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Abstract	This chapter explores the issues related to the role of children's play in the development of cognition, emotion, imagination, and creativity to increase the effectiveness of preschoolers' educational activities by improving their educational environments in order to ensure each child's creativity and support children's initiatives, allowing them to be independent and active. Modern experts emphasize the need to support children's cognitive initiatives in the contexts of pre-school education and family support. Vygotsky's cultural-historical conception is a methodological basis for substantiating play as the leading type of pre-school children's activity. The chapter is divided into two parts. The first part analyzes the conceptual framework of pre-school education in Russia, determining the degree of popularity and the features of play activities in day-care centers. It presents the results of research into early childhood educational environments in pre-school institutions and theoretically substantiates a set of psycho-pedagogical conditions, encouraging the innovative development of pre-school education in Russia. The vector of pre-school educational development coincides with the potential of STEM education. The second part presents the ANOVA results and correlation analysis, stating that the quality of preschoolers' education depends on certain indicators of teachers' professional skills which affect the development of the child's play activity.

Keywords (separated by '-')	Psychology of children's play - Development of imagination - Creativity in childhood - Educational environment - Quality of preschoolers' education

Chapter 3
Psychology of Children's Play, Imagination, Creativity and Playful Pedagogies in Early Childhood Education in Russia

Valerian F. Gabdulchakov and **Evgeniya O. Shishova**

Abstract This chapter explores the issues related to the role of children's play in the development of cognition, emotion, imagination, and creativity to increase the effectiveness of preschoolers' educational activities by improving their educational environments in order to ensure each child's creativity and support children's initiatives, allowing them to be independent and active. Modern experts emphasize the need to support children's cognitive initiatives in the contexts of pre-school education and family support. Vygotsky's cultural-historical conception is a methodological basis for substantiating play as the leading type of pre-school children's activity. The chapter is divided into two parts. The first part analyzes the conceptual framework of pre-school education in Russia, determining the degree of popularity and the features of play activities in day-care centers. It presents the results of research into early childhood educational environments in pre-school institutions and theoretically substantiates a set of psycho-pedagogical conditions, encouraging the innovative development of pre-school education in Russia. The vector of pre-school educational development coincides with the potential of STEM education. The second part presents the ANOVA results and correlation analysis, stating that the quality of preschoolers' education depends on certain indicators of teachers' professional skills which affect the development of the child's play activity.

Keywords Psychology of children's play · Development of imagination · Creativity in childhood · Educational environment · Quality of preschoolers' education

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3.1 Introduction

The development of society has created conditions for reforms in the system of pre-school education, setting new requirements for twenty-first century education in Russia. The implementation of the Federal State Requirements and modernization in the system of pre-school education in Russia determines the transition to a new educational paradigm, changing the approaches to the content and organization of the modern educational environment created for the comprehensive development of each child and their successful socialization. The child's personality develops owing to its interactions with a developing educational environment, which is understood as a system of psychological and pedagogical conditions within the social and spatial-objective environment (Vygotsky, 2005). Pre-school education is the first stage in the modern educational system and its main goal is to ensure the child's physical, cognitive, emotional and personal development. The pre-school period is character-ized by children's potential to develop and their greatest period of sensitivity and receptivity, which must be taken into account when designing the educational envi-ronment of modern childhood. "Preprimary education in Russia exists in the form of nursery schools (*yasli*) for infants aged six-weeks to three-years-old and kinder-gartens (*detsady*) for children aged three- to six-years-old. In many cases the two types of school are located in the same building. The facilities include provision for half-day and all-day schooling as well as boarding schools. They vary from year-round to seasonal institutions, the latter predominantly in rural areas" (Education Encyclopedia, 2021, para. 8).

Pre-school learning is primarily characterized by the desire to try new things, which determines the development children's personality through gaining aware-ness of their own interests and preferences in relation to the phenomena of reality

(Broström et al., 2014; Mashford-Scott & Church, 2011; Williams, 2016). In modern-izing the content of the current educational system, of primary importance is the development of the child's personality and the indication of their inner potential, individuality, abilities, independence and initiative. This study is based on the theo-retical foundations of sociocultural studies devoted to the role of children's play in the development of cognition, emotion, imagination, and creativity in playworlds and educational environments (Bronfenbrenner, 1999; Elkonin, 1978; Leontiev, 1981; Nilsson et al., 2018; Smirnova, 2013, 2019; Vygotsky, 1966).

