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ТИПОЛОГИЯ ДОШКОЛЬНЫХ УЧИТЕЛЕЙ В ЗАВИСИМОСТИ ОТ ДИДАКТИЧЕСКИХ СТРАТЕГИЙ

Аннотация: исследование фокусируется на идентификации дидактических методик, применяемых дошкольными воспитателями. Во Введении рассматриваются современные направления дошкольного образования. Исследуются начальные условия развития детей для выбора оптимальных дидактических методик. Целью исследования явилось описание выборов дидактических методик на основе эмпирических данных, взятых из реальных дидактических ситуаций. С помощью метода наблюдения и собеседования проанализирована дидактическая деятельность четырех учителей с преподавательским стажем от 1 года до 39 лет. В результате исследования показаны различные дидактические стратегии, используемые учителями. Проанализирован выбор стратегий на основе собственных предпочтений учителей, а именно ценностной стратегии, личностно-ориентированной стратегии, стратегии, где учитель лишь направляет образовательную деятельность обучающихся. Обработка всех данных позволит компилировать дидактическую типологию педагогов дошкольного образования. Автор намерен продолжить исследования в этом направлении и верифицировать данную типологию на основе более широкого списка данных.

Ключевые слова: воспитатель в детском саду, дидактические методики, передача образовательного контента.

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Kolínská Koutníková M.

A TYPOLOGY OF KINDERGARTEN TEACHERS BASED ON THEIR DIDACTIC STRATEGIES*

Abstract: this study focuses on the identification of didactic procedures of kindergarten teachers. The introduction presents modern trends in kindergarten education. It also discusses possible paradigmatic starting points for the transfer of educational content by a teacher and perspectives on child learning, which determine teachers' choices of their own didactic procedures. A qualitative research design was carried out using participatory observation of the didactic activities of four teachers, whose practices range from 1 to 39 years, followed by a semi-structured interview with these teachers. The aim of the study is to describe the choices of didactic procedures made by the kindergarten teachers through empirical data from didactic situations. The data obtained from participatory observation reveal different didactic strategies employed by the teachers and disclose a personal inclination of each teacher, namely an inclination towards a goal-oriented curriculum, an inclination towards a child-oriented curriculum, and an inclination towards the role of a teacher as a facilitator. A subsequent analysis of interviews identifies specific categories of teachers' procedures, which reflect their different conceptions of the transfer of educational content. Overall pro-

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cessing of the obtained data leads to a compilation of didactic typology of kindergarten teachers. This study will be followed up by further work, and the typology presented will be subjected to more extensive verification.
Key words: kindergarten teacher, didactic procedures, transfer of educational content.

1. INTRODUCTION

The study asks several questions: What methods do teachers choose in the process of education in kindergartens? What leads them to their decisions? The interest in any topic and the usability of its content are determined by the teacher, their personality and their choices. How then should teachers decide on the course of the educational process? Do teachers consider the implications of their decisions in relation to the future possibilities of children? This study focuses on the transfer of educational content, namely of science topics.

A teacher's professional attitude, creativity, authenticity, priority values, professional skills and knowledge, motivation, ability to assess the implications of their own decisions, and their acceptance of shared responsibility for the quality of education in their own country and for the future ability of the new generation to objectively assess and classify a large amount of information and act and decide responsibly with respect to sustainable development in postmodern society − these are just some of the prerequisite determinants leading kindergarten teachers to decide how to transfer educational content to children; in other words, to choose the way by which they will enable children to acquire current human knowledge (of science).

The next part presents selected contemporary didactic trends in (especially science) education in a kindergarten, followed by an outline of possible paradigmatic starting points for the choice of the form of educational content transfer by a teacher and its specific didactic procedures.

1.1. Didactic trends in current pre-primary education

The current educational needs of children call for new didactic practices and means, and use of innovative methods. These must reflect the accelerated development of educational needs of children and the changed needs of society (including the demands placed on children by society), as well as consider potential future needs and possibilities, influenced by the quickening development of the information society.

