

RESEARCH OF EMOTIONAL INTELLIGENCE OF CHESS TEACHERS AND PUPILS

DOI: 10.24234/miopap.v10i1.456

Anzhela SARGSYAN, Lecturer at Academician Mkrtych Mazmanyan Chair of Psychology Khachatur Abovian Armenian State Pedagogical University, "Chess" Scientific Research Institute

E-mail: sargsyananzhela54@aspu.am

Armine KHACHATRYAN, PhD in Psychology, Associate Professor at the Chair of Developmental and Educational Psychology at Khachatur Abovian Armenian State Pedagogical University, "Chess" Scientific Research Institute

E-mail: khachatryanarmine54@aspu.am

ABSTRACT

The research relevance is conditioned by the lack of experimental data on the study of the level of emotional intelligence of school teachers and learners of chess. The aim of the research is to identify the level of emotional intelligence of teachers and junior schoolchildren and their manifestation during the teaching and mastering of the "Chess" subjects. In accordance with the purpose of the research, "Happy and sad", "Do you understand emotions by mimics?", "Emotions identification, pupil", "Emotions identification, teacher", N. Holly's intellectual level diagnostic methodologies have been applied. The study results. Summarizing the results of analyses of all the applied methods during this research, it can be concluded that the low indicators of empathy of the teachers, managing emotions of themselves and others affects both the motivation to success of the 3rd and 4th grade pupils as well as the negative attitude to obtaining the teacher's appraisal, as a result of which the indicator of a positive attitude towards the teacher of the chess is diminished. The practical significance of the research. Taking into account the data analysis of the results of this study, we suggest providing training program in the chess teachers. The aim is to increase the level of development of chess teachers' emotional intelligence, to develop the ability of schoolchildren to recognize, distinguish and title the emotions of chess classes. The goal is to increase the level of development of chess teachers' emotional intelligence, to develop the ability to recognize, distinguish and title the emotions of schoolchildren in chess classes.

Keywords: "Chess" subject, junior schoolchild, emotional intelligence, emotion identification, author's method, Chess teachers, group training program, efficient learning

process/ efficiency learning process.

INTRODUCTION

Emotional intelligence as a psychological phenomenon is relatively new, and so far there is no clear definition of this concept. In 1990 P. Salovey has published an article titled "Emotional intelligence", which is the first edition on this topic. P. Salovey and J. Mayer define emotional intelligence as "personality manifestations expressed in the ability to perceive and understand emotions and to manage emotions based on intellectual processes" (Salovey P., Mayer J., 2015, pp. 132-135).

Emotional intelligence model, developed by P. Salovey, J. Mayer, D. Caruso, includes the following components:

1. Identification of emotions - the ability to accurately perceive and express emotions.
2. Emotional stimulation of thinking - the possibility of creating emotions that will contribute to the solution of intellectual problems.
3. Understanding emotions - an opportunity to understand complex emotions and their causes.
4. Managing emotions - the ability to maintain or change the emotional state of yourself or others.

Later by adding three more components of the model proposed by P. Salovey and J. Mayer, D. Goleman combines cognitive abilities with personality attributes, including enthusiasm, perseverance, and social skills. And if before just four major components were distinguished in the structure of emotional intelligence, which are self-consciousness, self-control, affection, communication skills, then D. Goleman classified motivation as one of those components (Goleman D., 2010, p. 487).

In 1985 R. Barn-On imported the concept of "emotional coefficient" and offered the "E. Kyu's questionnaire" for its diagnosis. R. Barn-On defines emotional intelligence as knowledge and competence that enables a person to overcome obstacles in different situations (Simonova, 2011, p. 160).

In 2004, the Russian psychologist D. Lyusin proposed a new approach to emotional intelligence. According to the author, emotional intelligence is characterized by the ability to understand and manage individual's emotions and emotions of others (Lyusin D.V., 2004, p.176). Lyusin divides two types of emotional intelligence distinguishing by their mechanisms and form of expression which are interpersonal and personal.

K. Weisbach and U. Dacks regard emotional intelligence as the ability to manage personal emotional life, which contributes to personal and professional growth (Kravtsova A.K.,

2012, p. 22).

According to O. Tikhomirov "emotional intelligence" is equivalent to "emotional thinking". Characterizing the peculiarity of emotional thinking, the author points out that emotional states are involved in the problem-solving process. In Tikhomirov's opinion, all the emotional phenomena (affect, emotions, feelings) are related to the process of thinking (Andreyeva I.N., 2008, p. 95).

I. Andreyeva provides a special approach to the structure of emotional intelligence by which two main aspects are separated:

1. Personal- it consists of components such as realizing personal emotions, self-esteem, self-confidence, responsibility, patience, self-control, activity, flexibility, interest, new aspirations, achievements' motivation, and optimism.

2. Interpersonal - Includes being easy-going, empathy, taking into account the interests of others, respect for them, predicting and evaluating interpersonal relationships, ability to work in a group (Andreyeva I.N., 2011, p.388).