Play is recognized as the leading type of children's activity as games contain the cultural code of child development (Elkonin, 1978). Thus, play enhances changes in children's activities, brings to the fore their interests and certain traits of behavior, accelerating their internalization. Moreover, play triggers children's emotions and intelligence. Games are of particular importance for shaping diverse forms of chil-dren's arbitrariness—from the most elementary to the most complex. Vygotsky called play "a school of arbitrary behavior". Therefore, play, as the freest and most attrac-tive activity to children, organizes both their behavior and inner life, making it more meaningful and conscious. The children's role in play sets the zone of their proximal

development and is subsequently internalized. The driving forces of child development are hidden in specific forms of children's activities, the ones which are most consistent with children's needs and capabilities. To achieve effective and comprehensive child development we should make the most of the games they play and their potential in education. A primitive, underdeveloped game cannot determine children's zone of proximal development for it to become their leading activity. Moreover, the game is not a means of learning, but a type of children's activity, involving their agency, independence, and initiative. An adult can stimulate the game, participate in it, but not take the lead and control the actions of children. Game activities should be organized in such a way as to minimize external control on the part of teachers.

Children's play activity, transformed into "children's activities"—a drawing game, a design and construction game, an exploration game, and a game-experiment based on STEM education, can be considered a universal tool for achieving the goals of a new Standard for Pre-school Education in Russia (Federal Standard, 2013). Therefore, the vector of pre-school education development coincides with the potential of STEM education. The implementation of the STEM education model is based on the principles of developmental education and Vygotsky's scientific ideas stating that development is the result of properly organized learning, which contributes to free development, creative initiative, independence, and the child's active cognitive position, thereby increasing children's cognitive functions associated with the development of memory, thinking, imagination, verbal communication, and cognitive activity. Teachers can harness the actions performed by the learners themselves by actively and enthusiastically manipulating and experimenting with the modern object-spatial environment through the organization of project and experimental research activities.

The STEM education model is an important component of many projects, which are implemented in Russia today. To a great extent, its success depends on the creation of a new object-spatial environment of the education system as a whole, on updating the content, the improvement of its software, methodological, financial and technical support, and teaching staff training (Trilisova, 2019). The STEM program in pre-school education has several modules: Froebel's didactic system; experimenting with animate and inanimate things; LEGO construction; mathematical development; robotics; and animation studio "I Create the World". The child's need for new impressions underlies the emergence and development of their inexhaustible search-oriented activity aimed at cognition of their surrounding world. The more diverse and intensive their search activity, the more new information the child gets, the faster and more comprehensively they develop (Volosovets et al., 2019).

The STEM approach in education will make it possible to personalize educational trajectories, to take into account personality characteristics and enable the learners' creative potential to unfold, laying the foundation for the digital transformation of their education.

The research tasks underpinning this discussion are:

- to analyze the conceptual framework of pre-school education in Russia;
- to define peculiarities of play activity in day-care centres;
- to define problems and promising ways of play activity development;
- to reveal the influence of the quality of the educational environment and its developing psychological and pedagogical potential on the formation of children's personality.

3.2 The Conceptual Framework of Pre-school Education in Russia

In 2013, a new Standard for Pre-school Education was adopted in Russia (Federal Standard, 2013). The implementation of the Standard involves the use of play in the educational process. The emphasis on play as a leading activity was recognized in the Russian system of pre-school education starting in the 1920s to 1930s with the works of Vygotsky (1931). However, this pre-school education practice has not yet received its conceptual substantiation.

The principle of leading activity has been thoroughly developed by Leontiev, Vygotsky's disciple, one among a number of researchers who has determined the form and content of Russian psychology. This principle says that the cognitive sphere and the psychological structure of the personality change in the process of the child's leading activities in each period of their development through building up new relationships, gaining a new type of knowledge and finding ways to obtain it. At present, Leontiev's activity approach to the study of consciousness and the psyche is being developed in pedagogical, age-related, social and other branches of psychology and has its followers in many countries of the world including Germany, France, Italy, Great Britain, the USA, among other countries.

