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Innovative Facilitative Technology for Psychological and Pedagogical Support of Adolescents' Emotional and Behavioral Development

Abstract

Introduction. The article addresses the development and substantiation of an innovative facilitative technology for psychological and pedagogical support of adolescents' emotional and behavioral development. The study's relevance stems from increasing emotional and behavioral instability among students with mental developmental delay (MDD), requiring comprehensive, scientifically grounded corrective approaches that traditional methods fail to provide. *Methodology and Methods.* The methodological framework integrates cultural historical theory, principles of the facilitative approach, and contemporary concepts of emotional and behavioral development in adolescents with Major Depressive Disorder. Methods include psychological and pedagogical diagnostics, implementation of experimental technology, pedagogical observation, expert evaluation, and qualitative and quantitative data analysis. *Results.* The three-module facilitative technology demonstrated effectiveness through increased emotional awareness, reduced impulsive and aggressive behaviors, and formation of stable adaptive patterns. Statistically significant positive dynamics in emotional and behavioral development of adolescents with MDD were confirmed. *Scientific novelty.* The study conceptualizes the facilitative approach as integration of emotional-cognitive, behavioral, and social-communicative strategies into unified technology, identifying criteria and indicators for dynamics of emotional-behavioral regulation essential for personalized corrective intervention trajectories. *Practical significance.* The technology provides a comprehensive tool for psychological and pedagogical support systems, including: a support program fostering emotional resilience and correcting behavioral difficulties; a game-based practicum for emotional and behavioral development (GPEBD) targeting negative emotional states; functional modules adapted to MDD characteristics; and an indicator map enabling individualized corrective interventions.

Keywords: innovative facilitative technology; emotional and behavioral development; mental developmental delay; adolescence; corrective and developmental intervention.

Introduction. The current stage of educational development is characterized by an increasing emphasis on strengthening systems that ensure adolescents' emotional and behavioral well-being. This trend is associated with heightened psychological demands in school, the growing frequency of behavioral difficulties, and a decrease in students' resilience to stressors.

Adolescence is a sensitive period for the formation of emotional regulation and stable behavioral patterns that significantly influence subsequent personal development and social

functioning. In Kazakhstan, the need for systematic psychological and pedagogical support is reinforced by the fact that a substantial proportion of schoolchildren experience persistent difficulties in mastering educational programs, and a notable share demonstrate emotional and behavioral deviations requiring targeted professional assistance (Ministry of Education of the Republic of Kazakhstan, 2022). Emotional maladjustment during adolescence negatively affects academic engagement, peer interaction, and personal maturity, thereby increasing the risk of school disadaptation

and secondary behavioral complications. Accordingly, contemporary educational practice prioritizes technologies aimed at strengthening emotional resilience, developing self-regulation and empathy, and forming constructive behavioral strategies.

One promising direction in school-based support is the facilitative approach, which focuses on creating developmental conditions that enable adolescents to actively and progressively cope with emotional and behavioral difficulties. However, despite the availability of individual corrective and developmental methods, educational practice still lacks integrated technologies that combine facilitation with systematic work on emotional and behavioral development, particularly in inclusive settings. This gap is especially evident when working with adolescents with mental developmental delay (MDD), whose emotional reactivity, reduced self-control, and difficulties in adaptive behavior require not fragmented measures, but a comprehensive and staged intervention.

Recent research indicates that multimodal, practice-oriented, and technology-enhanced formats significantly increase the effectiveness and stability of corrective outcomes in adolescents' emotional and behavioral development (van Balkom et al., 2010; Beauchaine, 2015; Tang & Chu, 2023; Bernthal et al., 2017; Kharbat et al., 2021; Drigas & Ioannidou, 2012; Grigorova & Ristovska, 2021; Law, 2015). At the same time, the majority of studies are focused on isolated manifestations (anxiety, aggressiveness, emotional instability) or on narrow developmental domains, whereas integrated facilitative technologies targeted at the systematic formation of emotional and behavioral regulation in adolescents with MDD remain insufficiently developed and empirically tested. This methodological and practical deficit determines the relevance of the present study.