Thus, psychology includes several emotional intelligence approaches:

- Theory of emotional-intellectual abilities (Mayer et al., 2001),
- Theory of emotional competence (D. Goleman),
- Non-cognitive theory of emotional intelligence (R. Bar-On),
- Theory of the dual components of emotional intelligence (D. Lyusin).

Discussing the psychological peculiarities of emotions, P. Eckman mentions that emotions do not have a continuous influence on personal activity, however, we feel emotions at some point, and in the next moment, we can feel nothing. Emotions often occur when we feel that an event is expected. It can have a positive or negative impact on us, so emotions arise to prepare a person for quick action in life's most important situations. According to P. Eckman there are seven emotions: joy, amazement, sadness, anger, disgust, contempt, fear (Eckman P., 2001).

Since 2011, chess has been included in the education system of the Republic of Armenia and is taught as a compulsory subject. This stimulated the conduct of pioneering experimental research in the field of psychology in order to identify the educational values of chess.

So, In 2014 "Chess Research Laboratory" was founded through the initiatives of the President-Founder of the Chess Academy of Armenia, Smbat Lputyan with the objective to identify the effectiveness of teaching chess in elementary schools of the Republic of Armenia. The Laboratory is installed at Khachatur Abovian Armenian State Pedagogical University. The experiments have been carried out at primary schools number 50 and number 60, among the 2nd and 4th-grade students with low, medium, and high academic progress in different regions

of the Republic of Armenia. For comparative analysis, considerable efforts have also been invested in relevant studies at schools number 1 and number 7 in Stepanakert, Nagorno-Karabakh Republic – among the 4th-grade students with no chess-learning experience. Taking into consideration the educational goals of elementary-school standards for chess as a curriculum item, the Chess Research Laboratory set forth relevant research objectives and pertinent methodology. Aim: to form and develop Learner's mental abilities; Objective: to detect and compare the level of logical thinking among the groups of students learning chess and those who don't; Methodology: Raven progressive matrices. Methodological analysis of raven progressive matrices: According to the Correlation principle in matrices, 4th-grade students with low, medium and high-level academic progress learning chess have recorded a higher degree of efficiency in differentiating the main elements of structure and identifying relations between them b. identifying the missed element and tracing comparison with the given examples. According to the Similarity Principle, the 4th-grade chess learners with low, medium and high academic progress managed to use the ability to identify symmetry and linear differentiation in decision-making According to the Progressive Change Principle, 4th-grade learners of chess with low, medium and high academic progress managed to use the abilities of dynamic (quick) observation, following changes, dynamic attention and imagination, consequently, their logical thinking has developed (Khachatryan A., Sargsyan A., 2014, p.14).

Armenian Psychologists presents the objective test results of chess research carried out by the Laboratory analysis of the Republic of Armenia. In order to identify the effectiveness of teaching academic chess, the research was carried out among the Armenian primary schools in 2-4 grades of high, medium, and low academic performance, concentration, and barriers to students' attention towards stability, response rates, as well as the moving objects. The focus of barriers to sustainability is put on appraisal methods of analysis, and it is clear that the barriers to sustainability assessment criteria are low, among the 4th-grade students with medium and high academic performance, there was an apparent increase in the number of true confrontations. Therefore, the stability of the learners' attention was increasing. The "counter the moving object" methodology results suggest that Reaction to Moving Object coefficient, which is equal to the number of delays and early confrontation quotient, is gradually decreasing, adding the exact number of confrontations. The aim of teaching academic chess at schools is to develop teaching and students' cognitive sphere, in particular, logical thinking, imagination, analyzing capacity, thus contributing to the academic study of other subjects (Mirzakhanyan K., Gevorgyan S., & Khachatryan A., 2016, p. 478).

The researches on the psychological processes – based on general methodological

orientation – might conventionally be classified into three major phases: researches which refer to (1) the intellectual potentials of chess, (2) the educational value of chess, and (3) the social value of chess. It goes without saying that all the phases declared appear interconnected and mutually completing, however, as we perceive it, the target-based researches of the aspects announced would enlarge the field of evaluation of the educational and cultural functions of chess. The functions mentioned are introduced below together with the current situation of the research of these components, as well as, the possibilities to enlarge them in accordance with the vision of the expert group of the Chess Academy of Armenia (Mirzakhanyan R., Gevorgyan S., Karapetyan V., & Petrosyan R., 2016, p. 18-24).

One of the the present researches in the Republic of Armenia evidences that, in the case of similar chess skills, the manifestation of cognitive dissonance, and the own argumentation as well are detectable within the domain of extroversion – emotional instability. Such children, even more than the introverts, need the school psychologist's support. The cognitive consonance is typical of those of the children involved who are ready to gain new experience and appear to be more positively charged towards their rivals or opponents (Mirzakhanyan R., Gevorgyan S., Karapetyan V., Dallakyan A., & Berberyan A., 2019).

