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# Designing Digital Resources for Multimodal Composition in the Kindergarten Environment

*Nikolay Tsankov*[1], *Sofia Dermendzhieva*[2*]

[1] Trakia University, Faculty of Education, Stara Zagora, Bulgaria, e-mail: nikolay.tsankov@trakia-uni.bg
[2] South-West University "Neofit Rilski", Faculty of Pedagogy, Blagoevgrad, Bulgaria, e-mail: sofger@swu.bg

**Abstract:** In the contextual field of environmental composition in kindergarten, transforming it into a space for cognitive, social, emotional, i.e., holistic formation and development of the child, multimodality operates with authenticity, magnetism, multilevelity, multidimensionality, and dynamism to overcome schematicity and linearity of thinking, thus stimulating imagination. Leading the way is the understanding that the environmental composing of multimodality in kindergarten is the foundation of quality for the child's cognitive, affective, sensory cognition and self-knowledge. This paper outlines the parameters of evaluating multimodal digital resources designed by students preparing for future kindergarten teachers. The starting points for their expertise in the relations of autonomy, coherence, justification, adequacy and authenticity as subjectively significant and objective wholes of multimodal composing are argued. Criteria and indicators for the expert evaluation of digital resources for multimodal environmental composing in kindergarten, as modeling and provoking and enriching the individual sensory experience of the child, as an opportunity to stimulate cognitive and personal activity are derived. It is necessary to conclude that through the design of multimodal digital resources, the existing contradictions in the starting conditions of the pedagogical interaction in the kindergarten will be overcome. The main recommendation points to the need for specific training of future children's teachers for multimodal environmental composition of educational practices in kindergarten, synergizing different modalities, rather than their linear sequential environmental combination.

***Keywords:*** *bpreschool, multimodal educational environment, multiliteracy, multisemiosis*

## Introduction

Every education system, in all its stages and levels, should have as its focus the inclusion of adolescents in the current social context. It is a worrying observation that, while recognising the specificities of contemporary society, educational institutions still function as systems of closed communities and find it difficult to adapt to the networked logic of the information society. The concepts, theories and methodologies presented in this study reveal the relationship between multimodality and multiliteracy and its importance for the social development of the preschool child.

Its functional role in the transfer of knowledge, skills and attitudes is conceptualised and analysed through the lens of the intensive development of information and communication technologies, given the needs of the 'digital' generations of children.

The child's engagement with the world is a process of mutual influence between the environment and the individual psyche. In psychological theories, this process is defined as "interiorization and exteriorization; accommodation and assimilation; periods in which the creation of cognitive schemes (intelligence) predominates and those in which emotionality predominates (affectivity)" (Madzarov, 2018: 12).

The mutually reinforcing periods of sensitivity denote the specific functions of the child's psyche: plasticity (the psyche changes under the influence of reality), elasticity (the psyche changes reality) and reveal the so-called "developmental fluidity". Thus, "in each period of childhood, either the idea of reality (knowledge) or the idea of the ways of influencing it (skills) increases predominantly, and as a result,

*Corresponding author: sofger@swu.bg

towards its end, these two elements of interaction between an individual and the environment become sufficiently adequate to reality and thus – sufficient for independent existence" (Madzarov, 2018: 123).

It becomes clear that, as a product of childhood, subject autonomy depends on the quality of sociosemiotic practices in which human intelligence is not only reproduced, but also stimulates the child towards a new personal meaning.

Awareness of this relativization underscores the need for:

- Making sense of the particularities of the sociocultural contextual framework in which contemporary children grow and develop;
- supporting the child's mastery of intelligent behaviour through involvement in resource-rich real and digital interactions;
- acceptance and understanding of difference as a basis for building on children's semiotic repertoire, given the prospect of embodied participation in society.

The term "semiosis" refers to the process of creating meaning. Each sign situation distinguishes four main components in semiosis: the sign carrier, the designee (signified object); the interpretant (mental, ideal image of the designee); the interpreter (the subject who constructs, interprets and uses the sign). Or, the sign is a synthetic expression, uniting the basic components of semiosis into a unity, and the meaning of the sign appears as a basic factor for any information-communicative act, because it contains the fixed information of the designe (Morris, 1964). That is, the designated sign (name) fulfills the function of representing (substituting) the designated object in the act of communication.

