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# DIDACTIC GAME TECHNOLOGIES FOR DEVELOPING GRAPHOMOTOR SKILLS OF CHILDREN IN SCHOOL-PREPARATORY GROUPS

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**Abstract. Background:** Graphomotor skills are a key component of children's readiness for school writing, yet in many preschool settings they are trained through repetitive copying tasks that do not suit the developmental needs of five- to seven-year-old children. **Aim:** The study aims to substantiate a theoretical framework for using didactic game technologies to develop graphomotor skills of children in school-preparatory groups. **Methods:** The research is a conceptual study based on theoretical analysis of regulatory documents and scientific literature on play theory, the cultural-historical approach, sensory education and fine motor development, followed by comparative analysis, classification and pedagogical design. **Results:** Three mechanisms through which didactic games support graphomotor development were identified: motivation, rule-based regulation of movement and non-tiring repetition. Graphomotor didactic games were classified into five groups: finger and manipulative, sensory-tactile, graphic, constructive and rhythmic-movement games. A four-stage technology for organising such games, five selection principles and three teacher roles were proposed. **Conclusion:** Linking each group of games to a specific component of graphomotor skill and turning the game plot into a means of regulating movement allows preschool teachers to develop graphomotor skills systematically while respecting play as the leading activity of preschool children.

**Keywords:** didactic game, game technology, graphomotor skills, school readiness, fine motor skills, guided play, preschool education.

## 1. Introduction

Writing is one of the most complex activities a child masters in primary school. It requires precise finger movements, eye-hand coordination, spatial orientation and conscious control of movement at the same time. These abilities do not appear suddenly at the age of seven; they develop gradually throughout the preschool years. Research shows that fine motor skills in preschool, especially writing-related skills, are associated with children's later achievement in reading and mathematics (Dinehart & Manfra, 2013). Handwriting difficulties, in turn, may affect a child's academic performance and self-esteem (Feder & Majnemer, 2007).

In the Republic of Uzbekistan, preparing children for school is defined as one of the main tasks of preschool education. The Law "On Preschool Education and Upbringing" requires that preschool education be organised with regard to children's age and individual characteristics (Law of the Republic of Uzbekistan No. ZRU-595, 2019). The Law "On Education" defines preschool education as the initial stage of the continuous education system and calls for the use of modern pedagogical technologies (Law of the Republic of Uzbekistan No. ZRU-637, 2020). The Concept for the Development of the Preschool Education System until 2030 sets the goals of introducing child-centred, play-based approaches and improving the quality of school preparation (Resolution of the President of the Republic of Uzbekistan No. PP-4312, 2019).

However, in practice graphomotor training in school-preparatory groups is often organised in a "school-like" way: children sit at tables and copy letter elements in notebooks. Such sessions do not correspond to the developmental characteristics of preschool children, cause rapid fatigue and may create a negative attitude towards writing. Didactic games, when used, are often chosen at random and are not targeted at specific components of graphomotor skill.

Thus, there is a contradiction between the considerable potential of didactic games for developing graphomotor skills and the lack of a theoretically grounded technology for using them systematically.

The **aim** of this study is to substantiate a theoretical framework of didactic game technologies for developing graphomotor skills of children in school-preparatory groups. The study addresses the following research questions:

1. Through which mechanisms does a didactic game support graphomotor development?

2. How can graphomotor didactic games be classified according to the components of graphomotor skill?

3. How should a graphomotor didactic game be organised, and what role should the teacher play in it?

## 2. Methods

**Research design.** The study is a conceptual (theoretical) study. It does not include empirical data collection; its purpose is to build a theoretical framework that can later be tested empirically.

**Sources.** Two groups of sources were analysed. The first group included regulatory documents of the Republic of Uzbekistan on preschool education (Law of the Republic of Uzbekistan No. ZRU-595, 2019; Law of the Republic of Uzbekistan No. ZRU-637, 2020; Resolution of the President of the Republic of Uzbekistan No. PP-4312, 2019). The second group included scientific works selected according to three criteria: (a) they present a foundational theory of play or child development; (b) they address fine motor or graphomotor development; (c) they describe the pedagogical use of play in early childhood education.

**Theoretical framework.** The analysis was based on four theoretical perspectives: the cultural-historical approach and the concept of the zone of proximal development (Vygotsky, 1967); the theory of play as the leading activity of preschool children (Elkonin, 1978); the sensory education approach (Montessori, 1912); and the concept of guided play (Bodrova & Leong, 2007; Weisberg et al., 2016).

**Procedure.** The study was carried out in three stages. First, theoretical analysis was used to identify how play influences the development of voluntary movement. Second, comparative analysis and classification were used to group didactic games according to the components of graphomotor skill. Third, pedagogical design was used to develop a technology for organising graphomotor games and to define the teacher's role in them.

## 3. Results

**3.1. Mechanisms of the didactic game in graphomotor development.** The analysis identified three mechanisms through which a didactic game supports graphomotor development.

The first is motivation. In a game, a child perceives drawing a line not as an exercise imposed by an adult but as a game task, for example, "helping the bunny get home". Elkonin (1978) showed that in play a child voluntarily accepts tasks that he or she would avoid in other situations.

The second is rule-based regulation of movement. Game rules such as "do not leave the path" or "do not touch the walls of the maze" are, in fact, graphomotor requirements turned into game rules. According to Elkonin (1978), play develops the child's ability to subordinate behaviour to a rule, which is exactly what writing requires: following the direction, size and position of a line.

The third is non-tiring repetition. Automatising a movement requires many repetitions. When the same movement is repeated in different game plots, the child does not lose interest, and repetition becomes enjoyable rather than tiring.

**3.2. Classification of graphomotor didactic games.** Based on the components of graphomotor skill, didactic games were divided into five groups (Table 1).