One of the research projects of present purpose to reveal the influence of individual psychological characteristics of schoolchildren who studied chess subject on the results of chess test. The method was of free drawing, «My chess lesson», was used, and the method of assessing chess knowledge and skills was also applied using the developed chess test. Based on the school chess curriculum, the test was compiled by a team of experienced specialists in the field of chess education, psychologists, sociologists and professional chess players. The materials of an empirical study on a sample of schoolchildren from all regions of the Republic of Armenia (N=383) are presented. Comparing the review of previous studies and empirical data, authors talk about the conditionality of chess skills by individual psychological characteristics of children, such as introversion, intuition, intelligence, reflexivity, etc. Psychological resources and the gender of schoolchildren also determine the development of chess skills. The results emphasize the need to consider individual psychological characteristics both in the preparation of the program and in teaching chess as a general subject at school (Sarkisyan V.Zh., Manukyan S.A., Ispiryan M.M., Gevorgyan L.L., Khachatryan E.A., 2022).

The novelty of the research is that the author's method developed and applied by us for identifying the level of emotional intelligence of younger schoolchildren can be useful both for chess teachers and specialists working in this field. We also propose to theoretically develop a group training program aimed at developing the emotional intelligence of teachers teaching

in the lower grades of an elementary education school, taking into account the data of research work conducted among students. Such a combination can be useful in order to make the learning process in the lower grades more efficient.

THE PRACTICAL SIGNIFICANCE OF THE RESEARCH. Taking into account the data analysis of the results of this study, we suggest providing a training program for chess teachers. The aim is to increase the level of development of chess teachers' emotional intelligence, to develop the ability of schoolchildren to recognize, distinguish and title the emotions of chess classes. The goal is to increase the level of development of chess teachers' emotional intelligence, to develop the ability to recognize, distinguish and title the emotions of schoolchildren in chess classes.

METHODS AND METHODOLOGY

An important precondition in the learning process is the ability to understand and manage emotions of the teacher and learners. It should be mentioned that at present there are no experimental data on the study of the emotional intelligence of "Chess" teachers and learners. That is why our research team has set a goal to expose the emotional intelligence of chess teachers and schoolchildren.

Since 2017, the psychologists research team of the "Chess" scientific research institute has conducted experimental studies in Schools № 168 and 155 of Yerevan. The experiment involved 60 schoolchildren from the 3rd and 4th grades, with high, average and low academic performance and 10 teachers of the "Chess" subject.

The research relevance is conditioned by the lack of experimental data on the study of the level of emotional intelligence of teachers and learners of the "Chess" subject. **The aim** of the research is to identify the level of emotional intelligence of teachers and junior schoolchildren and their manifestation during the teaching and mastering of the "Chess" subjects. In accordance with the purpose of the research, "Happy and sad", "Do you understand emotions by mimics?", "Emotions identification, pupil", "Emotions identification, teacher", and N. Holly's intellectual level diagnostic methodologies have been applied.

The methodological bases of the research are theoretical approaches to the structure of emotional intelligence of P. Salovey, J. Mayer, D. Caruso (Salovey & Mayer, 2015), main ideas about the main emotions of P. Eckman (Eckman P., 2001).

The research has been conducted in two stages:

1. Selection of methodologies for research purposes, development of authoring methods, pilot application
2. Research results data analyses.

The following methods have been selected and applied in accordance with the research objective:

1. "Happy and sad" (Ilyina M.N., 1998)
2. "Do you understand emotions by mimics?" (Psychological tests, 2000)
3. "Identification of emotions, pupil" (Author's methodology development)
4. "Identification of emotions, teacher" (Author's methodology development)
5. N. Holly's Emotional intelligence diagnostic method (Schutte N.S., Malouff J.M., Hall L.E., Haggerty D.J., Cooper J.T., & Golden C.J et al., 1998).

RESULTS AND DISCUSSION

Now, let's take a closer look at the results' analyses of each methodology. They are developed according to the relevant indicators, which are also given in the form of diagrams to make it more visible.

The results of the "Happy and sad" method were analysed according to the indicators of the following positions:

1. Position of the chess studying at the school,
2. Motivation to succeed in the chess class,
3. Attitude toward the chess teacher,
4. Position of getting the teacher's praise or being highly assessed,
5. A position of willingness to participate in a chess class.