Vygotsky's cultural and historical conception has become the methodological basis for substantiating play as pre-school children's leading activity. The main provisions of cultural-historical psychology are as follows: a qualitative change in human activity serves as the basis for human mental development; the main driving force of the child's mental development is education and upbringing; the initial form of activity is its expanded external (social, collective) implementation; psychological innovations stem from the interiorization of the initial form of their activity; interiorization acts as a constructive mechanism of human socialization that occurs in the course of cooperation, joint activities of the child and other people, which lead to the transformation of the world of culture/the world of "meaning"/into the world of personality/the world of "significance"/; various sign and symbolic systems play a major role in the process of interiorization; the unity of affect and intellect manifests itself in the interconnection and mutual influence of these sides of the psyche at all stages of the development and are important in human activity and consciousness.

145 Socially conditioned personality development, according to Vygotsky's concep-
146 tion, considers the social environment not as one of the factors, but as the main
147 source and condition for the cognitive development of the individual. According to
148 Vygotsky, the social development situation of a given age is a starting point for all
149 dynamic changes that occur in the development during a given period. It completely
150 determines the forms and the ways, following which the child acquires more and more
151 new traits of their personality, drawing them from the environment as the main source
152 of their development, in this way social phenomena become individual (Vygotsky,
153 1984, p. 262). Child development depends on two intertwining lines: biological and
154 social. However, it is not a mere addition of one to the other as they have a different
155 "specific gravity" in the development of different functions and at different age stages
156 and are important throughout the whole ontogenetic development. Vygotsky made
157 a great contribution to the solution of the problem of the learning and upbringing
158 ratio by emphasizing the role of learning as the main driving force in the develop-
159 ment of personality. Extremely important for educational psychology are the ideas
160 of Vygotsky on higher mental functions, on the stages of language development and
161 the functions of speech, on the zone of proximal development and scaffolding.

162 Given that in this situation children interact with their educational environment,
163 they display the activity relevant for use of the opportunities provided by this envi-
164 ronment and become real subjects of their own development, the subjects of the
165 educational environment, and they do not remain the object dependent on the condi-
166 tions and factors of the educational environment (Shishova, 2017). In the late 1930s,
167 Galperin formulated a thesis on the role and significance of activity in the mental
168 development of the child, revealing the distinguishing features between the concepts
169 of "education" and "activity". The development process, it was argued, occurs owing
170 to the subject's own activity, while environmental factors are necessary conditions
171 on which the individual identity of a person depends (Galperin, 1966).

172 Thus, play is able to activate a change in the child's activity, brings to the fore
173 their interests and certain traits of behavior, accelerating their internalization. More-
174 over, play triggers children's emotions and intelligence. Various aspects of play
175 and preparation for its implementation are described in previously published works
176 (Gabdulchakov, 2011; Gabdulchakov & Shishova, 2017). The significance of play
177 in pre-school and school age children was recognized by many Russian scholars and
178 teachers of the twentieth century (Makarenko, 1987; Sukhomlinskiy, 1981; Zankov,
179 1975). However, in practice, cruelty and child abuse were an unofficial norm. They
180 existed in the form of various punishments within the family and in kindergartens.
181 Adults could, for instance, subject their children to corporal punishment, lock them up
182 in a room, and deprive them of play. Only in 2013 did the Federal State Educational
183 Standard for Pre-school Education (Federal Standard, 2013) endorse the special
184 status of childhood and the emphasis on play activities.

185 The European system of pre-school education realized the significance of the play
186 activity owing to the works of Vygotsky, and across Europe play was implemented in
187 kindergartens much earlier than in Russia. Currently, play underpins the content and
188 goals of instruction in pre-school institutions in many countries (Faulkner & Coates,
189 2013; Hoyte et al., 2015; Hunter & Walsh, 2014).

