



DOI: 10.15804/tner.2023.71.1.08

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The Impact of Preschool Education Experience on Multidimensional Non-Cognitive Abilities and Personality Development of Adolescents

Abstract

The topic's relevance is based on solving the problems of the influence of preschool education experience on the multidimensional non-cognitive abilities and personality development of adolescents. The purpose of the article was to analyse the problems of the formation of multidimensional non-cognitive processes, substantiating and determining the non-cognitive abilities of preschool children: highly developed personality, giftedness, intelligence, soft skills and conducting an experiment using the basic survey of the 2013-2014 school years conducted by the Chinese Expert Research on Education (CEPS) at Renmin University (China). The methodological approach of the research was based on the methods of analysis, synthesis, comparison, generalisation of literary sources on the problem of researching the formation of multidimensional non-cognitive abilities, graphic methods for visual illustration and comparison of the results of the ascertaining and formative stages of the research. The content of the main concepts of "abilities" and "non-cognitive abilities" is determined, and their features and features are revealed. The identified non-cognitive abilities and their indicators, as well as the methods of their formation, can be used as methodical material for universities and for the personal development of individual preschool education specialists in near and far foreign countries.

Keywords: *preschool education, non-cognitive skills, personality development, analysis of variance (ANOVA), student's t-test*

Introduction

Preschool education needs improvement at all levels, the main task of which is to ensure favourable conditions for the effectiveness of a person-oriented educational system based on the principles of democratisation, humanisation and individualisation, and integration of the pedagogical process. On November 20, 1989, the UN General Assembly adopted the Convention on the Rights of the Child. Today it is an international legal act. The Dakar Framework for Action (Dakar Framework for Action) in 2000 encompassed the World Declaration on Education for All (Education for All). Its goal is to ensure that every child receives a primary school education. In 1990, the international movement to ensure basic education for all children, youth and adults was founded during the Education for All World Conference held in Jomtien, Thailand. The main principles of the Jomtien Convention include: universal access to education; equality in education; the importance of learning outcomes; expansion of means and scope of basic education; strengthening partnership ties (Peters, 2010; Artiukhova, 2020, pp. 108–115; Kolomiets et al., 2020).

The Thai Government provides education through the Ministry of Education. Education begins with preschool and ends with the upper grades of secondary school. (Education system..., 2022). There are preschool educational institutions that develop children using Montessori and Waldorf methods. Thai kindergartens prepare children for entry into Thai schools and teach pre-schoolers to read and write in Thai. Each kindergarten has its own developmental programme, which may include lessons in music, drawing, sculpting, mathematics, natural science, language development and creative abilities, and swimming. Preschool education in Thailand is up to 5 years old, after which children begin to attend primary school classes (Teaching methods in Thailand, 2022). Research by leading scientists in the field of preschool education proves its impact on the development of not only cognitive but also non-cognitive skills of children (Kozak & Shvydka, 2018, pp. 198–208; Pirozhenko, 2018, pp. 6–27).

The term “non-cognitive talents” originated in the West to describe abilities beyond traditional academic measurements, such as memorisation and recall. Non-cognitive skills were the subject of many studies, where the issues of their definition, evaluation, and formation technologies were raised. C. Zhou (2022) reviewed research on non-cognitive abilities and discussed the limitations of existing research. As with the current study, the author notes the difficulty of measuring non-cognitive abilities. However, in the work (Zhou, 2022), the author does not consider the preschool education of students, but this, as it has

already been proven empirically, is an important aspect of assessing non-cognitive abilities.

C. Semeraro et al. (2020) investigated the influence of students' cognitive abilities, non-cognitive characteristics and the nature of their interaction with mathematics teachers on students' final grades. In this work, the authors focused on non-cognitive factors' role in schoolchildren's mathematics learning. In contrast to the current article, in which the main attention is paid to the formation of non-cognitive abilities in students, the study (Semeraro et al., 2020) analyses how these skills are manifested. The authors assumed that improving the student-teacher relationship quality may play a positive role in preventing math anxiety and promoting mathematics learning. Such an interaction of non-cognitive abilities can be a perspective for further research in this area.