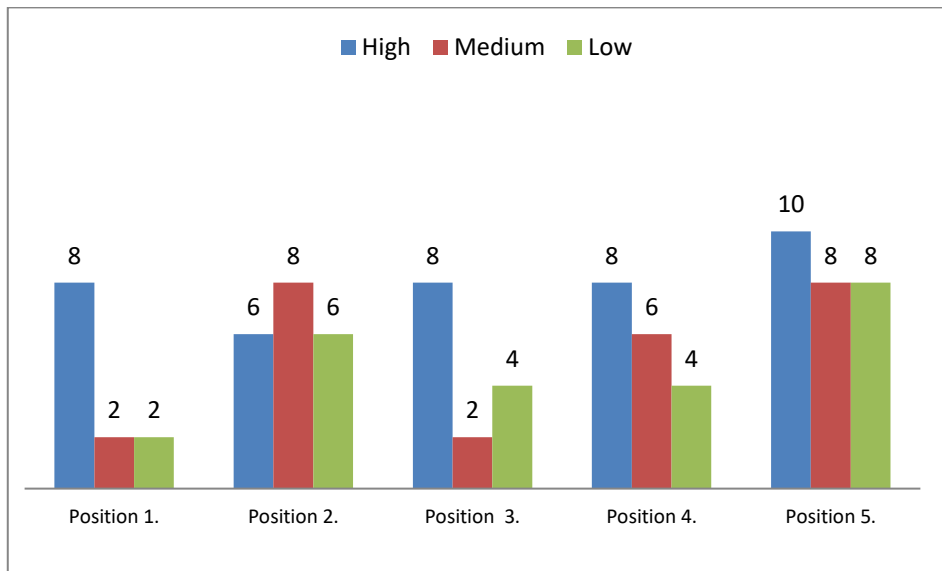


Diagram 1. Analyses of "Happy and sad" method' reserach results. 3rd grade



Diagram 2. Analyses of “Happy and sad” method research results. 4th grade

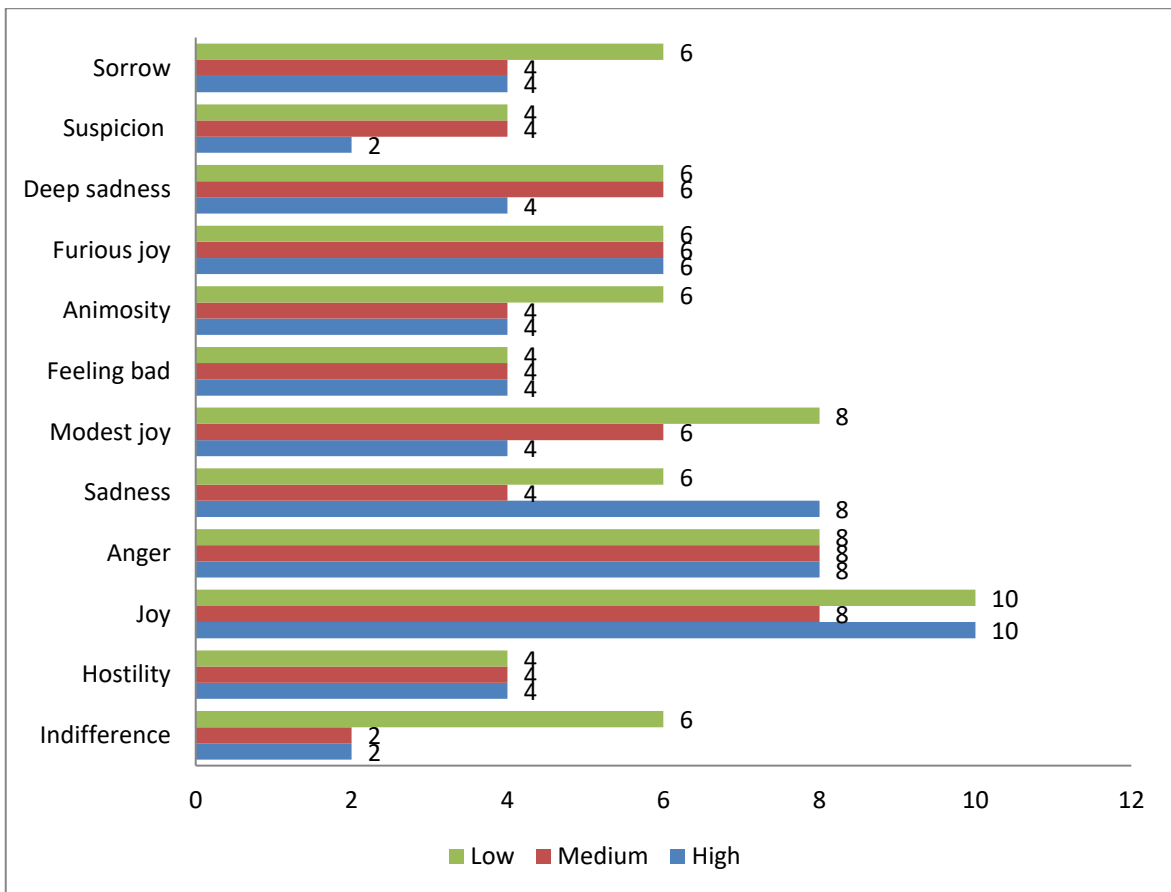
Analysing the results of the application of “ Happy and sad” method it becomes clear that:

- The 3rd grade pupils with high academic performance have shown a positive attitude to all of the above mentioned indicators, except for the motivation to succeed in the chess class,
- Interestingly, pupils with average and low academic performance, on the other hand, have shown a high level of motivation for success in the chess class while at the same time positive indicators have been revealed in terms of teacher's praise or being highly assessed and willingness to participate in chess classes.