In turn, communication as a process, takes place in observance of strictly defined rules:

a) syntactic (formal) – for orders or formation of sign constructs;

b) semantic (meaningful) – for making sense of signs and sign constructs;

c) pragmatic – for the use of signs and sign constructs.

The mastery of these rules, however, is subject to the unqualified condition that the creation of meaning (semiosis) is the result of the interaction of the subject who produces and interprets signs (interpreter) and the group of interpreters among whom there is agreement on the rules of interpretation (interpretation).

In the context of pre-school education, the manipulation of signs, their constant articulation and multiplication, is at the heart of children's endless experiences. Their narrative transformation into verbal, playful, pictorial, musical, and constructive activities in kindergarten is perceived as a means for the child's personal presentation and representation, serving as an indicator of their functional development.

In a broad sense, narrative is "a semiotic representation of a series of events, meaningfully related in a temporal and causal way". In contemporary sociocultural contexts, narratives are constructed using an unlimited range of semiotic media: written and spoken speech, gestures and movements, images, moving images, or in combination. Any semiotic construct that is created from signs is called a text. In the aspect of pedagogical interactions, signs and sign systems serve the process of cognition. But signs also refer, that is, they embed meaning and specify meanings. Or sign referencing is a communicative process of sharing and understanding. The transfer of signs in a variety of meaning contexts (family, educational, social) reflects the transfer of knowledge and skills in which the permanent construction and reconstruction of personal identity takes place.

Defined as culturally conditioned, semiotic resources highlight the dynamic nature of mechanisms for processing and composing messages. In the course of their internalization, individual forms of expression are extrapolated as a communicative resource, sealing the child's integration into "the emergent techno-social environment in which technology and nature are one and the same, as in the case of one inhabiting the electronic web as a social medium" (Stone, 2001: 50).

Moving beyond the strict confines of speech (spoken and written), "social semiotics analyses the ways in which people use semiotic resources both to create artefacts and communicative events and to interpret them in social interactions; it compares semiotic ways of using signs; and it discovers the ways in which semiotic resources are regulated in particular spatio-temporal environments and in particular communicative situations" (Gavrilova, 2016: 106).

This staging establishes multimodal practices as the organising principle of sociosemiotic interactions in childhood.

### *Preschool education in a contemporary context: multimodal construction of the social*

Communication in the contemporary world is changing cardinally, given the ongoing "transition from paper to screen/monitor/display" (Kress, 2003:190) and is defined as multimodal because of the "simultaneous use of more than one sign system" (Genova, 2019: 154).

Social semioticians have broadened the focus on understanding literacy: in addition to the knowledge and skills required for reading and writing, literacy now includes a variety of activities and practices relevant to sociocultural contexts: "reading, writing and language are not decontextualised, rather reading, writing and language are embedded in "culture-specific ways of knowing" (Bass, 2018: 10). Literacy in the contemporary world is a social practice that generates multiple literacies (multiliteracies) and is interpreted as a product of certain external and internal factors (Kress, 2011; Crafton, Silvers and Brennan, 2009). Multimedia symbolic forms are also accepted as inseparable from literacy because of the combination of diverse semiotic resources (Hill, 2007).

The growing heterogeneity in the kindergarten educational environment includes diverse cultures, languages, and beliefs. It is consideration of this condition that reveals the dialectic of the multimodality-multiliteracy relationship in the process of meaning construction (multisemiosis) and highlights its defining role in sign-transmitted messages.

Inherent in preschool is spontaneity – children assert themselves through impulsive expression and in the course of this presentation communicate with the world, make sense of relationships and model behaviours to connect with others.

Determining the modes of expression, the styles of learning and cognition, are the similarities in their community traditions - in other words, "funds of knowledge" whose content "carries" many and varied types of literacy.

Observation of children in interactions with peers and adults, as well as a special aperture on family culture, provides authentic data about their experiences and is a major guide for how teachers can build on these experiences. The study of community modes of communication (the use of language and its visualization in print and electronic media; the practices of embedding meaning and specifying meaning; the place of real and virtual play in children's everyday lives) highlights the sociocultural framework of development – or the extent to which adolescents are involved in the communication of a multimodal world.