For example, in dialogue methods, teachers can effectively work with question techniques, focusing on asking divergent questions, which encourage a number of answers. This requires a high level of pedagogic erudition in educational communication between a teacher and children; in the Czech environment, this issue is, for instance, investigated in the area of kindergarten education by Navrátilová and Wiegerová [16]. A higher level of support by a teacher is required in heuristic methods, such as inquiry-oriented learning, and problem-based and project-based methods (e. g. [2; 3; 4; 6; 18; 22; 24]).

A particular emphasis is nowadays placed on the application of constructivist strategies in the implementation of Inquiry-Based Education (IBE) and Inquiry-Based Science Education (IBSE). Appropriate methods for promoting curiosity and cultivating thinking include means such as experiment, observation, comics, children's portfolio and demonstration. When employing these means, it is crucial to ask divergent

questions and initiate discussion in a group of children both among themselves and with the teacher.

IBE and IBSE

Inquiry-Based Education starts from children's curiosity. It draws on constructivist theories, which view learning as a process of constructing knowledge in a child's mind as opposed to a transfer of knowledge. It builds on the ideas of J. Dewey, J. Piaget, L. S. Vygotsky and others. The main aim is that children should reach a goal independently, by their own activity, with sensitive teacher facilitation. It does not prescribe a specific process sequence but understands the cooperation between children and the teacher as an opportunity for children to learn to think in an inquiry-based manner using different inquiry methods. It is essential to provide a suitable and well-equipped environment. According to Nezvalová [22], pupils (children) participate in classroom education and shape it. As Linn, Davis and Bell [10], Akcay [17] state, inquiry is a purposeful process of problem forming, critical experimentation, assessment of alternatives, planning, researching and verifying, drawing conclusions, seeking information, modelling studied processes, discussion, and formation of coherent arguments. Preschool children naturally aspire to learn about their surroundings [16]. Children encounter science and research in a pleasant environment, which develops in them a positive attitude towards these activities. Consequently, children understand phenomena and scientific concepts better and develop higher mental functions. Kindergarten inquiry-based activities are based on discovery, observation, research and manipulation of objects. By observing and manipulating objects, the child gains a stimulus for further experimentation and their own creative activity.

Current educational needs are addressed by programmes fostering literacy support in all areas of modern science and reflecting trends in educational policies in most countries, such as the STEM programme (Science, Technology, Engineering, and Mathematics). The teacher helps children to ask questions, make hypotheses, look for evidence and verify it, communicate with each other, draw conclusions based on evidence, and learn to defend the conclusions and use them as arguments. The teacher develops children's skills in communication, problem solving, data analysis, planning, evidence-based argumentation, creativity, and constructive and critical thinking. NSTA (National Science Teachers Association) research from 2014 shows that preschool children are capable of conceptual understanding in these disciplines. Learning is based on children's activities, interests, experiences, communication and cooperation [6].

Work with children's preconceptions

The teacher draws on children's personal experiences, modifies questions according to them and builds on initial preconceptions of children. By using their own experiences, thought processes and ideas, children concentrate better [1], discover new information themselves, contrast it with their understanding, and try to solve a possible contradiction. At the same time, the teacher seeks to shift children's preconceptions. Preconceptions are thus the basis for developing new and more complete ideas. They also function as a starting point for the provision of information necessary to plan the next steps [9]. The teacher builds on understanding to help children develop new conceptions, which makes the process easier [25].

Work with a child's portfolio

Independent organization of children's activities can also be achieved through working with a child's portfolio. A portfolio is understood to be a compilation of a child's products, documenting any time period of a child's work and mapping their personal development and procedures. For the child, the portfolio is a source of information necessary for the development of their self-reflection skills, a means to be able to review and evaluate their own work, an opportunity to monitor the manifestations of their interest retrospectively, elaborate on them, map their own findings and reflect on how they feel about them (cognitive and affective development). This leads to the development of skills crucial for self-direction of their own work and development (i. e., autonomous learning). The experience of personal success is involved (when reviewing the work results). A teacher-child collaboration on the reflection of the portfolio is an essential prerequisite for the effectiveness of this tool. The documentation can be in an electronic (photographs, recordings), oral and printed form [21].