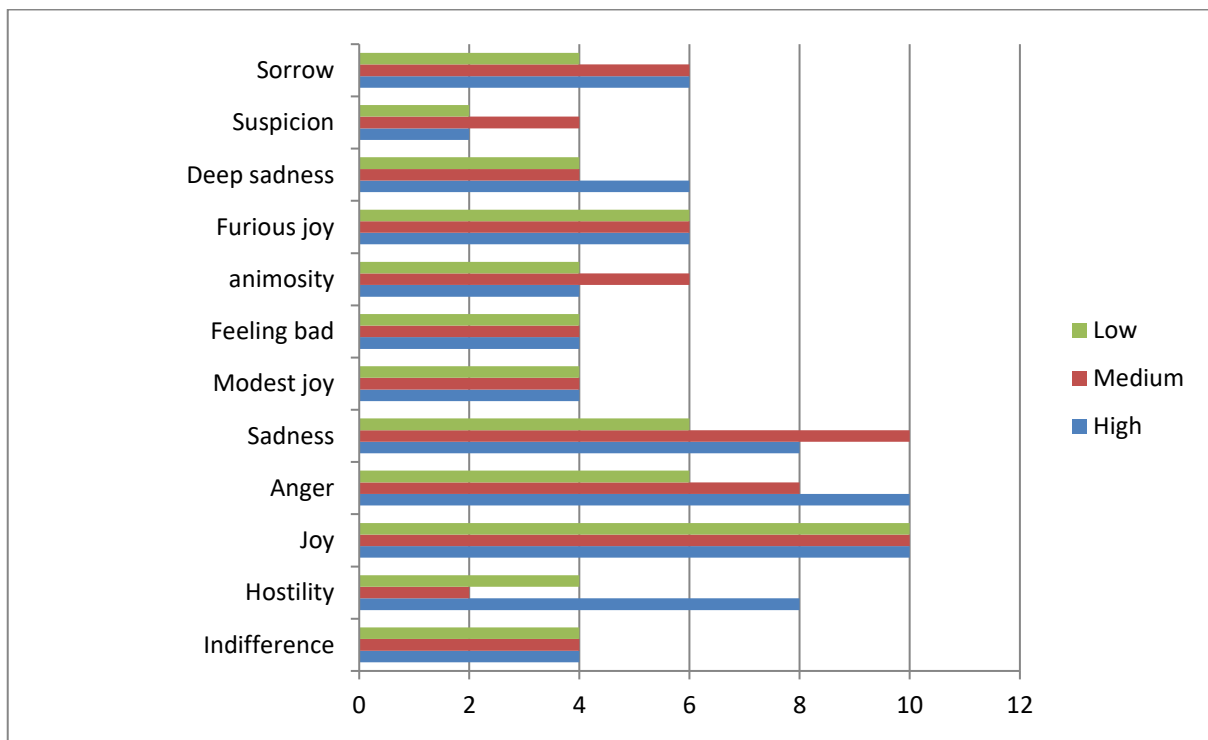
Analysis of the 4th grade research data showed the following result:

- Pupils with high and average academic performance have demonstrated a willingness to participate in chess classes, a positive attitude towards chess in school, a high level of motivation to success in chess classes,
- Pupils with average and low academic performance have shown a low level of motivation to succeed in chess class, a negative attitude towards a teacher's praise or being highly assessed, and towards the chess teacher.

The result data of “Do you understand emotions by mimics?” method have been analyzed according to the ability to identify and title the main 12 emotions.



**Diagram 3. Analyses of result data of “Do you understand emotions by mimics?”
method application: 3rd grade**



**Diagram 4. Analyses of result data of “Do you understand emotions by mimics?”
method application: 4th grade**

Analyses of result data of “Do you understand emotions by mimics?” method application showed that, regardless to the academic performance, the 3rd and 4th grade pupils identify and title “happiness”, “sadness” and “anger” expressing emotions.

“Emotions identification, pupil” method results data have been analyzed according to expression of the following emotional positions during the chess class.

1. Towards the teacher,
2. Towards the classmate,
3. Towards the participation in the chess class.

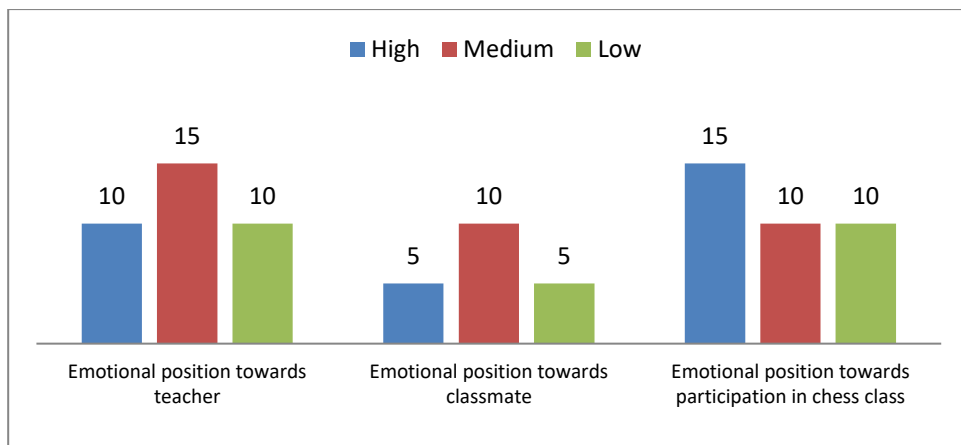


Diagram 5. Analyses of result data of “Emotions identification, pupil” method application: 3rd grade