S. Kassenboehmer et al. analysed and evaluated the impact of university education on adolescent non-cognitive skills (NCS) using Australian data of the highest quality (Kassenboehmer et al., 2018, pp. 538–562). They tracked the educational choices and NCS of 575 adolescents over eight years to highlight the effects of early childhood education on skill formation. In this study, the authors found a robust positive relationship between university education and extraversion and agreeableness for students from disadvantaged backgrounds. The article's authors believe that similar studies of higher education are no less necessary than preschool education. In this article, the authors focused on the academic success of students. Instead, in the work of Kassenboehmer et al. (2018), it was found that the developed non-cognitive skills are likely to operate through exposure to university life rather than through degree-specific curricula or university-specific teaching quality. That is, it is about non-market returns.

According to I. V. Zaitseva, the following should be considered “soft” skills: leadership qualities and the ability to work in a team, the ability to teach and conduct negotiations, the ability to set and achieve goals, time management, focus, presentation skills, effective communication skills, stress resistance, creativity, creative approach to problem-solving and analytical abilities, etc. (Karakaya & Turan, 2018, pp. 123–134; Zaitseva, 2020). This group includes individual, communication and management skills. In these works, the authors distinguish different groups of software skills. In the current article, the authors emphasise such components as openness of experience, benevolence, extraversion, neuroticism, and conscientiousness.

The purpose of the article is to analyse the problems of the formation of multidimensional non-cognitive processes, substantiation and determination of non-cognitive abilities of preschool children: highly developed personality, gift-

edness, intelligence, soft skills and conduct an experiment using the basic survey of the 2020–2021 school years, conducted by the Chinese expert of Education Research (CEPS) at Renmin University (China).

The modern European educational system does not have enough psychological-pedagogical and scientific-methodical support necessary for developing non-cognitive abilities for the development of the adolescent's personality. This issue requires a detailed study in line with the influence of preschool education experience on adolescents' multidimensional non-cognitive abilities and personality development.

Materials and Methods

The presented research work was carried out in three main stages. The first stage of scientific research consisted of preparing a theoretical base for further research. The analysis, synthesis, comparison, and generalisation of scientific and educational literature on the research problem was performed, which allowed for determining the directions of the development of pedagogical ideas in the researched field and the methodological principles of the research. The second stage of the experiment is dedicated to the analytical study of the impact of preschool education on multidimensional non-cognitive abilities and the development of the adolescent's personality, the determination of the conditions for the formation of non-cognitive abilities and their implementation in practice. The study uses baseline survey data from the Chinese Education Panel Study (CEPS) during the 2020–2021 school year. ANOVA and Student's t-test were used for statistical analysis. Accuracy, prediction error, non-cognitive abilities, and personality development are metrics that are evaluated and also compared to existing approaches. The final stage of the research work made it possible to formulate the conclusions of the scientific research, which act as a final reflection of the obtained results and determine, in general, the main trends of the ways of the influence of the experience of preschool education on the multidimensional non-cognitive abilities and personality development of the teenager, and to outline the prospects for further research.

Results

Fundamental changes in the educational paradigm require the transition to interactive learning strategies, the search for alternative forms of the educational pro-

cess, and the introduction of the latest educational technologies, designed to form teenagers not only professional skills but also Soft Skills (Kovalchuk et al., 2022, pp. 39–51; Naumenko, 2021, pp. 40–44). Such skills are understood as universal competencies that increase the competitiveness of a specialist in the modern labour market, who can solve complex professional tasks, work effectively in a team, make balanced decisions, and think critically (Hrebinyk, 2020, pp. 21–25).