Therefore, the purpose of this research is to develop and substantiate an innovative facilitative technology for the psychological and pedagogical support of adolescents' emotional and behavioral development in mainstream schools and to evaluate its effectiveness using diagnostic and outcome indicators.

Research hypothesis: If an innovative facilitative technology based on the integration of diagnostic, facilitative, preventive, and corrective-developmental procedures is developed and implemented, then adolescents with mental developmental delay (MDD) will demonstrate increased emotional awareness, a reduction in the intensity of negative emotional and behavioral manifestations, and the formation of more constructive and adaptive behavior strategies.

Research objectives: To theoretically substantiate the structure and content of the innovative facilitative technology aimed at adolescents' emotional and behavioral development; To determine criteria and tools for assessing the dynamics of emotional and behavioral regulation in adolescents with mental developmental delay (MDD), implement the technology in educational practice, and evaluate its effectiveness.

Materials and Methods. The study employed a quantitative quasi-experimental research design with a pre-test and post-test assessment. The research was aimed at evaluating the effectiveness of an innovative facilitative technology for psychological and pedagogical support of adolescents' emotional and behavioral development in mainstream school settings. The quasi-experimental design was chosen due to the ethical and organizational constraints associated with random assignment in educational environments and is widely used in applied psychological and pedagogical research.

Participants. The empirical study was conducted in secondary schools of Almaty, Kazakhstan (Schools №16, 20, 28, 64, 91, 116, and 133). The sample consisted of 165 adolescents aged 11–13 years. Participants were identified as adolescents with mental developmental delay (MDD) based on conclusions provided by school psychological services and psychological-medical-pedagogical commissions.

The formation of the study groups was based on the principle of comparability with respect to age and baseline indicators of emotional and behavioral functioning. Adolescents were distributed into a control group and two

experimental groups. At the initial stage of the study, no statistically significant differences between the groups were identified, which ensured the validity of subsequent comparative analysis.

Data Collection Tools. To assess the dynamics of emotional and behavioral development, a set of standardized and widely used diagnostic tools was employed:

1) Indicator Map of Negative Emotional States (Chernukhina, 2002), used to identify and quantify the intensity of negative emotional manifestations (anxiety, fear, resentment, aggression, emotional tension, sadness);

2) Personal Anxiety Scale for Adolescents (Prikozhan, 2000), applied to assess age-specific characteristics of personal anxiety;

3) School Anxiety Test (Phillips, 1970), aimed at identifying anxiety associated with educational situations;

4) Vineland Adaptive Behavior Scales, used to evaluate adaptive functioning, including communication skills, socialization, and daily living skills;

5) Tapping Test (Osnitsky, 1998), applied to assess neurodynamic characteristics and work capacity;

6) Bass–Darky Questionnaire, used to identify the level and forms of aggressive and self-aggressive behavior.

The selected instruments ensured a comprehensive assessment of both emotional and behavioral domains and allowed for the evaluation of adaptive functioning as a key outcome of psychological and pedagogical intervention.

The study was conducted in three consecutive stages. At the diagnostic stage, baseline indicators of emotional and behavioral functioning were assessed in all groups. At the formative stage, the innovative facilitative technology was implemented in the experimental groups. The technology consisted of three interrelated modules: a diagnostic module,

a facilitative-developmental module, and an outcome assessment module. The intervention included structured facilitative practices, game-based activities, scenario and role-play methods, and targeted exercises aimed at developing emotional awareness, self-regulation, and adaptive behavior. At the control stage, repeated diagnostics were carried out to assess changes in emotional and behavioral indicators and to evaluate the effectiveness of the implemented technology.

Data Analysis Technique. Statistical data processing was performed using SPSS Statistics software. Descriptive statistics were used to summarize baseline characteristics of the sample. Comparative analysis of pre- and post-intervention indicators was conducted to identify changes in emotional and behavioral functioning. The statistical significance of differences was evaluated at a confidence level of $p < 0.05$, which is standard for psychological and pedagogical research.

