning. The present report examines the possibilities of forming skills for effective communication and dialogicity in high school students in the process of training in technical disciplines through teamwork on projects

Keywords: communication skills, dialogicity, team, team roles

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Introduction

Communication skills and dialogicity

In its social aspect, communication is seen as a dynamic process involving the exchange of information, mutual perception and understanding, interaction and mutual influence between people. One of the most famous psychological interpretations of the need for social communication is that of the American psychologist William Schutz, presented in his theory of the basic interpersonal orientation of the individual. According to Schutz, the need for other people is determined by three main primary human needs: inclusion, attachment and control. Based on them, a person's interpersonal behavior can have different manifestations. Depending on inclusion, which is seen as people's need to be in a group, a person can have oversocial, social, and undersocial behavior. According to the need for attachment, it can be depersonalized, hyperpersonal, or personal, and according to the need for control, a person's behavior manifests itself as giving up, autocratic, or democratic. Each of these needs

manifests itself in individual behavior in a different way and with different intensity depending on the point of view. One of these perspectives is related to the Other-Self perspective and encompasses what one expects from others, and the second perspective is related to the Self-Other perspective and includes what a person would like to do in relation to others. According to Schutz, childhood experiences have a determining role in the realization of these needs later in adulthood.

Every interpersonal communication contains a theme, a message of interaction and motives for exerting control. The theme may be clear and specific, but sometimes it is implicit or not fully relevant to the communication. The message reflects the interaction, seeking to build and strengthen it. Motives are related to feelings, which play an important role in communication. Sometimes they remain hidden, in other cases they subtly accompany it, and in others communication is completely dependent on them. In the process of interpersonal communication, each of the participants is involved with verbal and non-verbal signals. Verbal communication is done through speech. Good verbal communication requires the skill of free expression, richness of speech, compliance with literary legal speech rules, expressed in correct pronunciation, appropriate intonation and pace of speech, "color", strength and timbre of the voice. In order to communicate effectively, a person must have a sufficient vocabulary, be able to formulate his thoughts correctly, be able to express himself clearly and convincingly, and convey information in a way that makes it understandable to different people. In the process of communication, in parallel with his speech (verbal) behavior, each person implements a whole system of non-verbal (non-verbal) messages. The term "non-verbal communication" includes everything that is communicated in the process of communication without the use of words. It is realized by means of non-verbal signs and signals. Some of them are innate, and others are acquired through upbringing and education and through the ethno-cultural characteristics of the environment in which a person grows up. And while verbal communication refers to signals that are received by hearing, non-verbal messages are received with the participation of all human senses - mainly sight, but also smell, touch, hearing. In addition, nonverbal communication is more direct, more general, and more spontaneous than verbal communication. Therefore, it is strongly present in some social psychological mechanisms, such as suggestion, persuasion, imitation. Non-verbal communication is related to feelings and emotions. Some of it comes from the subconscious and is much less subject to conscious interpretation and observation. As a result, decoding and responding to nonverbal messages becomes much more automatic and partly unconscious compared to making sense of verbal messages. Some of the nonverbal messages can be controlled, but others happen completely automatically, making them much more effective in conveying information about attitudes and feelings than speech. Through them, the real emotions, attitudes and motives of the communicator are revealed much more easily.

To summarize, the most common errors in communication are related to inconsistency between verbal information and non-verbal signals and signs, insincerity, exaggeration and distortion of facts, escape or diversion from the topic of conversation, failure to listen, use of slang and dialect words, "labeling", selective listening and misinterpretation of information, lack of feedback from the listener, nonverbal rejection, inability to control nonverbal communication, etc. The ability to communicate effectively verbally and non-verbally is

expressed in approximately equal levels of eye contact, direct eye contact, displays of warmth, trust, security, positive feelings and emotions. It is desirable that the posture is relaxed and that the body is slightly bent forward in dialogic forms of communication. Positively coloured gestures, a clear and sufficiently high voice, rich and nuanced intonation, the appropriate pace of speech, respect for personal space taking into account its ethnic and social parameters are part of the indispensable elements of effective communication. The success of people's communicative relationships depends to a large extent on how well they are able to listen and how well they are able to adapt their communication style. And while these are culturally determined and in no small part determined by the upbringing, values and education of the individual the universal rule for all cultures is politeness.