Work with demonstration

Being based on the principle of illustration, demonstration is a source of information intended for further processing. It includes not only the demonstration of real phenomena and objects, but also scientifically accurate depictions of real objects and phenomena, as well as static and dynamic projections of pictures, photographs, graphs and audio recordings. A teacher can demonstrate an experiment that children only observe, but it is necessary for the teacher to direct the children's attention to the phenomenon under study.

Work with experiment

Children play the role of «scientists» in experimenting. The teacher prepares situations that enable children to take the initiative in experimenting and expressing hypotheses, observing, measuring, exploring, devising procedures, communicating opinions and expressing arguments to support or refute hypotheses. They analyse and synthesize the collected data, draw conclusions from observations, deduce, create possible models of objects and phenomena, and discuss them. Criteria of the experiment are a) to provoke interest by a question (a problem and the essence of the phenomenon), b) creation and verbalization of a hypothesis by children (it is possible to work with descriptive, predictive and causal hypotheses, which must be supported by experience, observation and other previous findings due to not fully-developed hypothetical thinking), c) verification of the hypothesis (by carrying out experimental verification, manipulation, preparation of other variables, and control testing), connected with observation and recordi making, d) verbalization of findings – confirmation or refutation of hypotheses by children. The unconditional principle of an experiment is that the nature of phenomena is revealed, discovered and explained by children themselves, who through their own activities and inferences, provided the conditions for a possible «AHA effect» are made, rebuild their existing child preconceptions.

Work with educational comics

Benefits of teaching through comics pointed out by researchers (e. g. [7; 15; 19; 23]) include support of visual literacy, motivation for children to read and express themselves, motivation for dyslectic students, and usability in foreign language teach-

ing and inquiry-based learning in history and science. The motivational function of comics in the development of multimodal literacy is confirmed (e. g. [24, p. 23]), and there are broad possibilities for the use of comics in science education (e. g. [19; 21; 23; 24]). Educational comics do not stagnate at the level of support of the transition from declarative knowledge to procedural knowledge, but endorse the multimodal involvement of all acquired knowledge in the construction of new knowledge. It activates multimodal thought processes, in which the percipient analyzes and synthesizes features as well as the whole tone of juxtaposed images, derives their chronology, engages their own experience, compares and converges existing and new information, critically evaluates it, assesses correlating possibilities, and creatively constructs new ones. In kindergartens, when educational comics are used, work with a story and story learning can be applied. Participents (children) can find themselves in the role of characters' friends and solve a problem together. Work with comics is based on cognitively formative teaching focused on a constructivist didactic approach (enabling the construction of concepts, [11]. Conceptualization, according to Bruner's theory of concepts, accelerates thinking, and the teacher contributes to it by their active intervention that facilitates understanding, i.e., the teacher presents ideas on a simple level, helps children to focus on key concepts and later returns to the ideas on a higher level [2].

1.2. Transfer of educational content

When examining the transfer of educational content, we try to clarify how teachers transfer the content of the curriculum (in this case a science curriculum) to children. Teachers build, to various degrees and quality, on children's previous experiences. In understanding the principles and determinants of transfer, an important influence is played by psychodidactic theories (theories of education); how one learns – how knowledge, skills and habits are acquired. Key components of the educational process are teaching objectives, content (subject matter), teacher-pupil interaction, teacher-selected strategies (methods, organizational forms, didactic means and specific procedures), conditions under which the educational process takes place, the teacher's overall teaching style, and their attitudes to and opinions on children's education and the transformation of educational content. The uniqueness of the teacher's personality implicitly determines the uniqueness of each teacher's teaching style. During their teaching practice, the teacher develops an unmistakable and typical teaching style, which always depends on the teacher's cognitive style (characteristic ways by which people perceive, remember information, think, solve problems and make decisions). The teacher's decision on the method of transfer and the choice of a didactic approach is influenced by their attitudes, beliefs and self-efficacy. The form of transfer and practices in science education applied by the teacher is influenced by different pedagogical theories and approaches in which the teacher prefers and believes, by their beliefs about a child's capabilities and abilities, by their opinion on the way a child learns, and by their empirical pedagogical experience and a correlating teaching approach and method. All of the following approaches can be found in the practice of science education in kindergartens.