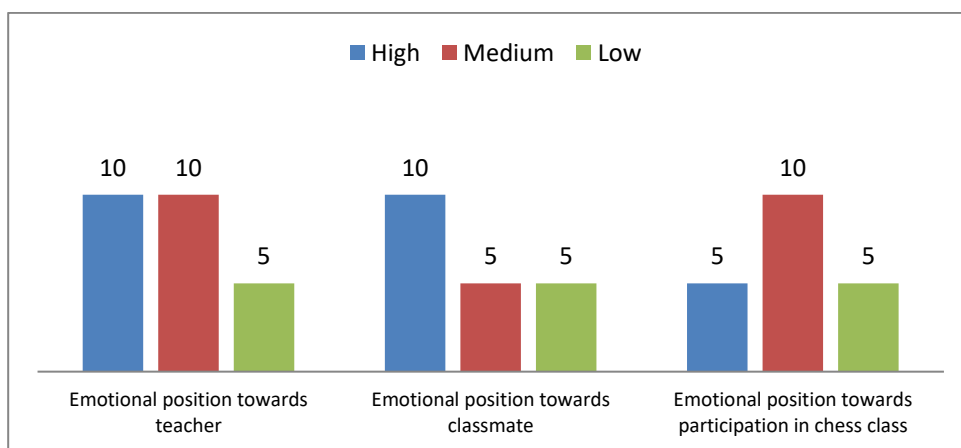


Diagram 6. Analyses of result data of “Emotions identification, pupil” method application: 4th grade

Analyses of results' data of “Emotions identification, pupil” method showed that, regardless to the academic performance, the 3rd and 4th grade pupils generally demonstrate a positive and neutral position towards the teacher and participation in the chess class. The result

is different in the case of the emotional position towards the classmate, where low indicators are performed.

Analyses of result data of “Emotions identification, teacher” method has been implemented according to the schoolchild’s position of the teacher’s following emotional positions:

1. Towards the pupil,
2. Towards assessment and monitoring,
3. Towards personal emotions’ control and management.

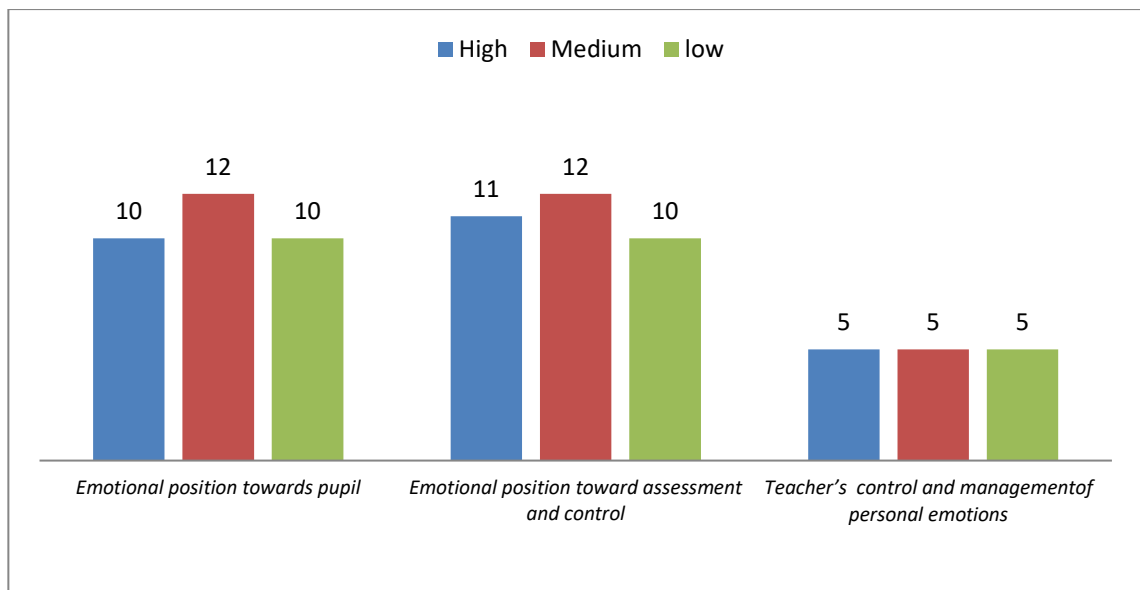


Diagram 7. Analyses of result data of” Emotions identification, teacher” method application. 3rd and 4th grades

Analyses of result data of “Emotions identification, teacher” method application reveals that in the 3rd and 4th grades has performed equivalent indicators. Regardless of the pupils’ academic performance, in their opinion teachers demonstrate a positive attitude toward pupils and their assessment and control. However, from the point of view of pupils, teachers show lower levels of control and management of their emotions in chess classes.

The results of the "Emotional intelligence level assessment" methodology were analysed according to the following criteria:

1. emotional awareness,
2. control over personal emotions,
3. self-motivation,
4. empathy,
5. control over other people emotions.