A mandatory element of good communication is dialogicity. In the process of teamwork or other joint activity of people, the ability to conduct dialogue, as part of communication skills, is a mandatory condition for achieving the set goals. The dialog has a number of features. It has a strong situational conditioning and is distinguished by dynamics expressed in a continuous change of the communicative roles "speaker - listener" of the interlocutors. Since speaking and listening are mutually conditioned, the effectiveness of the dialogue as a whole depends on their synchronization. Dialogic communication has a spontaneous character and provides an opportunity to use non-linguistic means, which gives expressiveness and specificity to its structure. It implies the activity of all its participants and requires joint discussion of information and making a common decision. It is aimed not only at the subject of communication, but also at the participants themselves, allowing for a certain versatility, expressed in a transition from one topic to another and subjectivity in the assessment. Dialogic behavior is related to recognizing the interlocutor's right to his own point of view, showing empathy, mutual respect and tolerance, an attitude of partnership, listening to the interlocutor, criticality and self-criticism, the ability to overcome disagreements, etc.

2- Psychological-pedagogical features of high school students in the context of the formation of communication skills

The high school stage of education covers the age of 16. up to 18 This is the final stage in the transition to adulthood and is usually referred to as adolescence or adolescence. In this period, the aspiration of adolescents is to express their individuality, to be original. The need for independence and communication are important features of this age period. There is an aspiration and assertion of personal choice regarding one's own behavior, desires, interests, activities and pursuits. Adequate self-esteem, high moral requirements, need for independence and activity in responsible spheres of public life. At this age, the student's intellectual activity is accompanied by a clearly expressed will, richer needs and interests, "mastery of thought", "new quality of thinking", creative imagination. As a result of the accumulated knowledge, the students acquire the skills to think much more fully, developed and original, to convincingly express and defend their point of view. In the educational activity, students pay more attention to independent work, discussions, discussions, counseling and cooperation. Their social self- determination is part of the motivation to learn. A psychological center in thoughts and feelings is

the choice of profession. Therefore, the interest in learning and learning correct social-communicative models for professional realization is increasing.

3- Socio-communicative features of team organization at work

The idea of teamwork of people is based on the principle of synergy, according to which the energy of a system is greater than the energies of the elements participating in it.

The main characteristics of each team are related to its goals and structure (size, role differentiation and composition of the team), with the status of its individual members, including the leader, with group dynamics, identity, cohesion and motivation, with the socio-psychological climate, communications and interpersonal interaction. The team does not have a strictly hierarchical - structured organization of work. All its members participate in the decision-making process. In the process of teamwork, each member usually has one main task, but may also perform additional ones.

Team members complement each other in terms of their knowledge and skills.

Distinctive characteristics of teamwork are: partnership behavior, mutual respect and personal integration, equal participation of everyone in discussions about the methods, content and goals of the work and its implementation. Team organizational approach is related to good interpersonal relations and understanding. Team members maintain a harmonious relationship with each other. Everyone contributes to ensuring a positive working environment and an atmosphere of trust by listening to each other, giving and receiving open feedback, exercising and accepting constructive criticism, self-affirmation, tolerance and willingness to compromise, openness and responsiveness. An important prerequisite for the success of teamwork is team cohesion, expressed in similarity between group members and close individual values and attitudes, desire to be together, striving to like each other. The factors that most strongly determine the effectiveness of a team are the clearly formulated goals and tasks, the degree of satisfaction with the work performed and with the group interaction, the working conditions and the availability of sufficient resources at the disposal of the team, the socio-psychological climate and interpersonal relationships, the fair and stimulating assessment, everyone's personal commitment. The degree to which a team realizes the set goals and achieves specific measurable results is defined by the term team effectiveness. It also includes the satisfaction that team members experience in the teamwork process. Effective teams are distinguished by clear goals, high motivation and competence to achieve them, skills to deal with difficult and conflict situations, goodwill, cooperation, support, clear rules and norms, a good leader, etc.