3.3 Methodology

Our research into the educational environment of early childhood in Russia is based on data collected in 16 pre-school educational institutions in the Republic of Tatarstan (part of Russia), which has a population of more than 3 million people. Among them, four preschool educational institutions are the best kindergartens, according to the results of the municipal rating ("On the rating of preschool educational institutions", approved by the Ministry of Education and Science of the Republic of Tatarstan, dated April 8, 2015). The rest of the subjects were selected from average kindergartens. The kindergarten groups were divided into two parts, based on the results of the municipal ranking. Group A included the best kindergartens and group B—average preschool educational institutions.

Two hundred and sixty-seven pre-school children from three to five years, and their respective mothers, adding a further 267 to the sample, and 33 pre-school teachers participated in the study, totaling 566 participants. For diagnostic purposes international criteria were used to assess the quality of pre-school education, namely, ECERS (Early Childhood Environment Rating Scale) as well as professional pedagogical expertise. In order to categorize the tasks according to the level of play development, the indicators of substitution, implementation of intentions and game interactions were analyzed, and to assess various aspects of the play activity, we used the experimental situation proposed by Smirnova et al. (2018). In this ascertaining experiment, an object environment was simulated in the playroom, after which the children along with the teachers were invited to free play in the room. The diagnostic task was to identify their ability to play independently, free from the suggestions of adults or images embedded in toys. The diagnostic situation did not provide for the active participation of an adult. Toys, carrying a certain image such as dolls, animals, soldiers, cars, for example, were not used and children were therefore left to play with polyfunctional, "open" materials, including fabrics of different textures, a roller made of fabric, ropes, ribbons, laces, elastic bands, small logs and sticks, wooden rings, chestnuts, fir cones, and cardboard boxes of different sizes. All these items were located in zones accessible to the children. Then 3–5 children were invited to the room, whom the adult suggested to play while he was busy with his own affairs, but if necessary, he could help. The time of observation for each subgroup of children averaged 60 min. The analysis included the following indicators: (1) the level of substitution (object, positional, spatial); (2) interactions (organizing and in-game); (3) and the game concept (the level of idea, its development, the implementation of the idea and its stability). These indicators were assessed in conventional points from 0 (complete absence) to 3 (high degree of expression).

According to Vygotskian cultural-historical theory, the key feature of play is the creation of an imaginary situation, i.e. the substitution of imaginary objects and events with real ones (Vygotsky, 2004). Therefore, the presence and level of substitutions in the game were considered to be the most important characteristics of a game story. We used ECERS to conduct the research, specifically ECERS-R which consists of seven subscales: space and furnishings, personal care routines, language-reasoning,

₂₃₃ activities, interactions, program structure and parents and staff (Harms, 2016; Harms
₂₃₄ et al., 2005; Sheridan et al., 2009). Below, and in relation to game substitutions, we
₂₃₅ present three sets of quantitative values for the indicators used in the study:

3.3.1 Object Substitutions

₂₃₇ These are the use of some objects instead of others and the use of imaginary objects.
₂₃₈ This parameter was evaluated on the following scale:

₂₃₉ 0—no object substitutions;
₂₄₀ 1—the functional use of objects in the game—the use of toy copies or objects in
₂₄₁ accordance with their intended purpose (for example, sitting on a chair and stick
₂₄₂ or acting as sticks;
₂₄₃ 2—the use of substitutes based on their similarity to the object (a stick used as a
₂₄₄ thermometer or a tree);
₂₄₅ 3—the construction of game items (for example, a fishing rod created from a stick
₂₄₆ and a ribbon, a candy made from an acorn, foil and ribbons).

3.3.2 Positional Substitutions

₂₄₈ This category of substitutions is concerned with replacing the self with another
₂₄₉ position or positional attitude in the game, which can be real (acting out the story
₂₅₀ without accepting a role, for example, "as if we were doing repairs," "as if we were
₂₅₁ moving"), role-playing or performing the part of a director. Positional substitutions
₂₅₂ were estimated as follows:

₂₅₃ 0—no playing position;
₂₅₄ 1—a real playing position;
₂₅₅ 2—a role-playing position;
₂₅₆ 3—a director's position.