Dyankova and Nikolova emphasize that "in the context of the new social data, there should be a redefinition of education as it determines the cultural and intellectual capital of society" (Dyankova and Nikolova, 2023: 258). Key in this direction is the issue of providing culturally appropriate education to minority communities, and as a result the number of programmes that promote multilingualism and multiliteracy among minorities is increasing. There has been an acceleration in proposing "new educational policies that affirm and protect linguistic diversity, new models of development that meet the needs of all segments of society and that promote the integration of ethnic minority groups, new educational strategies that enable learners to achieve their educational goals without being forced to sacrifice their linguistic and cultural heritage" (Malone, 2005:1).

Recognizing culturally, communicatively, linguistically, artistically, and technologically diverse forms of expression, multimodal educational environments in kindergarten focus "on community and social practices, [and] on multimodal means of representing and constructing meaning" (Crafton, Silvers, and Brennan, 2009:35) to achieve its inclusive function.

By assigning a special status to intersubjectivity in preschool age, the teacher supports the child's "embodied experience" of expressing themselves in ways that function quite differently and further develops this experience in joint activities by simultaneously using multiple semiotic resources. Based on qualitative experiences in real and digital educational environments, multimodal practices for design and redesign, for construction and deconstruction, for contextualization and recontextualization, encourage the child to identify, reproduce, and improvise meanings in sign-mediated messages.

### *Design of multimodal digital resources – conceptual foundations*

The application of information technology in preschool is a factor of personal development and is associated with the development of skills in children:

- to welcome change and to influence change;
- think critically and make choices;

- to identify and solve problems;
- develop their creative imagination;
- to be proactive in sharing their practical experiences of dealing with multimodal designs;
- respond to the invitation to collaborate.

The preschool child's refined exposure to digital resources provides ample opportunities to encode and interpret information, resulting in a dialogue between them and the child and the formation of a thinking style and ability to communicate that is appropriate to modern communication media. In an environment enriched by multimodal digital resources, the child learns to solve problems by strategizing independently and avoiding a dependent state on outcomes. In this way, children are more motivated to develop their skills to work in a digital environment for longer and increase their self-esteem. Activating creative thinking triggers positive emotional processes, i.e. – by having fun, children achieve early digital literacy development.

In her research on multimodal visual literacy, Ariel Friedman used a population of 3-4-year old children and found that those of them "who learn with and about digital images improve their ability to perceive details and significantly expand their language parameters, including vocabulary, use of complex sentences, asking questions, and storytelling" (Friedman, 2018: 1). The cited study provides grounds for an important conclusion regarding the preschool age: activities with digital technologies based on visual images have a progressive effect on stimulating decision-making in choosing image designs and improving children's verbal interpretation of self-taken photographs. Specialized studies in the field of video games unequivocally establish "causal relationships between playing video games and high performance in cognitive tasks such as mental rotation and memory tasks" (Tasevska, 2023: 122).

Sylvia Woolf and Rosie Floyd point to the undeniable impact of new multimodal practices on early literacy and metacognitive development in 3-4-year old children. Fundamental to this is their thesis that "multimodal experiences are critical to children's abilities to act strategically in future situations" (Wolfe and Flewitt, 2010: 387).

Research work focused on the design of digital resources by preschool education students should be tailored to address tasks dictated by the needs for early multiliteracy development in digital environments, namely: (1) pedagogical situations that support preschoolers' practices related to early multiliteracy development in a digital environment; (2) pedagogical situations that promote children's curiosity, problem-solving skills, creative thinking, and collaboration with peers through the use of digital media; (3) pedagogical situations introducing transmedia play* with a focus on developing "children's multiliteracy through their interactions with contemporary media that connect stories and structures across platforms" (Alper and Herr-Stephenson, 2013); (4) pedagogical situations based on the multimodal functions of iPods and iPads technologies, providing children with educational practices different from traditional forms of literacy. These practices influence the child's self-assessment of his or her positioning as an active learner.

In terms of the methodological preparation of students – future preschool teachers, their ability to design and adapt digital multimodal resources suggesting and structuring multimodal pedagogical interactions proves essential.

Taking into account the multilayered nature of (multi)literacy, conceptually, in the design of multimodal educational environments in kindergarten, the following are emphasized: (1) the multifaceted forms of children's expression as the main interactant in social interactions; (2) the multifaceted signification of language as a communicative being, respectively in the digital environment; (3) the dynamic connectivity of information media as expressors of meanings and prerequisite for understanding; (4) the dialogical communication with the child and his community to enhance visual, informational, multicultural, media and digital individual experiences in preschool age.