Results. The control (evaluation and analytical) stage of the study was conducted to assess the effectiveness of the innovative facilitative technology for the psychological and pedagogical support of adolescents with mental developmental delay (MDD). The analysis focused on two key domains: 1) emotional functioning and 2) behavioral and adaptive functioning.

Emotional functioning. Changes in adolescents' emotional states were assessed using the Indicator Map of Negative Emotional States. Comparative analysis of pre- and post-intervention data demonstrated a positive dynamic in the experimental groups. As shown in Table 1, the number of adolescents experiencing pronounced negative emotional states, including aggression, resentment, emotional tension, fear, anxiety, and sadness, decreased following the formative experiment.

Table 1

Assessment of adolescents' emotional states using the Indicator Map of Negative Emotional States (NES)

№	Emotional states	Number of adolescents experiencing negative emotional states (NES)				
		CG	EG 1		EG 2	
			before (FE)	after (FE)	before (FE)	after (FE)
1	Aggression	8	25	15	30	15
2	Resentment	9	26	16	29	14
3	Emotional tension	7	23	15	32	16
4	Fear	9	21	15	34	16
5	Anxiety	11	17	13	38	28
6	Sadness	16	27	22	28	21

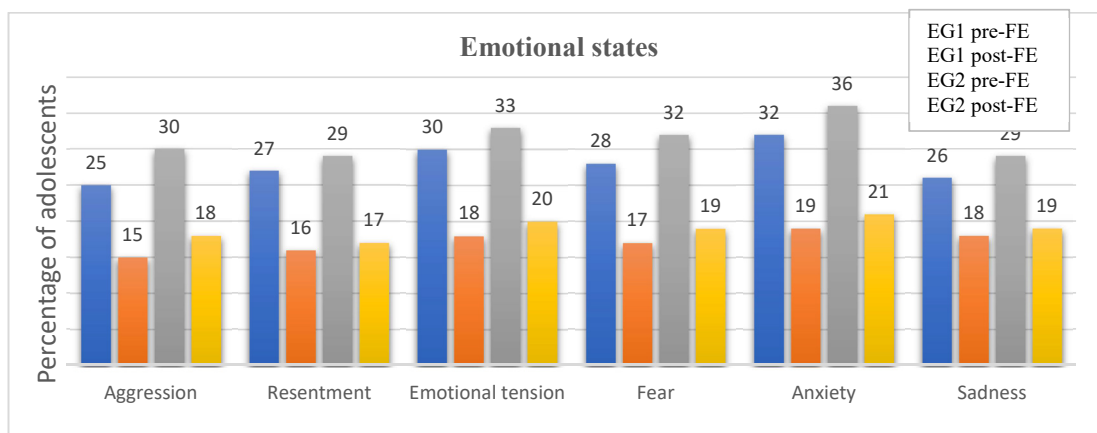
Table 1 presents quantitative changes in emotional state indicators across the control and experimental groups before and after the implementation of the facilitative technology. The most pronounced reductions were observed in indicators of anxiety, aggression, and emotional tension in the experimental groups. Further analysis revealed that emotional tension, which is considered a key marker of emotional maladjustment in adolescents with MDD, was

significantly reduced after the intervention. Visual comparison of emotional and behavioral indicators confirms this trend (Figure 1).

As illustrated in Figure 1, adolescents in the experimental groups demonstrated a normalization of emotional background, a decrease in the intensity and frequency of negative emotional experiences, and an increase in emotional awareness. These changes indicate the development of more stable emotional regulation mechanisms.

Figure 1

Indicators of Emotional and Behavioral States of Adolescents with Mental Developmental Delay (MDD)