4- Types of team roles

In order to build a good team, it is necessary that its members possess specific behaviors called team roles. In

team role theory author Dr. Meredin Belvin defines it as "a tendency to behave, contribute and interact with other people in a certain way"

These team roles are formed over the course of the team's existence and represent different patterns of behavior. There is no good or bad team role. Each of them is useful for the team's activities. Rarely do members possess the characteristics of only one role. Also, a person may have one role profile in one team and a different one in another. This depends not only on himself, but also on the other members of the team, the socio-psychological climate, the set goals and tasks, etc.

There are many studies and qualifications of the various team profiles. Meredin Belvin's model distinguishes nine different team roles – discoverer, specialist, coordinator, observer-evaluator, doer, finisher, resource explorer, shaper and masseur. These nine roles fall into three groups: action-oriented roles; roles, people-oriented and intellectually oriented roles. The first group includes the roles of shaper, executor and finisher. The second group includes the roles of coordinator, mass worker and resource researcher. In the third group are the roles of discoverer, observer, evaluator and specialist. The characteristics of each of the team roles following the model of Meredin Belvin are summarized in Table 1.

Table 1. Types of team roles according to the model of Meredin Belvin

Groups of team roles	Team roles	Positive qualities	Negative traits	Corrective measures
Action oriented roles	Shaper	Emotional, open, ambitious, irreconcilable to violations and irregularities. Action-oriented, stimulates team efforts	He tends to ignore the human factor. Often impatient, irritable and aggressive, strives and requires rapid achievement of the set goals / quick decisions and, fulfillment of the tasks set	To master his desire for quick success and progress, which creates unnecessary tension and exacerbates the microclimate in the team
	Performer	He has strong character, leadership qualities, competence. Able to turn ideas and concepts into real-life tasks and work procedures He is fully dedicated to the common work.	Unstable under dynamic conditions Is reluctant to accept/get involved in the realization of new and untested ideas. It lacks flexibility. Tend to show unconstructive and negative criticism	To encourage flexible decision-making skills under unstable and rapidly changing conditions
	Finisher	Strict, precise, observes even the smallest details and details	Does not support other people's initiative often bogs down in detail and loses the overview of common	To develop skills for a multilateral/more holistic view and understanding of

			goals, tends to constantly doubt and worry	the objectives and objectives set
Roles, orientation to people	Coordinator	-natural leader and authority, -dominates without applying command style -Able to motivate -positive and with a true judgment for each of the team members -coordinates the joint efforts and communicates well, -tolerant, but strong enough not to accept inappropriate advice and opinions	With a manager with another profile, intolerance and conflicts are possible	To be given a leadership position in the team
	Masseur	It contributes significantly to the cooperation and the good atmosphere in the team. - Well-meaning and sociable, - detects the moods in the team. Understand the needs and concerns of individual members. He has diplomacy and insight. He hates tension and conflict and tries to resolve them.	He rarely has his own ideas and suggestions.	Assign him personal tasks to perform.
	Resource Researcher	seeks out new developments, brings in contacts, ideas and information, encourages new initiatives. Is able to successfully apply the knowledge of others. Positive, responds with enthusiasm, sociable and inquisitive. Keeps the team from stagnating	Tend to lose interest quickly.	To encourage perseverance and greater thoroughness
Intellectually Oriented Roles	Discovered	-has a very high intellect and potential, - naturally creative, a source of creative and unusual ideas and solutions	- often underestimates the practical details and accompanying procedures -prone to disregard for other people's opinions and confrontation Direct in your judgments and criticisms	It is necessary that his natural creativity be guided in the desired direction, so as not to lead to deviation from the common goals and interests
	Observer-evaluator	Thoroughly consider and analyze problems objectively evaluate the proposed ideas and solutions can find the optimal	He tends to downplay the contribution of others. shows inappropriate criticism and	He is not given a leadership position. No manifestations of

		solution in the presence of a large number / numerous proposals	tactlessness, He rarely has ideas of his own, lacks original thinking.	/Deliberate tactless attitude is parried
	Specialist	Has in-depth knowledge in a specific area contributes to finding expert solutions	His interests are related only to his field and he is not interested in things outside it	to integrate into tasks that require the expansion of his field of knowledge /application of knowledge from other fields

The discoverer is the person from the team with the greatest potential and intelligence, the source of the original and non-standard ideas and thoughts. He sees the big picture and is not interested in the details, which is why he often underestimates the practical details, the inevitable procedures and rules. He is direct in his judgments and criticisms, prone to confrontation and disrespecting other people's opinions. It is necessary that his natural creativity be guided in the right direction so as not to allow deviation from common goals and interests.