3.3.3 Spatial Substitutions

₂₅₈ This type of substitution means the creation and semantic differentiation of the play
₂₅₉ space. Making space meaningful and dividing it into zones according to the story
₂₆₀ indicates a high level of the play development.
₂₆₁ The substitution of a real space by its simulation was rated according to the
₂₆₂ following scale:

₂₆₃ 0—space is not taken into account in the game;
₂₆₄ 1—the functional use of space elements (for example, carpets, and furniture);

265 2—the simulation of a play area (for example, creating a house, shop, cave with
266 treasures) around which the game plot unfolds, other places are not indicated;
267 3—the semantic division of space into zones, among which not only houses and
268 places of action are designated, but also additional spaces where the game action
269 unfolds (for example, here is a dense forest, and there is a meadow with flowers,
270 a bus stop, a road).

271 Using international criteria for assessing the quality of pre-school education, in this
272 case ECERS (a scale of integrated assessment of the quality of education in pre-school
273 educational institutions), makes it possible to obtain a comprehensive and differen-
274 tiated picture of the quality of pre-school education and thereby gauge the extent to
275 which it meets the specific requirements of the Federal State Educational Standard of
276 Pre-School Education. This research, conducted in the Republic of Tatarstan, made
277 it possible to obtain a comprehensive picture of the quality of early education and to
278 correct, as necessary, the educational programs of pre-school educational institutions
279 in a megalopolis with a population of more than one million people. The research
280 was carried out in accordance with Code of Ethics of the Russian Psychological
281 Society. All participants received an agreement for signing and an information sheet.
282 Participants were free to leave the study at any time. The methods of mathematical
283 statistics (descriptive, inductive statistics, analysis of variance (ANOVA), cluster
284 analysis) and qualitative analysis were used to statistically process the empirical
285 data obtained during the study. The calculations were performed by means of the
286 specialized computer statistical packages Microsoft Office Excel 2010, IBM SPSS
287 Statistics 23 for Windows.

3.4 Results and Discussion

289 In the first phase of the study, we conducted research into the main parameters of the
290 educational environment of early childhood with the help of the ECERS scales for
291 a comprehensive assessment of education quality. Table 3.1 presents the analysis of
292 ECERS-R average scale values in Groups A and B.
293 The research results show that pre-school establishments create optimal condi-
294 tions for the harmonious and all-round development of physical, personal, intellec-
295 tual, cognitive, and emotional areas of the child's personality. To this end, they should
296 base their activities on caring, developmental, and educational tasks, as well as on the
297 integrity of the educational process owing to the integration of content and the diver-
298 sity of children's activities along with continuous improvement of the educational
299 environment. Pre-school institutions should also engage in comprehensive develop-
300 mental and correctional work with preschoolers and health care professionals, such
301 as psychologists and speech therapists, to identify children, who need correctional
302 and development aid, and promptly provide psychological and pedagogical support.
303 The research found that despite the difficulties, the kindergarten staff was trying
304 to create a challenging, hands-on-learning developmental environment, depending

Table 3.1 Analysis of ECERS-R average scale values in groups A and B

Indicators of early childhood environment rating scale	Group A includes the best four kindergartens		Group B average pre-school institutions: twelve kindergartens	
	Average value	Standard deviation	Average value	Standard deviation
Space and Furnishings	4.72	0.43	3.08	0.99
Personal Care Routines	4.54	0.09	3.29	0.84
Language-Reasoning	4.56	0.85	2.63	1.01
Activities	4.33	0.90	2.51	0.78
Interactions	4.95	0.72	33.58	1.16
Program Structure	3.92	0.88	22.49	0.73
Parents and Staff	4.25	0.41	33.33	0.59

on the relevant activities in the group and the interests of the children. Most of the basic indicators were positively assessed. However, the analysis of educational environments in the observed groups of pre-school educational institutions demonstrated that the developing subject-spatial environment in Group B kindergartens was insufficiently intensive and not always available for independent use by children. Further, these twelve kindergartens often failed to create appropriate conditions for game playing and the motor, cognitive, research and creative activities of pre-school children. These educational environments were not aimed at supporting children's initiative and activities in gaining knowledge that contributes to revealing children's individual creative potential.