A teacher focused on a goal-oriented curriculum

In didactics, a goal-oriented curriculum model is understood as a teacher's educational practice focused on performance. An example of such a passive teaching model, in which the teacher provides information and requires it back from children, is the concept of programmed teaching. The teacher follows a fixed plan, communicates information, assigns tasks, checks and compares children's performances, and rewards and punishes children. It draws on the cognitive concept of behaviourism, in which a person is defined on the basis of observable behaviours, and where the subject is subordinated to the stimuli of the external environment.

A teacher focused on a child-oriented curriculum

A child-oriented curriculum inclines towards a personal development model and strong individualization. It applies the principles of the creation of a positive socio-emotional climate in the classroom, non-directive teaching practices, an emphasis on the emotional aspect of child development and an inner individual motivation. The most important factor in didactics is individualization in teaching. Practices based on this concept are characterized by flexibility and ease with regard to the necessity of their fulfilment by all children, as well as with regard to the course and sequence of activities as they can be modified, can run parallel or sequentially, their order can be changed and some of them may not be required by the teacher. Authors of strong and valid ideas with regard to a child-oriented curriculum include Neill, Maslow and Montessori.

A teacher perceiving their role as a facilitator of children's knowledge

This refers to a teacher who is convinced that children learn most effectively when under conditions of non-directive guidance and gentle (yet strategic) support, i.e., facilitation. They believe that children obtain a new understanding of phenomena by their own discovery of the essence of the phenomena, which is based on constructivist theories. Regarding didactics, this involves the development of a child's conception of phenomena in teaching, social learning, the application of cooperative teaching models and significant curriculum changes. The fundamental premise is that knowledge cannot be acquired effectively by transmission; in other words, it cannot be gained in a simple way. On the contrary, knowledge is gradually constructed and transformed to a point defined as the elimination of cognitive conflict and the achievement of a balance in thought (von Glasersfeld, 1998). Constructivism postulates variable thinking, emphasizes the multiplicity of human knowledge in the cognition process, and views different preconceptions of each child, which the teacher is supposed to work with and build upon, as a basis for the process of concept construction, since they are the dominant characteristic of a learning subject [14]. The constructivist didactic approach aims at enabling children to construct concepts themselves [11].

Concepts enable thinking and communication. Children explore of what the studied concepts are comprised, how they can be identified and described, and what connects them, and thus they learn new concepts. Bruner [2] defines a concept as a set of identifying traits that form the core of the concept. He states that one learns the concept by recognizing the traits; the teacher actively intervenes by presenting ideas at simplified levels, helps children focus on key ideas and continues in the spiral,

proceeding to higher levels. Constructivism perceives the formation of knowledge as a necessarily active and dynamic process, where one's own mental and physical activities are needed to autonomously form a new idea by the processes of assimilation, accommodation, and a subsequent equilibrium and a new construction of concepts as described by Piaget [12]. The child must experience the delightful moment of their own «discovery» (of the essence of the concept or the problem). They must have the possibility to perceive the newly acquired knowledge as an idea (a construct) they have created themselves. On the basis of their previous experiences, they internalize the new knowledge and thus reshape their original inaccurate idea.

Such interiorization occurs mainly in social interaction – in a shared experience with other learners and the teacher. In practice, in a kindergarten, constructivism calls for a social dimension; teachers' practices are then characterized by the use of cooperative teaching, projects, group work, situation and problem-based teaching, etc. Teachers employ practical activities in the spirit of Dewey's activity teaching thought. The employed intellectual and practical activities can be comprised of different means of engagement, exploration, explanation (interpretation and discussion) and creative thinking activities connected with argumentation. Following the principle of interactivity, children find an explanation by inventing a completion, searching for details, discussing the issue in a group and using other sources of information (such as an experiment).