The basic survey of the 2020–2021 school years conducted by the China Expert Education Survey (CEPS) was used for the analysis. The National Research Center of Renmin University (China) developed and conducted the survey. Students of the seventh and ninth grades are involved in the survey. Respondents were selected using a multistage proportional size sampling (PPS) process. Using a four-stage sampling procedure, information was collected at the following levels: district (district), school (building), class (individual), student (individual), teacher (individual), subject teacher (individual), and school administration (individual) 19,527 seventh- and ninth-grade students from 102 schools and 423 classes took part in the first survey. Experimental booklets were distributed as a representative sample (Barnett & Jung, 2020). The level of non-cognitive ability was used to measure success in this study. Currently, there is no agreed method for defining or assessing non-cognitive skills. Most people believe that non-cognitive abilities are a combination of several skills rather than a measure of one.

The results of four interrelated questions show that students can clearly formulate their thoughts and feelings, quickly react and receive new information, and show a sincere interest in learning new things. The study found that the four items converged into a single-factor value ($\alpha = 0.72$) using factor analysis. The value of this factor is called “openness” and is used in conjunction with the “big five grid” model to assess a person’s consistency, even if they are not very cognitive.

When answering questions on the CEPS questionnaire, students replied how often they had felt down, depressed, lethargic or sad during the previous week with a possible range from 1 (never) to 5 (often) on a 5-point scale. With the addition of negative emotionality, which is observed among teenagers of a specific type of temperament, this combination may be called “negative emotionality”. If the score on the component increased, the intensity of the corresponding negative feeling would also increase.

The value of one factor ($\alpha = 0.69$) was calculated from responses to the CEPS questionnaire about how often students were absent or late for class. Based on the study’s results, “self-discipline” was defined as the inverse of the mentioned factor and this value was used to predict absenteeism, tardiness and other types of behaviour. Stronger self-discipline corresponds to higher factor scores.

As a measure of social connections, students were assessed by the number of people with whom, according to them, they are close. Having many friends has been used as a surrogate for sociability in previous studies. People with more acquaintances are better able to move from one phase of development to another.

The main independent variable in the study is preschool attendance. If a student answers “yes” or “no” to the question on the CEPS questionnaire about whether they attended preschool or a one-year preschool class before starting 1st grade after age 3, this answer is used to create a binary code (variable yes = 1, no = 0).

Preschool educational attainment and non-cognitive abilities of middle school children were considered in this study through the literature review. Individual characteristics such as gender (female – 1), class (9 – 1), nationality (Han – 1), minority status (minority – 0) and residential registration (agricultural as reference) are used. At the family level, two factors are taken into account: the level of education of the parents and the perception of the children about the socio-economic situation of the family before they go to primary school. Individual categories are separated by the line the economic status of the family is problematic. In a way, the quality of education provided to teachers in a given area is a barometer of the region’s overall economic and social health. The impact of preschool education on economic and cultural growth in a specific area is analysed.

The average number of years of schooling of students in the district was used as a proxy variable. An expert assesses a child’s readiness for school after passing a specialised examination. The student is not ready for school because of his lack of independence, insufficient emotional and social development. The student’s personality must be positively shaped to ensure his success. Figure 1 shows the abilities of children that preschool education should give them.



Figure 1. Abilities of preschool education

The analysis of variance (ANOVA) and Student's t-test for statistical data analysis were used in the study. Analysis of variance, also known as ANOVA, is a statistical approach that divides data about the observed variation into several separate components that can be used in other studies. To compare the means of two samples, dependent or independent, the statistical tool of choice is the T-test, which can be used to compare sample means.

SPSS (or) Statistical Package for the Social Sciences (IBM SPSS Statistics) is a program used to study statistical data. Analysis of variance and t-test were used to statistically examine the effect of preschool education on non-cognitive abilities and personality development of high school students in China using a nationwide sample from the 2020–2021 CEPS baseline data. The statistical evaluation of the proposed strategy is shown in Table 1.