Fostering communication between children was rare and the teachers did not observe the balance between listening and speaking activities. Teachers rarely spoke with the children in Group B kindergartens about logical relationships and rarely encouraged children to reflect throughout the day. Many members of the staff did not have the required competencies. Thus, the conditions supportive of the development of children's coherent speech, their acquisition of lexical and grammatical categories in speech and logical thinking were unmet. Teachers did not encourage children to reflect and did not rely on current events and experiences to help them in the course of developing their concepts. Neither were the children encouraged to verbalize their thoughts or to explain their course of reasoning when solving problems. Some teachers were not aware that their great efforts to organize a good game for children often completely discouraged them from playing. Under tight external regulations by teachers, these games failed to promote freedom and self-realization in children. Pre-school and primary education teachers need to both understand the technology of game activities with appropriate didactic content and possess greater pedagogical skills. The children's daily schedule was often full of educational activities with little time and attention given to free play. With rigid regulations, classes were not initiated by the children themselves.

In Groups A and B, parents were involved in various forms of interaction: consultations, workshops, hands-on activities, based on a long-term planning. Pre-school educational institutions closely cooperated with their pupils' families. In these kindergartens, teachers used collective forms of work which engaged with the participating mothers through parent meetings, participation in 'a week of health' events, competitions, exhibitions of children's creative work and celebrations of festivals together with their children. The examination of the early childhood educational environment demonstrated that all pre-school educational institutions in the sample had different opportunities and developing potentials.

As a criterion indicator, we considered the presence or absence of conditions and opportunities for developing the child's activity (or passivity) and their personal freedom (or dependence) in each educational environment. The best pre-school educational institutions aimed to ensure individualization, to support ideas, to develop creative thinking and to promote the individual development of each child. Whereas statistically, average pre-school institutions were oriented towards preparation for schooling, discipline, and their educational process was strictly regulated.

Table 3.2 The results of the cluster analysis based on the sample of sixteen pre-school educational institutions (average values of indicators-criteria)

Indicators	Culture			
	Cluster 1 (31%)	Cluster 2 (37%)	Cluster 3 (12.5%)	Cluster 4 (18.8%)
	Stimulating-Productive Educational Environment	Learning Environment	Heuristic Educational Environment	Creative Educational Environment
Subject-spatial content of the environment	3.8	4.1	4.8	5.2
Time management	3.3	1.8	4.4	5.5
Adult/child interaction	3.1	3.5	4.7	5.4

In order to confirm this thesis, we conducted a mathematical analysis of the data through cluster analysis using diagnostic indicators as criteria for classifying the subject-spatial content of the environment, time management, and adult/child interaction. To analyze the data, we used a hierarchical cluster analysis and the Complete Linkage method, which makes it possible to isolate compact clusters consisting of the most similar elements. According to the results of the cluster analysis, we identified four distinctive modern types of the early childhood educational environment with different variants of indicator combinations. Then, for each group, average values were calculated, allowing us to give a meaningful characterization of the identified types. Let us consider each group separately. Table 3.2 presents the average values of indicators that act as classification criteria for the cluster analysis, to sample the 16 pre-school educational organizations. Analysis of the obtained results allowed us to distinguish types of educational environments depending on the quality of pre-school education, as determined by the following positions:

- The ways the child realizes their right to individual development in accordance with age possibilities and opportunities provided by the institution;
- The ways the pedagogical process is organized in the kindergarten;
- The conditions created in the pre-school educational institution (the educational environment focused on the self-worth of pre-school childhood and the positive microclimate in the team); and
- The system which stimulates qualitative work and creative activities by the staff and the head in the pre-school educational institution.