### *Expertise and quality assessment of multimodal digital ensembles for kindergarten composition*

The pedagogical aspects of evaluating the multimodal digital resources created by students in the course of their studies are related to the conceptual model (as meaning structure) and the approach to design as pedagogically meaningful ones. The pedagogical aspects are conceptualized from the position of approaches to the realization of the specific cognitive, social, emotional, technological solu-

tion indicated by the specific digital multimodal resource and the possibilities of its categorization and standardization, namely: (1) goal-oriented, (2) process-oriented, (3) outcome-oriented, (4) child-centered (facilitation-centered) – learning-centered, (5) teaching-centered (coaching-centered), (6) collaborative or interaction-centered, (7) hermeneutic-centered (toward interpretation), (8) behaviorist-centered, (9) cognitivist-centered, (10) constructivist-centered, (11) connectivist-centered, etc. The context of expertise of digital multimodal resources broadly encompasses the set of tools for effective use of e-learning resources in the following areas: (1) managerial-regulatory, (2) intellectual-cognitive, (3) informational-communicative, (4) practical-applied, (5) heuristic-exploratory, (6) socio-cognitive, (7) evaluative-results-oriented, (8) situational-constructive, (9) intuitive-associative, (10) problem-based, (11) adaptive, inclusive.

The concretization of the proposed aspects as a basis for a conceptual evaluation framework of multimodal digital educational resources is the basis for deriving a set of basic criteria and indicators for their expert evaluation, following the example of Tsankov and Damyanov (2019), presented in Table 1.

**Table 1.** *Evaluative Conceptual Framework of Electronic Educational Resources as Integrated Multilayered Polyfunctional Products.*

| Criteria | Indicators for Assessment |
|---|---|
| Technical feasibility | • hardware and software compatibility;<br>• accessibility (remote, identification-authorization, autonomous access);<br>• necessary infrastructure for storage and maintenance;<br>• access time;<br>• accessible to external users;<br>• platform/media dependency. |
| Functionality and reliability | • options for searching and extracting information;<br>• export and download availability options;<br>• options for annotation (tagging), sorting and classification;<br>• intuitiveness of the interface;<br>• appropriate navigation;<br>• content licensing conditions;<br>• degree of functional and technical customization;<br>• applicability to persons with SEN;<br>• relevant level in terms of gender, ethnic, cultural and social integration;<br>• use through embedding or interaction. |
| Access to the electronic resource (opportunities and transformations) | • It is not online – offline;<br>• Provision of information only;<br>• One-way interaction;<br>• Two-way interaction;<br>• Transaction and integration of capabilities;<br>• Multi-channel access. |
| Overall design of the electronic resource | • Usefulness of the content;<br>• Degree of concretization;<br>• Degree of integrability;<br>• Constructive grouping;<br>• Number of media integrated into the course. |
| Design of learning through the electronic resource | • Predominant learning strategy (satisficing/minimizing; optimizing, maximizing, algorithmic, heuristic, prospective, situational);<br>• Incentives;<br>• Potential response opportunities;<br>• Support;<br>• Level of customization. |
| Content Design – Organization | • Map of the resource;<br>• Content map – static, dynamic, functionality, interactivity;<br>• Using quick links and metaphors;<br>• Horizontal content correlation (within one cognitive level);<br>• Vertical content correlation (between different cognitive levels). |

It is an undeniable fact that the development of digital technologies requires a qualitatively new type of information interaction, defined as interaction with multimodal text. Discussing its broad semantic

scope, multimodality researchers note that the layout of *multimodal text* is highly dynamic – image, sound, animation often complement the message, but it is quite possible that they apostrophize the message and suggest a contrary meaning (Luchinskaya and al, 2021). Multiple studies (Binder, 2014; Britsch, 2005; Mellgren and Gustafson, 2011; Granly and Maagero, 2012) reveal that multimodal text encourages preschool children to discover and create meaning.

In an operational aspect, digital resources require a multiliterate approach that integrates an expanded set of hybrid literacies and new pedagogies (Mills, 2009). In connection with these conclusions, Lazar Stošić emphasizes that "older teachers during their training did not have the opportunity for training with modern technical devices, did not have access to information technologies, educational technologies... while the younger generation of teachers possess the knowledge necessary for their use" (Stošić, 2015: 113).