2. METHODOLOGY

This study adopts a qualitative research approach. To gain deep knowledge of the terrain, participant observation and correlating semi-structured interviews with observed teachers were employed. The data were collected by constant comparison, i.e., searching for common and different elements and common categories, and refining them by additional data. The research sample consists of four teachers, ages 24 to 61, working in four selected nursery schools. To comply with the requirement of anonymity, the teachers are labelled U1 − U4. Participants' qualifications meet Czech legislation. They have a pedagogical education, which two of them gained at secondary school, one in a bachelor's study programme and one in a master's study programme. The length of their teaching practice ranges from 1 to 39 years. The aim of the research is to find out what didactic procedures the kindergarten teachers choose for the development of children's knowledge of natural phenomena. It also aims to: 1. describe how teachers proceed in transferring the content of (science) topics to children, and 2. investigate the determinants of the didactic choice of a kindergarten teacher in the process of (science) education. The following research questions have been set: 1. How do the teachers systematize and organize science activities? 2. What methods and means do the teachers consider suitable for (scientific) cognition? 3. What conditions for children's learning do teachers consider key?

The data were interpreted in each individual phase of the research. Further processing of the data from both phases led to the creation of theoretical models of didactic procedures representing a typology of kindergarten teachers. Given the nature of the research, I have no ambition to generalize the results. The research will be followed up with further work.

3. RESULTS

3.1. Procedures observed in didactic situations

3.1.1. U1, female, 61 years old, education: secondary pedagogical school, 39-year-long teaching experience, heterogeneous class

The organizational forms of teaching used by U1 are frontal teaching, static demonstration (of bird images), work with visual material while children follow instructions, asking closed questions, motivation by reward and punishment (praise, reprimand and a child's exclusion from follow-up activities), compulsory art work, storytelling by the teacher, drama activities of children according to the teacher's instructions.

The teacher perceives children's suggestions and opinions as disruptive since they break the continuity of activities, information and lessons to be learned. She proceeds according to a set structure, outline and scheme; she does not deviate from them or modify them.

The transfer of science education content is based on explanation and nstructtion, imitation learning, verbalization, the attitude of the authority, and conditional learning. The teacher fulfils regulations and expects their fulfilment from children as well. The procedure is mechanized, children are used to it and the teacher does not change it.

3.1.2. U2, female, 26 years old, education: secondary pedagogical school, 7-year-long teaching experience, heterogeneous class

U2 applies frontal teaching, learning centre teaching, art work, familiarization with tasks, instruction, static image demonstration (of flowers), explanation, dialogue, presentation, declamation of words with a rhythm, singing and memory exercises.

The teacher follows the following steps: a task assignment, an explanation of the procedure and of what is required from children, a demonstration of the technique, a control of its implementation by children and a correction of children's work to direct them to the «right» procedure.

She communicates warmly and patiently, with a smile, repeats the instructions, and strives for a positive climate and a pleasant atmosphere. However, it is evident that she is saddened by the «unsuccessful» products of children who completed the task using their own method. U2 tries to do many activities and document the activity of children with their products. She motivates children by explanation and storytelling to make them recall symbols of spring. There are situations when children oppose her and she retreats. However, outcomes are expected from children (especially from those in the last year of pre-primary education, which is compulsory), the amount and type of activities are fixed, and children perceive order and do not protest. They are led to acquire a certain amount of knowledge and skills, and to maintain systematicity. Outside the main controlled activity, the teacher does not reorganize children's activities; on the contrary, children's activities and creativity are supported. The approach of U2 is of a humanistic personal kind, but with a clearly transmissive way of content transfer. In the case of 'the controlled activity', she considers her duty to systematically follow the sequence of steps, which should lead children to reach the set objectives.

3.1.3. U3, female, 24 years old, education: master's degree in pre-school pedagogy, 1-year-long teaching experience, heterogeneous class

U3 employs learning centres, excursions and inquiry-based learning using the methods of a dialogue, storytelling (building on previous children's experiences), asking divergent questions, discussion, children's work with visual material (content of the concept, development over time), manipulation of real material and movement games to relax children. She also works with children's preconceptions and applies experiments (observation, manipulation, discussion, brainstorming, deduction by children), pedagogical improvisations, free choice of activities by children and group work. She motivates children to explore and discuss, works with children's hypotheses, leads children to make arguments, and strives for children's independent understanding. She proceeds in accordance with constructivist ideas and according to the principles of IBSE (inquiry-based science education). She thinks through strategies, chooses goals, methods and means, evaluates their effectiveness, adopts an interaction dialogue and modifies the procedure according to current specifics of the group of children. For content transfer, U3 uses heuristic strategies, does not stick to precise rules, and looks for different options and creative solutions. She takes into account children's views and wishes and includes them in her plans of activities and procedures. It is evident that her own pedagogical efficiency is increased by her natural emotional engagement, which increases children's motivation.