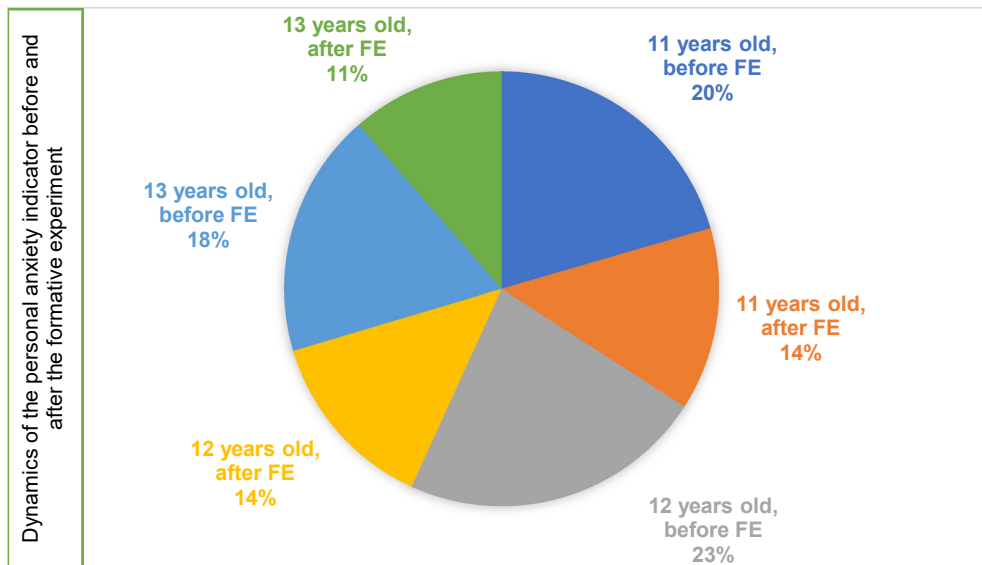


Anxiety indicators. To assess age-related dynamics of anxiety, repeated diagnostics were conducted using the Personal Anxiety Scale for Adolescents and the School Anxiety Test. The results of the comparative analysis are presented in Figure 2.

As shown in Figure 2, the implementation of the facilitative technology led to a reduction in anxiety levels across all age groups. In 11-year-old adolescents, a more pronounced decrease in situational anxiety was observed, whereas in 12- and 13-year-olds, reductions were noted in both personal and school-related anxiety.

Figure 2

Dynamics of Personal Anxiety Indicators in Younger Adolescents with Mental Developmental Delay (MDD) in Experimental Groups Before and After the Formative Experiment

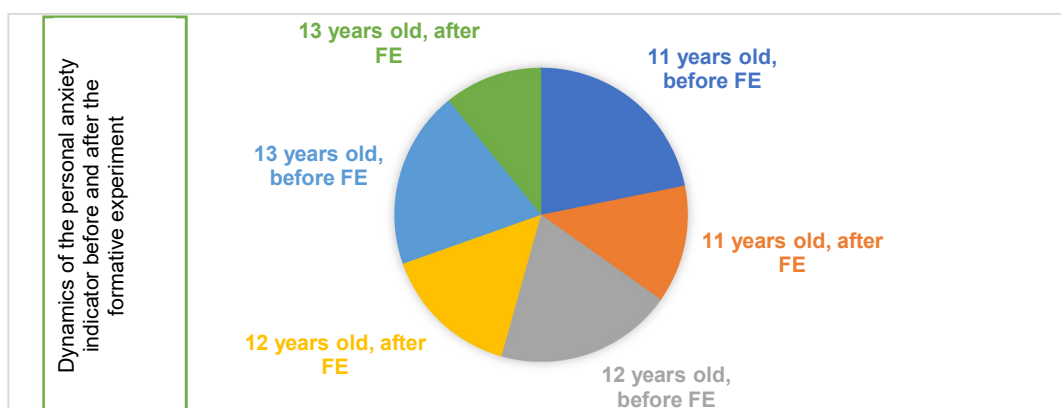


The dynamics of self-assessed anxiety are presented in Figure 3. Before the intervention, the highest levels of self-assessed anxiety were recorded among 12-year-old adolescents, which corresponds to the peak of school-related

emotional tension. Following the formative experiment, a statistically significant decrease in self-assessed anxiety was observed across all age groups, with the most substantial changes occurring in the 12-year-old group.