In the context of preschool education, the functional suitability of digital resources is subject to the criteria outlined in Table 2.

| *CRITERIA* | Low degree of indication | Medium degree of indication | High degree of indication |
|---|---|---|---|
| 1. Relevance of the digital resource to the educational goals and practices in kindergarten. | The multimodal text validates children's experiences and competencies. | The multimodal text adds value beyond conventional analog methods. | The multimodal text contributes to refining meanings, synthesizing ideas, and transforming understanding. |
| 2. Quality of the digital resource in activating „motivated association" between signifier and signified. | The multimodal text mediates the interpretation of images and events in storytelling. | The multimodal text presupposes another emerging behavior of social literacy. | The multimodal text stimulates cognitive activity towards analyzing the relationships between motivated signs (signifier and signified). |
| 3. Effectiveness of the digital resource in promoting cultural responsiveness. | The multimodal text encourages active engagement in the process of seeking meaning. | The multimodal text prompts sharing and collaboration and positions the child as a competent communicator. | The multimodal text motivates the testing of skills for exploration and self-expression through access, analysis, evaluation, and creation of multimodal designs. |

Conceptualizing foundational assumptions for designing a multimodal educational environment, operationalized through a triad of aspects of enriching interaction in kindergarten, S. Dermendzhieva elucidates: "1) Conceptual Aspect (what is the meaning) – reflects the significance and value of implementing multimodal practices in pedagogical interaction aimed at the early development of multiliteracy in preschool age; 2) Personal Aspect (what will develop) - reflects the current need to enrich pedagogical interaction in kindergarten with various communicative modes to refine meanings, synthesize ideas, and transform understanding necessary for early development of informational, visual, multicultural, digital, and media literacies, as substantive dimensions of literacy in a contemporary context; 3) Activity Aspect (how it will be shaped) – identifies meaning-centered fields with their basic concepts and indicators, and highlights the approaches through which the implementation of multimodal practices in pedagogical interaction is structured, mediating the objective phenomena for child development: sociocultural context and cognitive activity, children's exposure and interactions in real and online spaces, cultural responsiveness, dialogization, and personalization in the context of early development of multimodal literacy in preschool age (Dermendzhieva, 2021: 163-164).

By problematizing the fields and acknowledging the potential of the multimodal approach, the kindergarten has a chance to become a focal point of educational spaces, sufficiently democratic and inclusive, synergizing both "the stories, identities, languages, and discourses, including those of marginalized subjects, and providing the opportunity for them to become visible, (as) resource carriers, viewing their 'recognition' (of resources) as an important characteristic of multimodal education, especially in the context of social justice" (Archer, 2014: 190). Through the analysis of practical levels in the kindergarten, S. Dermendzhieva highlights an innovative organization of activities based on multimodality, namely: "(1) contextual interaction; (2) reflexivity and cultural responsiveness; (3) conceptualization and sense-making; (4) active engagement; (5) creative transformation; (6) problem-solving" (Dermendzhieva, 2021: 164).

## Conclusion

The complete design of digital resources for multimodal environmental composing in kindergarten is an opportunity to create for the child a logical, attractive, living experience, as a synergetic medium of cognitive, affective, sensory cognition in order to engage and stimulate self-knowledge in a multimodal educational environment. This stimulates non-linear, perceptual and creative synergism in producing experiences that reference starting points for enriching pedagogical interaction, through which external social and educational multimodal environmental effectiveness will be transformed into internal child personal effectiveness of knowing the world and the self through a parallel appreciation of the child's personal experience and authenticity as reference points for self-actualization and self-expression, stimulated by synchronizing and synergizing modalities and their environmental composing.

It is through the design of digital resources that the existing contradictions in the initial conditions of pedagogical interaction in the kindergarten will be overcome, which are related "to the imbalance between the sociocultural and individual nature of the participants and to the particularities of the social, normative evaluation of their capabilities" (Dimitrov, 1994: 163).

All of this necessitates specific training for future preschool teachers in the field of multimodal environmental composition and the design of multimodal digital ensembles that synergize various modalities rather than linearly combining them in sequence.

### Conflict of interests

The authors declare no conflict of interest.

### Author Contributions

Conceptualization, S.D.; methodology, N.T.; writing – original draft preparation, N.T. and S.D.; writing – review and editing, N.T. and S.D.; Analysis, discussion and conclusion, N.T. and S.D.; All authors have read and agreed to the published version of the manuscript.

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***Author's Note:*** The transmedia game resembles gaming models in its material dimensions but differs with increasingly hybrid and social characteristics.

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