3.1.4. U4, female, 48 years old, a student of the university programme in pre-school pedagogy, 5-year-long teaching practice, heterogeneous class

The organization forms used by U4 include group teaching, learning centres and excursions. She applies methods of individual dialogues with children, work in learning centres, movement games including musical ones (dance and singing), dining (as an opportunity for targeted learning about the composition and origin of food, measures and weights), practical manipulation activities with observation, experiments and practical activities in the school garden. When solving problems, she adopts the principles of effective pedagogical communication (such as eye contact at the child's level, listening, expressing understanding, providing space for a child's own solution and need for personal peace, interest in the child's experience). U4 reflects on children's experiences, decodes them and reacts in such a way as to create a favourable atmosphere. She seems to consider emotional experience and the strengthening of children's self-confidence, self-perception and self-assertion more important than a systematic work on the cognitive component of personality. She authentically expresses her own emotions and spontaneously materializes ideas. Her didactic approach may appear unsystematic and random at times, but some of her intentions are transposed into another activity, which is a positive pedagogical adaptation to a particular situation. U4 turns the roles of the «unknowing child», the one who asks questions, and the «omniscient teacher», the one who explains; she herself asks questions of the type «And why?» in a dialogue with a child. She uses real things, authentic situations and IT aids in class.

3.2. Interpretation of data from the interviews with the teachers

The teachers' statements from interviews were coded, which gave rise to a categorization based on the teachers' approaches to the transfer of the science education content, their beliefs about the key elements in the educational process, and their opinions on the fundamental determinants of the science educational process. Four didactic procedures were distinguished after further processing of the data: performing the plan, systematic, improvisationally creative and strategically open.

3.2.1. U1 – Performing the plan procedure

U1's approach to the transfer of educational content can be characterized by the following categories: well-being (of children), thoughtfulness (among children), rules (adherence, obedience, respect for the teacher), respect (for an individual's interest), enjoyment, experience, consideration for nature (not to destroy it), knowledge (including knowledge of concepts and names) and the physical. U1 attempts to apply mainly a personality developmental approach. Due to her many-year teaching experience she realizes that children learn best through activities that engage multiple senses and are fully motivated by practical activities and observation of natural events. She includes biological conditions into general conditions that make learning ffecttive. However, her declared views do not adequately correspond to the observed didactic procedures, which incline to transmissivity, often with behaviourally oriented methods. U1 considers it necessary not to deviate from prepared activities so that the planned objectives are not jeopardized. Children should accomplish tasks that she has prepared based on her knowledge and experience and based on what is necessary for admission to primary school education.

3.2.2. U2 – Systematic procedure

U2 builds on careful preparation, detailed systematic planning, a large number of stimuli and means, and verifiable progress in children's knowledge, and demands performance from children. The categories representing U2's beliefs about the key determinants in the process of educational content transfer include well-being, experience, incentive environment, heterogeneity, readiness for school, care for nature and knowledge. U2 strongly focuses on preparing children for primary school education and providing them with knowledge required from children when leaving kindergarten. She prepares a number of tasks, which children can choose from, yet, it is obligatory for children to complete the selected task. The teacher herself prepares for lessons systematically; proceeds according to topics agreed upon at the pedagogical meeting at the beginning of the school year and adjusts them only sporadically. The topic plays a key role in decision making in her didactic procedure. She states that the most effective topics include practical ones, such as animals and the human body. She strives for the maximum clarity and diversity of methods, techniques and didactic means to explain the content of concepts. She considers it essential to make children acquire a lot of knowledge that will serve as a basis in their further education (especially the knowledge of names of natural phenomena). She believes in the benefit of age-heterogeneous groups while using adjusted tasks for internally differentiated age groups. Her main aim is that children will acquire the basic knowledge of the surrounding natural world and will perceive nature as a necessary part of human life.