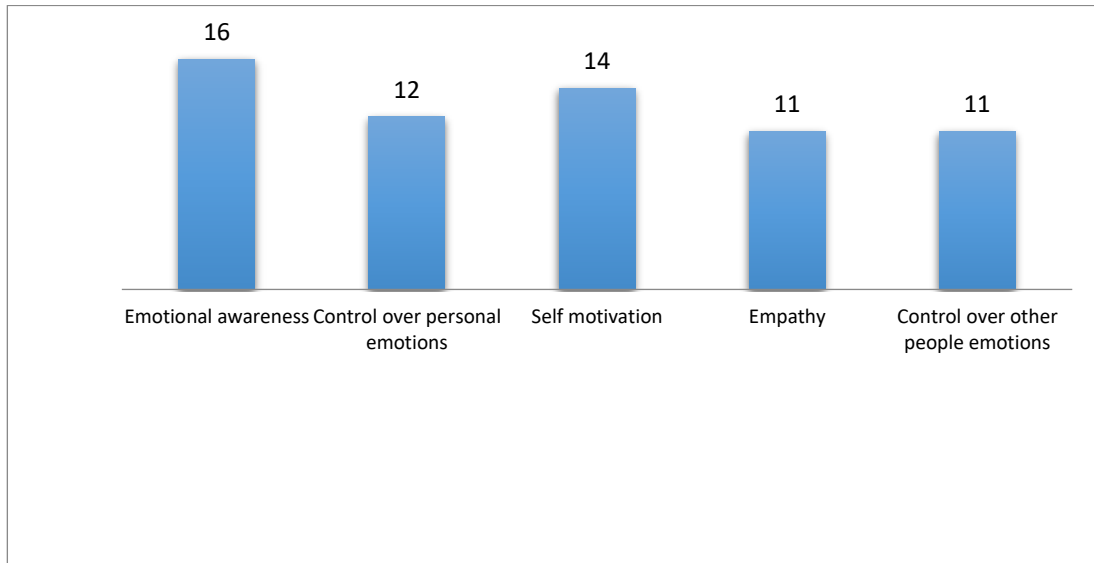


Diagram 8. Analyses of result data of “Emotional intelligence level assessment” method application

Analysis of the results shows that although the chess teacher's emotional awareness and self-motivation indicators in the school are high, the picture is different from the empathy and in the case of the self and other's emotions.

CONCLUSIONS

Summing up the analysis of the results of all the methodologies conducted during the experiment, we conclude:

1. Chess teachers demonstrate a high level of emotional awareness, while the pupils, on the contrary, are able to recognize only the joy, sadness and anger out of basic emotions,
2. The low level of empathy of the teacher, the influence on self and other's emotional control indicators impact the 3rd and 4th grade schoolchildren, also affects the motivation of succeeding in chess classes as well as the negative attitude towards getting the teacher's praise, thereby reducing the positive attitude towards indicator of the chess teacher,
3. Regardless the positive attitude of the teacher towards schoolchildren, if the teacher's emotions management and control indicators are low in the educational process, then it essentially affects both the emotional position of learners, their attitude towards classmates, and the position of participation in the chess class.

REFERENCE LIST

- Andreyeva, I. N. (2008).** O STANOVLENII PONYATIYA "EMOTSIONAL'NYI INTELLEKT" [THE FORMATION OF THE CONCEPT OF "EMOTIONAL INTELLIGENCE"]. *Voprosy psikhologii*, 5, 83-95.
- Andreyeva, I. N. (2011).** EMOTSIONAL'NYI INTELLEKT KAK FENOMEN SOVREMENNOI PSIKHOLOGII [EMOTIONAL INTELLIGENCE AS A PHENOMENON OF MODERN PSYCHOLOGY]. *Novopolotsk: PGU. (Seriya "Sotsial'no-gumanitarnye nauki"; vyp.8).*
- Baron, R. M. (2006).** THE BAR-ON MODEL OF EMOTIONAL-SOCIAL INTELLIGENCE (ESI). *Psicothema*, 18 Suppl, 13–25.
- Goleman, D. (2010).** EMOTSIONAL'NYI INTELLEKT NA RABOTE [EMOTIONAL INTELLIGENCE AT WORK]. (A. P. ISAEVA, TRANS.). *Moscow, Russia: AST; AST MOSKVA; Vladimir; VKT. (Original work published 1998)*
- Ilyina, M. N. (1998).** PODGOTOVKA K SHKOLE: RAZVIVAYUSHCHIE UPRAZHNENIYA I TESTY [SCHOOL PREPARATION: DEVELOPING EXERCISES AND TESTS]. *Saint Petersburg, Russia.*
- Mayer, J. D., Salovey, P., Caruso, D. R., & Sitarenios, G. (2001).** EMOTIONAL INTELLIGENCE AS A STANDARD INTELLIGENCE. *Emotion*, 1(3), 232–242. <https://doi.org/10.1037/1528-3542.1.3.232>
- Khachatryan, A., & Sargsyan, A. (2014).** CHESS RESEARCH LABORATORY. *Paper presented at the International Conference "Chess in Schools".*
- Kravtsova, A. K. (2012).** TIP UPRAVLENCHESKOGO VZAIMODEYSTVIYA LIDEROV I EMOTSIONAL'NYI INTELLEKT [THE TYPE OF LEADERSHIP INTERACTION OF LEADERS AND EMOTIONAL INTELLIGENCE]. *Sovremennye Issledovaniya Sotsial'nykh Problem [Modern Research of Social Problems]*, (6), 42-51. Retrieved from <http://sisp.nkras.ru/e-ru/issues/2012/6/kravtsova.pdf> (Accessed: 04 September 2012). [in Russian]
- Lyusin, D.V. (2004).** SOVREMENNYE PREDSTAVLENIYA OB EMOTSIONALNOM INTELLEKTE [MODERN IDEAS ABOUT EMOTIONAL INTELLIGENCE]. In D.V. Lyusin & D.V. Ushakov (Eds.), *Sotsialnyi intellekt: Teoriya, izmerenie, issledovaniya [Social intelligence: Theory, measurement, research]* (pp. 29-36). *Moscow: Institute of Psychology, Russian Academy of Sciences RAN. [in Russian]*
- Mirzakhanyan, R., Gevorgyan, S., & Khachatryan, A. (2016).** AN ADEQUATE PERCEPTION ON ATTENTION TOWARDS STABILITY AND OBSTACLES OF