Table 1. Statistical analysis

Outcome Variable	ANOVA	Student T-Test
Openness	0.036**	0.042**
Negative emotions	-0.071***	-0.071***
Self-discipline	0.028*	0.011
Number of good friends	0.547+	0.278
Quality of friends	0.151***	0.176***

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

According to the results of the obtained statistical data, a consistent and significant connection can be traced between the personal development of students and their non-cognitive skills, such as open-mindedness, negative mood, self-discipline and the quality of friends. Students who attended preschool showed less negative emotionality, including despair, melancholy, and dissatisfaction. It suggests that students have better emotional regulation skills than their peers who did not attend preschool. Pupils who received preschool education were more disciplined. Figure 2 shows the non-cognitive abilities of teenagers.

Personality development is a process through which a unique set of structured thinking and behaviour patterns is formed during a person's life. This process is called personality development. A person's character develops due to the combination of her genes, upbringing, and social and cultural influences. Figure 3 shows personality development. Pre-schoolers who nurtured their personalities showed greater gains in learning (24%), creativity (22%), vision (18%), goal setting (21%), and planning (15%).

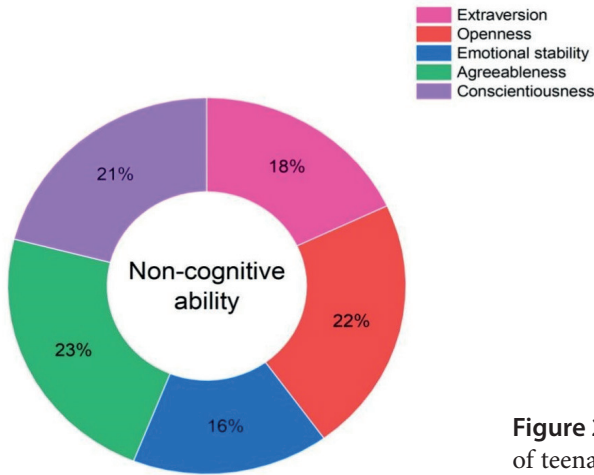


Figure 2. Non-cognitive abilities of teenagers

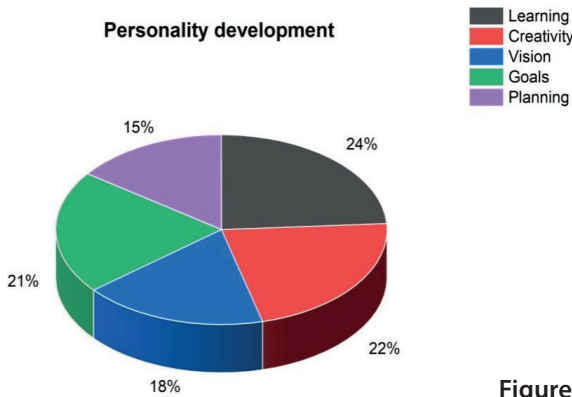


Figure 3. Personality development

Accuracy means verifying the truth of all facts and the absence of exceptions. Accurate information is critical because people’s lives may depend on it. For example, students learn accuracy in educational institutions. Figure 4 presents a comparison of the accuracy of the existing and proposed methodologies. Previous approaches, such as LDA, have 64%, CST 84%, and MWUT 75% accuracy. The proposed ANOVA+T-test has an accuracy of 96%.

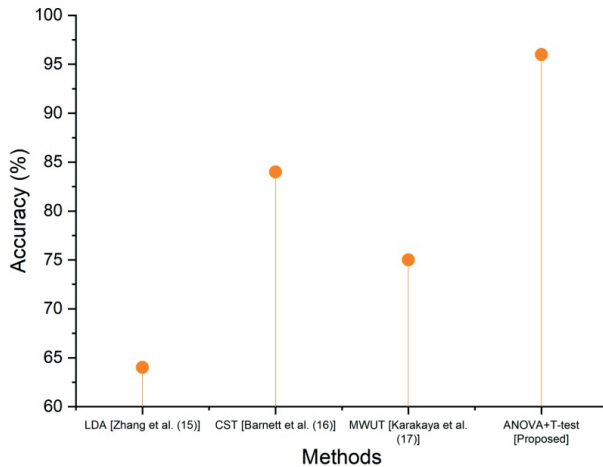


Figure 4. Comparison of accuracy for existing and proposed methodologies

Figure 5 shows a comparison of prediction errors for the existing and proposed methodologies. Previous methods, such as LDA, CST, and MWUT, had prediction errors of 94%, 81%, and 77%, respectively. The proposed ANOVA+T-test has a prediction error of 62%.