Figure 3

Dynamics of Self-Assessed Anxiety in Adolescents with Mental Developmental Delay (MDD) Before and After the Formative Experiment

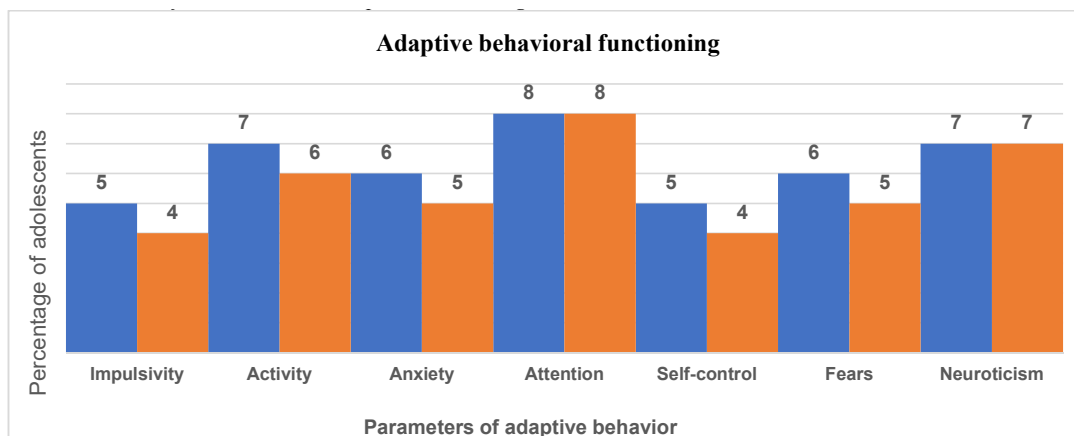


Behavioral and adaptive functioning. The second criterion for evaluating the effectiveness of the facilitative technology was the assessment of behavioral and adaptive functioning. Adaptive behavior was examined using the Vineland Adaptive Behavior Scales.

Post-intervention results demonstrated improvements in key domains of adaptive

functioning, including communication, socialization, and daily living skills. Comparative analysis of maladaptation indicators is presented in Figure 4, which illustrates differences between the control group and adolescents with MDD after the formative experiment.

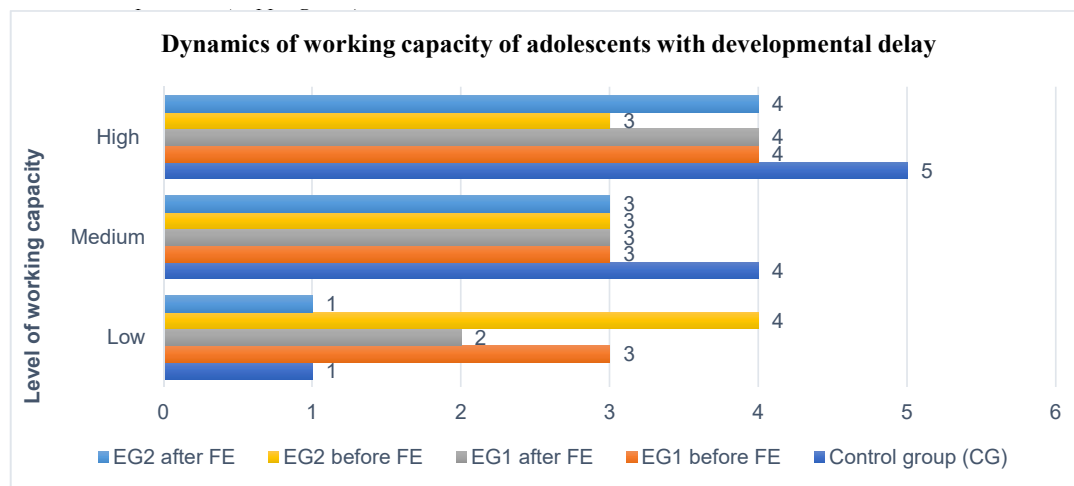
Figure 4
Mean Indicators of Behavioral and Adaptive Functioning



Additional assessment of regulatory efficiency and work capacity was conducted using the Tapping Test. The results, presented in Figure 5, indicate a positive transition dynamic:

adolescents who initially demonstrated critical levels of work capacity progressed to acceptable levels, while those at acceptable levels reached optimal performance indicators.