SPACE AND TIME, AS AN ASSIMILATE RECORD OF AN ACADEMIC CHESS.

Sociology Study. <https://doi.org/10.17265/2159-5526/2016.07.006>

- Mirzakhanyan, R., Gevorgyan, S., Karapetyan, V., & Petrosyan, R. (2016).** TARGET-ORIENTED RESEARCH OF THE STRATEGIC PROGRAMMES ON CHESS ACTIVITIES AS SPECIALIZED EXPERIMENTAL PLATFORM FOR DYNAMIC DEVELOPMENT OF PUBLIC EDUCATION. *European Law Review*. <https://doi.org/10.21859/eulawrev-08041>
- Mirzakhanyan, R., Gevorgyan, S., Karapetyan, V., Dallakyan, A. M., & Berberyan, A. (2019).** TYPICAL EXPRESSION OF COGNITIVE DISSONANCE AND CONSONANCE IN THE COURSE OF ARGUMENTATION AMONG PRIMARY-SCHOOL CHILDREN PLAYING CHESS. *Imastut'yun*, 13(2), 75–84. <https://doi.org/10.24234/wisdom.v13i2.281>
- Pavlovich, I. E. (2013).** EMOTSII I CHUVSTVA. 2-E IZD.: PERERABOTANNOE I DOPOLNENNOE. *Izdatelskiy dom "Piter"*. (*Emotions and Feelings. 2nd edition: revised and expanded. Publisher "Piter"*.)
- Ekman, P. (2010).** PSIKHOLOGIYA EMOTSIY. YA ZNAYU, CHTO TY CHUVSTVUESH. 2-E IZD. [PSYCHOLOGY OF EMOTIONS. I KNOW WHAT YOU'RE FEELING. 2ND ED.]. (M. MATVEYEVA, TRANS.). *Saint Petersburg, Russia: Piter*. (Series "Sam sebe psikholog").
- Sarkisyan, V., Manukyan, S., Ispiryan, M., Gevorgyan, L., & Khachatryan, E. (2022).** THE INFLUENCE OF STUDENTS' PSYCHOLOGICAL CHARACTERISTICS ON THE RESULTS OF LEARNING CHESS. *Counseling Psychology and Psychotherapy*, 30(4), 97–123. <https://doi.org/10.17759/cpp.2022300406>
- Simonova, L.B. (2011).** RAZVITIE EMOTIONAL'NOGO INTELLEKTA BUDUSHCHEGO PEDAGOGA [DEVELOPMENT OF EMOTIONAL INTELLIGENCE OF THE FUTURE TEACHER]. In T.Yu. Andryushenko, A.G. Krintski, & O.P. Merkulova (Eds.), *Psikhologiya obrazovaniya v XXI veke: teoriya i praktika. Materiali Mezhdunarodnoy nauchno-prakticheskoy konferentsii. Volgograd, 14-16 sentyabrya 2011 g.: 80-letiyu Volgogrdskey gosudarstvennogo sotsialno-pedagogicheskogo universiteta [Psychology of education in the XXI century: theory and practice. Materials of the International scientific-practical conference. Volgograd, September 14-16, 2011: the 80th anniversary of the Volgograd State Socio-Pedagogical University]* (pp. 284-286). Volgograd: Peremena. [In Russian]
- Salovey, P., Mayer, J. D. (1990).** EMOTIONAL INTELLIGENCE. *Imagination, Cognition, and Personality*, 9.

Schulte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J., & Dornheim, L. (1998). DEVELOPMENT AND VALIDATION OF A MEASURE OF EMOTIONAL INTELLIGENCE. *Personality and Individual Differences*, 25(2), 167-177.

The article submitted and sent to review: 22/10/2022

Accepted for publication: 09/03/2023

© The Author(s) 2023. Open Access. This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>