Linear discriminant has two main problems: the first is the exclusion of discriminative information in the class means, and the second is the small sample size problem (Gong & Li, 2019). The chi-square test makes several assumptions and assumes a random sample of data with a sufficiently large sample size (Zhou, 2022). The conclusions of the chi-square test will be false if they are drawn from

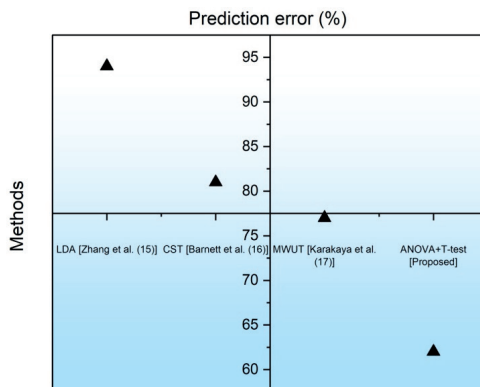


Figure 5. Comparison of prediction errors for existing and proposed methodologies

too small a sample. Psychological research often uses relatively small sample sizes. Considering the above problems, that is why analysis of variance (ANOVA) and Student's t-test were used.

Discussion

Based on the analysis of the works of leading scientists in the field of the studied issues, the following most important non-cognitive skills that must be formed in preschool age are determined, namely: highly developed personality, giftedness, intelligence, soft skills (Shahabaz & Afzal, 2021, pp. 77–106). Leading Western scientists G. Eysenck and R. Cattell presented a model of personality structure, the so-called “big five” (Boyle et al., 2016). It is a dispositional model of a person's personality, which includes five general and relatively independent traits (dispositions):

- 1) openness (B) of experience;
- 2) benevolence (D);
- 3) extraversion (E);
- 4) neuroticism (H);
- 5) conscientiousness (C).

However, the presented structure is constantly improved by the authors. The most significant remarks are the peculiarities of the national mentality, which does not allow comparing the results of assessments obtained on different cohorts of the examined, and the instability of some components in the age aspect.

In general, the following main groups are distinguished in the personality structure:

- 1) temperament;
- 2) character;
- 3) abilities (Nandi & Nikoletti, 2014, pp. 3131–3150).

The originality of the current study is that the article substantiates the role of preschool educational institutions in forming non-cognitive abilities of preschool children: highly developed personality, giftedness, intelligence, and soft skills. The authors tried to prove that preschool education positively and significantly affects this process. For this, a survey of students was conducted, which proved this hypothesis.

According to the results of the conducted experimental research, it was found that preschool children showed fewer negative emotions, more self-discipline, fewer cases of absenteeism and more openness to new experiences. Thus, one of

the most important aspects of raising children in a preschool educational institution is the formation of non-cognitive abilities, which allows you to prepare them for work in the context of intercultural, interstate interaction and effective development of the adolescent's personality in the future.

Conclusions

Thus, children who attended preschool were more likely to have good friends who contributed to their success in school. Thus, preschool education can contribute to the future development of strong personalities who have non-cognitive abilities. These results support the thesis that preschool programmes must be improved and invested in at the state level.

Thus, implementing the solutions established in the research will fully increase the level of formation of non-cognitive abilities, which will ultimately affect the development of the adolescent's personality. However, it should be noted that this topic is quite debatable and needs further consideration, particularly in the context of analysing the latest programmes and technologies for teaching preschool children, including in a distance format.

A promising direction for further research is the consideration of modern programmes, including remote ones, increasing the professional competence of educators and identifying their main shortcomings, the influence of various types and levels of preschool education on the development of non-cognitive skills and character formation of adolescents. The results of the scientific research, as well as the conclusions and perspectives of further research formulated on their basis, can be used as an effective scientific base for improving the training of educators near and far abroad.

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