A specialist has in-depth knowledge of a particular field and is usually not interested in things outside of it. He devotes himself entirely to activities and problems related to his specialization, follows his own goal and acts on his own initiative.

The coordinator is best suited as a team leader. He has a natural authority, dominating without commanding. Thinks positively, keeps cool and self-discipline when disagreements arise. He knows how to distinguish the strengths and weaknesses of each of the members and motivate them. He has a balancing position, coordinates joint efforts, communicates well, is tolerant, but also strong enough to ignore inappropriate opinions and advice.

The observer - evaluator is the person in the team who thoroughly considers and analyzes the problems, evaluates the proposals and opinions, discovers imperfections in the ideas and arguments. He rarely has his own ideas, lacks creativity, is usually serious and distant, prone to tactlessness, inappropriate criticism and belittling the contributions of others. Therefore, teams led by such personalities are not particularly productive. The contribution of the observer-evaluator is essential in the presence of numerous ideas, requiring complex and complex decision-making.

The executor is the one who turns strategies, concepts, plans and decisions into practical work procedures and executable tasks. He is distinguished by a strong character, practicality, high organization, but is unstable in dynamic and unstable conditions. His leadership style is extremely effective, although he tends to show unconstructive and negative criticism towards others. He devotes himself entirely to the common work. He knows how to work precisely, systematically and efficiently, but he lacks flexibility. He is reluctant to respond to new and untested ideas.

The finisher is the person who strictly follows the order and the work program. Checks for the observance of even the smallest details and details, tends to worry and doubt incessantly. He has a strong character, often loses

sight of general goals and gets bogged down in details. If he is the leader of the team, these qualities hinder the initiative of the others. Nevertheless, with his strictness, he does not allow important details to be missed and contributes to the team's success.

The resource researcher looks for news, brings contacts, ideas and information to the group, promotes new initiatives. Can successfully use the knowledge and skills of others. He is sociable, inquisitive, reacts with enthusiasm, but tends to lose interest quickly. His contribution to the team is that it prevents it from stagnation and maintains contacts with the outside world.

The shaper stimulates the action and efforts of the team, unites its goals, ideas and opinions in a working project. Possesses openness, ambition and emotionality. It tends to ignore the human factor. He is often impatient, irritable and aggressive, which unnecessarily aggravates the atmosphere in the team. Nevertheless, with his intransigence to violations and irregularities, as well as the desire for quick solutions and implementation, he is extremely useful to the team and moves it forward.

The masseur is the most sensitive member of the team. He is very sociable and well-intentioned. Shows a strong interest in people, understands their needs and concerns, perceives the mood in the team. Possesses diplomacy and insight. He hates tension and conflicts and tries to resolve them. He rarely presents his own ideas himself, but rather builds on the ideas of his colleagues. His contribution is that he contributes significantly to the good atmosphere, cooperation and harmony in the team.

5- Formation of student teams when working on projects.

In order for all students to actively participate in project work, regardless of their level of knowledge, and to contribute to the achievement of overall success, it is extremely important how the teams will be formed. In an express diagnosis of the characterological features of the personality is presented, which includes the Eysenck Questionnaire, an adapted version for adolescents, a legend for calculating the results of the Eysenck Questionnaire, a classification of the types of behavior depending on the ratio of the results on the scale of neuroticism and the scale of introversion, description of the characterological features and manifestations of each type, directions of interaction and ways of correcting the behavior of adolescents according to the respective type. The close types according to Eysenck from the point of view of psychological-pedagogical features of the students can be united in the following five main groups, conditionally designated as group A, group B, group C, group D and group F. Characteristic features and guidelines for impacting the negative aspects of each of the groups, as well as the Eysenck types that each of them unites, are summarized in Table 1. For the effective work of any student team, it is necessary that it includes a competent student who has in-depth knowledge and can find the necessary information, a creative student who has out-of-the-box thinking and generates original ideas, and an executive student who, although not a source of ideas and not having in-depth knowledge, contributes to the team's success by diligently and responsibly performing specific tasks. Of course,

this division is very general and is in the context of the achievement of educational goals. But it can serve as a starting point when creating student teams.