**Table 1**

**Classification of didactic games for graphomotor development**

| Group of games | Component developed | Examples |
|---|---|---|
| Finger and manipulative games | Motor-technical: finger strength and precision | Finger plays with rhymes, stringing beads, lacing, clothespin games |
| Sensory-tactile games | Sensing shape and kinaesthesia | Drawing in sand or grain, tracing rough shapes with a finger, "Magic bag" |
| Graphic games | Visual-motor and spatial-perceptual | Mazes, connecting dots, "Draw the path", stencil tracing, graphic dictation |

| Group of games | Component developed | Examples |
|---|---|---|
| Constructive games | Spatial imagination and hand coordination | Mosaics, making shapes from sticks, modelling letter elements from plasticine |
| Rhythmic-movement games | Rhythmic-dynamic: pace and evenness of movement | Drawing patterns to the rhythm of a rhyme or music, "Raindrops", "Waves" |

Each group develops a particular component of graphomotor skill. The sensory-tactile group draws directly on Montessori's (1912) idea of preparing the hand for writing indirectly, through tracing sandpaper letters and geometric insets before the child writes. Therefore, a teacher should not limit work to one group but should combine games from different groups depending on which component is weaker in a particular child.

**3.3. Technology for organising a graphomotor didactic game.** A four-stage structure was designed for each graphomotor game (Table 2).

**Table 2**

**Four-stage technology for organising a graphomotor didactic game**

| Stage | Teacher's activity | Child's activity |
|---|---|---|
| 1. Creating the game situation | Presents the plot and the game task ("The chicks must find their mother") | Becomes interested and accepts the game task |
| 2. Demonstrating the movement | Shows the model of the movement and explains it in words | Observes and repeats the movement in the air or with a finger |
| 3. Game action | Helps, makes the task easier or more difficult | Performs the game task with a pencil |
| 4. Evaluating the result | Evaluates the result through the plot ("Did all the chicks get home?") | Compares the work with the model and finds mistakes |

In this technology, the game plot becomes a means of regulating movement: the child accepts the need to draw a line correctly not as the teacher's demand but as the logic of the game. The fourth stage develops self-monitoring, which reflects Bodrova and Leong's (2007) view of play as a means of developing self-regulation.

**3.4. Principles for selecting games.** Five principles for selecting graphomotor didactic games were formulated:

1. **Purposefulness.** Each game targets a specific component of graphomotor skill.

2. **Gradualness.** Games move from gross to fine movements and from sensory experience to graphic action.

3. **Variety.** The same movement is repeated in different game plots so that the child does not get bored.

4. **Moderation.** The duration of graphic games corresponds to age norms and alternates with movement games.

5. **Creating a situation of success.** Each game is achievable for every child, so that confidence and interest are maintained.

**3.5. Roles of the teacher in the game.** Three teacher roles were defined. As an organiser, the teacher designs the plot, prepares materials and presents the task using images familiar to children, such as fairy-tale characters, animals or vehicles. As a play partner, the teacher takes part in the game, shows the movement on behalf of a game character and helps the child within the plot, for example, "The bunny got lost; let's show him the way together". As an observer and analyst, the teacher watches how each child holds the pencil, chooses the direction of movement and responds to difficulties, and uses these observations to plan further games. The organiser role dominates at the beginning of the game, the partner role during the game, and the analyst role at its end.

## 4. Discussion

The proposed framework develops the classical view of play as the leading activity of preschool children (Elkonin, 1978) in relation to a specific learning goal, namely graphomotor readiness. Vygotsky (1967) argued that in play a child "stands a head

taller" than in everyday life, which means that play creates a zone of proximal development. The results show how this idea can be applied to fine motor learning: the game plot allows a child to perform a precise movement that he or she would not perform willingly as a formal exercise.

The framework is consistent with the concept of guided play, in which an adult sets a learning goal while the child keeps agency within the activity (Weisberg et al., 2016). The four-stage technology and the three teacher roles can be seen as an application of guided play to graphomotor learning: the teacher defines the target movement, but the child acts inside a meaningful game. This also corresponds to Bodrova and Leong's (2007) position that adult support should gradually decrease while the child's independence grows.

The results are also relevant to the findings of Dinehart and Manfra (2013), who showed that writing-related fine motor skills in preschool are associated with later academic achievement. If these skills matter for later success, the way they are trained in preschool also matters. The proposed approach offers an alternative to repetitive copying, which Feder and Majnemer (2007) note does not address the underlying components of handwriting such as visual-motor integration and motor planning.

The main theoretical contribution of the study is that didactic games are linked to specific components of graphomotor skill, and the game plot is treated as a tool for regulating movement rather than as decoration. In practical terms, the framework supports the goals of the national preschool education policy, which calls for child-centred, play-based approaches (Resolution of the President of the Republic of Uzbekistan No. PP-4312, 2019).

**Limitations.** The study is conceptual and does not provide empirical evidence of the effectiveness of the proposed framework. Its classification and technology are based on theoretical analysis and require validation in real preschool settings.

**Future research.** Further studies should test the framework empirically, compare it with traditional copying-based training, and examine how its effectiveness varies depending on children's initial level of graphomotor development.

## 5. Conclusion

The study substantiated a theoretical framework of didactic game technologies for developing graphomotor skills in school-preparatory groups. A didactic game supports

graphomotor development through three mechanisms: motivation, rule-based regulation of movement and non-tiring repetition. Graphomotor didactic games can be classified into five groups, each linked to a specific component of graphomotor skill. A four-stage technology, five selection principles and three teacher roles make it possible to organise graphomotor training systematically while preserving play as the leading activity of preschool children. The framework can be used by preschool teachers in planning sessions and by teacher educators in preparing future preschool specialists.

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