Thus, the modern educational environment of early childhood can be placed in one of the four main types:

1. "*Stimulating-Productive Educational Environment*" This type of educational environment is characterized by the child's activity or passivity within the framework of a given or initially found way of acting. The child's activity is

₃₇₆ determined by an external stimulus. In this context the child lacks initiative and
₃₇₇ independence as the activity is dominated by an external activator. In such an
₃₇₈ environment, children lack agency, they are dependent and passive, not feeling
₃₇₉ themselves to be the subjects of their own development. As such, educational
₃₈₀ opportunities in this environment are realized through external influences and
₃₈₁ the influence from the pedagogical staff.

2. "*The Learning Environment*" Excessively intensive educational activities, rigid
regulation of the educational process, lack of individualization and lack of time,
define this type of learning environment. The educational process is carried out
in disciplinary school-lesson form. The child is an object of influence exerted
by an adult, whose position is that of a mentor, not a partner; initiative and types
of activities rest entirely with the teacher.

3. "*Heuristic Educational Environment*" This learning environment is character-
ized by the child's discovery and acquisition of knowledge as a result of their
own activity, it is not simply passive mastering of knowledge and stimulation
introduced by external factors. Heuristic education has an accompanying char-
acter. Teachers ensure the expansion of educational spheres in each child, that is,
the emergence, formation and development of personal educational products, as
well as the subsequent comparison of these products with their cultural counter-
parts. Specially organized heuristic educational situations provide experience
of the child's own creative activities, enabling pre-school children to reproduce
cultural patterns of life and activity. The heuristic environment is rich in posi-
tive emotions and offers a field for the child to manifest their own initiative and
independence.

4. "*Creative Educational Environment*" This category of learning environment
promotes the development of the child's activity, their ability to create some-
thing new, to transform reality, to develop social relations, and their ability
to lead their own self-development as the creation of themself. The child
learns to independently set goals and realize their own plans. In this type of
environment, the discovered empirical regularity is not a heuristic one, but
an independent problem. This type of environment is characterized by the
absence of a rigid regulatory system and is focused on the individual devel-
opment of the child revealing their own creativity. In the best pre-school educa-
tional institutions, two types of environment were found: "Heuristic educational
environment" and "Creative educational environment". In the average kinder-
gartens the following types of environment were found: "Stimulating-productive
educational environment" and "Learning environment".

We carried out a comparison of mean values to verify the differences in the degree
of manifestations of the children's play activity in the educational environments of
differing quality (the one-way analysis of variance was used, $p < 0.05$), as a result of
which reliably significant differences were revealed according to the following diag-
nostic criteria: "substitution" (F = 25.72); "interaction" (F = 29.3), "game design"
(F = 13.76); "initiative' (F = 5.25). Thus, veracious differences were found in the

levels of play development in modern preschoolers, studying in the best and average pre-school educational institutions.

The issue of play is one of the most acute problems in modern pre-school pedagogy. Its significance for child development is recognized by almost all professionals. It has been proven that play activity is of decisive importance for the formation of the main new formations in pre-school childhood such as voluntary behavior, creative imagination, and self-awareness. It is play that is the content of preschoolers' communication, it develops children's interpersonal relationships and their communication skills. However, despite these generally accepted and unconditional arguments, play is increasingly being pushed out of the pre-school education system. In the daily routine of children's educational institutions, there is virtually no time left for free play. Play development has not become an independent task of pre-school education. As a result, the level of modern preschoolers' play development is dramatically declining, which is confirmed in numerous studies by Smirnova (2013, 2018). The study of Smirnova's, in which three-to-five-year-old children from Moscow preschool educational institutions participated, showed that a low level of play development (such as manipulations and monotonous actions with toys) was observed in 60%. A high level, which is characterized by expanded role relationships and the creation of a play space, was recorded only in exceptional cases (in 5% of children). Thus, older preschoolers' play activities are mostly at a low level of the development (Figs. 3.1, 3.2, 3.3, 3.4, and 3.5).

AQ3

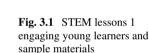**Fig. 3.1** STEM lessons 1 engaging young learners and sample materials

Fig. 3.2 STEM lessons 2 engaging young learners and sample materials

3.5 Conclusion

We have obtained results, based on the cluster analysis, indicating four types of educational environments with different learning opportunities that are found in preschool institutions in Russia. A "stimulating-productive educational environment" and a "learning environment" contribute to the development of child passivity and dependence, while a "heuristic educational environment" and a "creative environment" both of which are characterized by their focus on the free development of active children reveal their personal potentials.