Table 2. Characteristic groups and types according to Eysenck

Character istic groups	Types according to Eysenck	Characteristic features
Group A	3,11,12,2123 ,29,30	+ : sociable, energetic, purposeful, active, fighting, persistent, leaders - : ambitious
Group B	2,8,9,10, 17,24,25	+ : sociable, cheerful, emotional, confident, executive, balanced, calm, - : non-initiative, non-targeted, do not aspire to leadership Recommendations: Do not give them leadership positions; to join groups with a strong leader
Group C	1,7,18,19, 27,28,31	+ : active, executive, empathetic, calm, modest, independent, benevolent, independent, diligent - vulnerable, shy, insecure, silent
Group D	13, 14, 15, 20, 22, 26, 32	+ : confident, energetic, persistent, purposeful - : conflicted, vindictive, lack of empathy and sympathy, ambitious, haughty, emotionally limited
Group F	4, 5, 6, 16	+ : executive - : insecure, non-initiative, inactive, vulnerable, shy, with distorted evaluations and self-evaluations, indecisive

Empirical Research Of Students' Communication Skills Formed Through Teamwork On Projects

1. Organization of the study

The research was conducted with 60 high school students over a period of two academic years. In the training of technical subjects, the students developed learning projects, and in parallel with the achievement of educational goals, they also developed skills for effective communication and dialogue. The formation of the student teams was done by testing the students with the Eysenck Questionnaire, an adapted version for adolescents. Based on the results obtained, 6 teams of four students each were created, so that in each team there were types from different characterological groups, according to table 1, and which, from the point of view of educational level, included both "competent" students and "executive" students. Original and non-standard thinking is usually manifested in the very process of project work through purposefully formulated tasks to be performed by the teacher, and that is where the "creative" students can be found. This can also be achieved through preliminary research of students /pedagogical observation, testing, surveying, etc./ to establish this competence for creative thinking. In the process of developing the learning projects, the teacher's role is to promote the lively exchange of information and knowledge between team members. It should motivate all members to be sympathetic to the achievement of common goals and to act jointly to achieve them, working together or independently, but in a constant relationship with each other, as well as the problems accompanying the work to be discussed openly

and resolved in a timely manner.

2. Methodology of the study of students' communicative and dialogic skills

The study of students' communicative and dialogic skills was carried out by means of survey and testing methods. It was held twice - at the beginning and at the end of the research period, covering two groups of students - experimental and control. The students from the experimental group were trained in teams by developing projects. In the control group, the training kept the classic class-lesson format. The questionnaire developed for the study of communication skills includes seven statements with five possible answers - never, rarely, sometimes, often, always. Respondents need to choose only one of these answers.

Survey

- I know how to listen to others and communicate with them.
- When I'm talking to someone, I can easily lose my train of thought.
- I express my opinion freely.
- It is not easy to say openly what I really think.
- It happens that I want to say something, but I don't know how to express myself.
- When I speak, others listen attentively
- If someone needs advice, I patiently try to help them.

Testing was performed with the Eysenck questionnaire, adapted version for adolescents.

According to the level of manifestation of communication skills, the Eysenck types were grouped into the following three categories:

- first category - types with a high level of manifestation
- second category - types with a medium level of manifestation
- third category - types with a low level of manifestation

The types belonging to each of these categories are shown in Table 2.

Table 3: Levels of manifestation of communication skills

	Levels of communication skills	Eysenck Types, Adapted Version for Adolescents
First category	High level of manifestation	2,9,10,11,12,13,21,23,26
Second category	Medium level of manifestation	3,8,17,24,27,29,30,31
Third category	Low level of manifestation	1,4,5,6,7,14,15,16,18,19,20, 22,25,28,32

3. Analysis of results

The results of the testing with the Eysenck questionnaire of the students of the experimental group are summarized in table 3 and presented graphically in figure 1.