Figure 5
Dynamics of Changes in Work Capacity of Adolescents with Mental Developmental Delay (MDD) After the Formative Experiment (Tapping Test)



Discussion. The obtained results confirm the effectiveness of the innovative facilitative technology as a comprehensive tool for supporting adolescents’ emotional and behavioral development in mainstream educational settings. The observed reductions in anxiety, emotional tension, and aggressive manifestations are consistent with contemporary findings emphasizing the effectiveness of multimodal and facilitative interventions in school-based psychological support (Beauchaine, 2015; Tang & Chu, 2023).

adolescents, supports the view that facilitative and development-oriented interventions are most effective during periods of heightened emotional vulnerability. Similar age-specific effects have been reported in studies examining emotional regulation and school anxiety in adolescents with developmental difficulties (Drigas & Ioannidou, 2012; Grigorova & Ristovska, 2021).

The pronounced decrease in emotional tension and anxiety, particularly among 12-year-old

Improvements in adaptive functioning, as evidenced by the Vineland Adaptive Behavior Scales, indicate that the facilitative technology contributes not only to the correction of negative

emotional manifestations but also to the formation of socially adaptive behavior patterns. This finding aligns with research highlighting the importance of integrated emotional-behavioral interventions for enhancing social competence and self-regulation in adolescents (Law, 2015; Kharbat et al., 2021).

The transition dynamics observed in work capacity and regulatory efficiency further suggest that the technology supports the gradual development of voluntary activity regulation. These results confirm that the facilitative approach enables a shift from a corrective-deficit paradigm to a facilitative-developmental model, emphasizing adolescents' internal resources and active participation in the regulation of their emotional and behavioral states.

Conclusion. The dynamic nature of the innovative facilitative technology for the psychological and pedagogical support of adolescents' emotional and behavioral development is reflected in its adaptability and flexibility. The technology does not function as a static set of corrective procedures, but as an adaptive system that takes into account individual emotional and behavioral profiles of adolescents, as well as the changing conditions of the educational environment. The findings of the present study confirm the feasibility and effectiveness of implementing this technology within mainstream schools as part of a comprehensive system of psychological and pedagogical support.

The methodological integration of pedagogical, psychological, and corrective-developmental approaches constitutes a key strength of the proposed technology. By combining diagnostic procedures, facilitative interventions, preventive elements, and outcome assessment within a unified technological cycle, the developed model ensures a systemic and multi-level influence on adolescents' emotional and behavioral functioning. This approach contributes to the development of emotional resilience, self-regulation skills, adaptive behavioral strategies, and social competence in adolescents with mental developmental

delay (MDD). The results obtained have both theoretical and practical significance. From a theoretical perspective, the study expands current understanding of the mechanisms underlying emotional and behavioral regulation in adolescents with MDD and substantiates the effectiveness of facilitative technologies as a developmental alternative to deficit-oriented corrective models. The findings also contribute to the methodological discourse on school-based interventions by demonstrating the value of integrated and modular approaches in inclusive educational settings.

From a practical perspective, the proposed facilitative technology can be effectively integrated into the system of psychological and pedagogical support in educational institutions. Its modular structure allows for adaptation to the specific needs of different student groups, school contexts, and stages of adolescence. The technology may be used by school psychologists, teachers, and multidisciplinary support teams as a structured program aimed at reducing emotional maladjustment, preventing behavioral difficulties, and fostering adaptive functioning. Despite the positive results, the study has certain limitations, including the restricted regional scope of the sample and the absence of long-term follow-up data. These limitations outline the directions for future research, which may focus on expanding the sample, conducting longitudinal assessments of intervention outcomes, and examining the applicability of the technology in diverse educational contexts.

In conclusion, the developed innovative facilitative technology represents an effective and scientifically grounded tool for optimizing the emotional and behavioral development of adolescents with mental developmental delay (MDD). Its implementation contributes to the formation of adaptive behavioral strategies, emotional stability, and psychological well-being, thereby enhancing the quality and effectiveness of psychological and pedagogical support within the modern education system.

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