The results of the correlation analysis demonstrate that the quality of preschoolers' education affects the development of the child's play activity in relation to their: (1) ability to play independently, free of adult suggestions; (2) chosen features of substitution (object, positional, spatial); (3) interactions (organization and in-game); and (4) game idea (the level of the idea, its development, its implementation, and stability). The development of a child's play depends also on certain indicators of teachers' professional skills in respect of their ability to: (1) ensure self-realization of children's personality; (2) practice empathy; (3) create a reflexive field; (4) use the reserves of children's unconscious activity; (5) use an individual approach to children; and (6) associate communication with children's real needs. Thus, in the course of our study, it was shown that the educational environment contributes to

Fig. 3.3 STEM lessons 3 engaging young learners and sample materials

Fig. 3.4 STEM lessons 4 engaging young learners and sample materials

the effective formation of pre-school children's play activity. The effectiveness of the pedagogical process, as an environment in which the child exists, can be of various types: supportive, developing, rich, comfortable, or, in some cases, neutral. Children's game arises from the child's living conditions in the environment. In this case, play does not disconnect people, on the contrary, it unites the "adult world" and the "world of children", ensuring the creation of conditions for their mental development and "growing up", thereby preparing the child for their future life.

Fig. 3.5 STEM lessons 5 engaging young learners and sample materials

⁴⁶⁶ STEM education is child-centered, there is no strict regulation of children's knowl-
⁴⁶⁷ edge, no subject centrism in teaching; it is based on the principles of developmental
⁴⁶⁸ education and Lev Vygotsky's scientific thesis that properly organized learning has
⁴⁶⁹ the development-generating effect. Thus, by modeling intellectual-developmental
⁴⁷⁰ situations and by involving children in various types of research and scientific-
⁴⁷¹ technical creative activities, the teacher creates conditions for developing a person-
⁴⁷² ality prepared to live in modern realities. Preschoolers' positive personal develop-
⁴⁷³ ment most successfully occurs in conditions when an environment is capable to
⁴⁷⁴ encourage children to manifest their agency and initiative. In this case, it provides
⁴⁷⁵ opportunities for revealing children's inner potential, for developing their subjective
⁴⁷⁶ nature and creative thinking, and promotes their individual development. Conversely,
⁴⁷⁷ extremely rigid norms, lack of variability and support for children's individuality led
⁴⁷⁸ to a decrease in their cognitive interests, primitivization of their play activities, a
⁴⁷⁹ limited range of interests, etc. The data obtained can serve as reference points for
⁴⁸⁰ transformation of the pre-school education system.

⁴⁸¹ ## 3.6 Recommendations

⁴⁸² Our experience shows that in the course of organizing STEM games, the teacher
⁴⁸³ should take into account:

⁴⁸⁴ – the resilience of the subject-development environment: this environment should
⁴⁸⁵ ensure the comfort and success of children's play activities, conditions for specific

types of these activities and the development of children's intellectual abilities, their critical thinking, the formation of their teamwork skills in the process of cognitive research, and their scientific and technical creative work;

– that the child's immersion in the STEAM environment can begin with designing activities, within which preschoolers, using fragments of various materials (wood, paper, metal, plastic), will acquire elementary technical skills and abilities, and get acquainted with the basics of engineering. Various construction kits will help teachers develop children's creativity and spatial thinking. The solution line should include specialized kits for learning how to do mathematics, outdoor activities and make simple engineering projects;

– preschoolers' cognitive activity integration: the child's cognition during the game should be integrative (interdisciplinary), based on different areas of natural sciences, on engineering creativity, mathematics, and digital technologies. This integration involves the use of the project method based on cognitive and artistic search with a specific real product as a result of the children's activity;

– the psychology of speech activity in play: the result of play (cognitive-research) activity should be "trapped" in the child's memory and become his own achievement;

– the focus on the cognitive interests of the child (creativity cannot be imposed from the outside, it is based on the child's internal needs).

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Chapter 3

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