Table 4. Levels of communication skills – testing

Levels of communication skills - testing	high level	medium level	low level
Initial testing	20%	37%	43%
Final testing	37%	53%	10%

From the results obtained by testing with the Eysenck questionnaire, it is established that at the beginning of the study, 43% of the students have unsatisfactory communication skills, 37% are at an average level and only 20% show skills for effective communication and dialogue. At the end of the study, after project training, the percentage of students with a high level of manifestation increased by 17%, and those with a low level decreased by 20%.

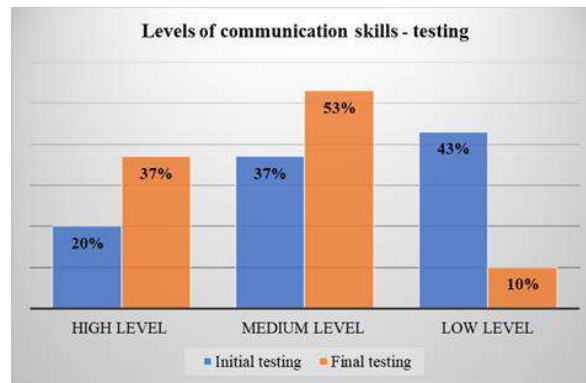


Figure 1. Levels of communication skills – testing

Table 4 and Figure 2 summarize the results of the expert group survey.

Table 4. Levels of communication skills – polling

Levels of communication skills - polling	high level	medium level	low level
Initial testing	20%	33%	47%
Final testing	44%	50%	6%

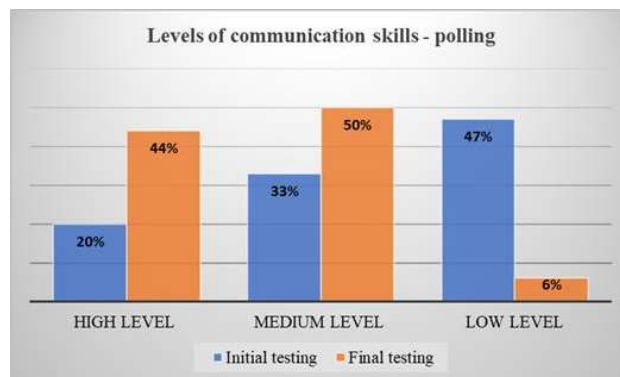


Fig. 2 Levels of communication skills – polling

The data obtained with the survey method are close to those established with the testing method. The initial survey shows that 47% of respondents have a low level of manifestation of communication skills, 33% have an average level and 20% have a high degree of manifestation. At the end of the training with the experimental group, the percentage of students with low levels was reduced to 6%, and the percentages of students with medium and high levels of manifestation increased by 17% and 24%, respectively.

The results of the parallel surveys and tests of the control group at the beginning of the research period are close to those of the experimental group, but at the end of the study, the positive changes in the direction of improving the communicative and dialogical skills of the control group are insignificant.

Conclusion

Project-based learning, which is related to team organization of work, free communication, expressing a personal position, listening to someone else's point of view, arguing and defending one's opinion, contributes to increasing students' communication skills and dialogic behavior, as the strongest influence is established in the direction of overcoming the low levels of manifestation of these skills.

References

- Georgiev, Lubomir. Developmental Psychology and Age Psychology, Sofia 2005.
- Denny, Richard. Profitable Communications. Sofpress, 2006.
- Lowndes, Lyle. The art of communication. IC "Hermes", 2010
- McKay, Matthew, Davies, Martha, Fanning, Patrick. The messages. Communication skills. Ed. LICK, 2009
- Mircheva, Camelia. Communication skills and effective communication, "Heros" Art Club Publishing House- Stara Zagora, 2012
- Pease, Alan, Pease, Barbara. The latest book on body language. Sofia, Siela, 2012
- Psychological tests. Encyclopedia. Faber Publishing House, Sofia, 2001
- Stamatov, Rumén. Psychology of communication. IC "Hermes", Plovdiv, 2008.
- Handbook of the competence "cooperation", Operational program "Development of human resources" 2007-2013 Project BG051PO001-7.0.01-0015-C0001