However, it is questionable whether U2's teaching of nomenclature leads to the formation of such a relationship between the child and the surrounding natural world.

3.2.3. U3 – Strategically open procedure

U3 considers the most important determinants of an effective transfer of educational content as the following: prepared environment (availability of stimulating, material equipment), authenticity (of materials), adaptation to a group (the teacher adjusts goals), cooperation (among teachers, between parents and the teacher, among children, and between children and the teacher), heterogeneity, communication, self-concept (give the child time and space), experience and support. She carefully thinks through strategies, chooses goals, methods and means, evaluates their effectiveness and adjusts them, adopts an interactive dialogue, and includes needs, experiences and opinions of a particular group and individuals. She encourages children's personal activities and realizes that children themselves attempt to influence their own interests, activities and learning. She does not adhere uncompromisingly to her planned methods, but seeks other options and creative solutions. She considers contact with reality the key factor. She supports children's thinking and communication by placing an emphasis on face-to-face communication with parents (both between children and parents and among the teacher, children and parents), and by spreading information about school activities through social networks, notice boards, emails and children's portfolios. Her declared ideas are fully reflected in her work. She is open to new ideas, purposefully applies heuristic methods, reflects on her activities, and gives children an opportunity to influence their activities and the circumstances that affect them.

3.2.4. U4 – Improvisationally creative procedure

The representative of this approach emphasizes the following: well-being, prepared environment, contact, tolerance, experience, and communication. U4 primarily aims to develop children's communication, come to a close understanding of each child and their family, and adapt to the child's needs. She attempts to encourage children's interests in science activities through a joyful experience. In order to understand the child's interest and current mindset, she communicates with parents and builds a close relationship with the child. She is convinced that the teacher should be the child's confidant and friend, and finds a tactile contact useful. She believes that the most important element is a creation of a positive climate by the teacher. She states that science education is most effective under these conditions. She plans activities according to children's suggestions, their current and long-term interests, and her knowledge of children's personalities. Children intervene in the creation of educational content. The teacher also takes into account current social and natural events, and builds on authentic situations. She perceives children as strong individuals, whom she cooperates with. She states that her choices of the content and course of science activities are shaped by the following goals: to provide children with sufficient time and support from the teacher and other children, to implement activities that children find meaningful, to give children a choice, to cooperate and to alternate activities with movement.

3.3. Typology of teachers based on their didactic procedure

The evaluation of the data gathered by observation, their comparison with the data obtained from interviews, and the assessment of their correspondence led to the formation of four models of didactic procedures of the participating kindergarten teachers. They represent four different types of teacher work. The typology of teachers is derived from the data according to the style of their work, which is characterized as follows:

3.3.1. I do not disturb the well-established practice – a teacher focused on a goal-oriented curriculum

The teacher adheres to standards and set procedures, applies proven established methodology, adopts moralization, and demands order, concentration and performance from children.

The teacher proceeds in the following way: **motivation by the teacher's activity** (storytelling, art work, demonstration and setting an example) − **provision of information** (explanation, work with pictures, information supplied by the teacher) − **work with information** (asking questions, a task to process information, information processed by the child) − **reward and relaxation** (physical activity, art activity, another activity, child's reward).

The educational process is characterized by well-established procedures, with the teacher not deviating from the prepared plan and not interrupting the routine. The teacher adheres to class and school educational programmes and makes weekly preparations complemented with worksheets. The transfer method is transmissive with an inclination to the target/performance-oriented curriculum. The teacher rewards and punishes children (for example, by a lack of interest); employs controlled activity within which she motivates children by the demonstration of visual material, encourages them to visual activity, presents information by explanation, attempts to establish a sensitive relationship to nature by explanation, and implicitly draws on children's opinions and preconceptions (asking questions of the type «What would happen...?"»), which though have only one «right» answer while disruptive manifestations of children's interests are suppressed. A certain manipulation of children's feelings and a slight fabrication of scientific facts were revealed. Subsequently, the child is rewarded for completing the activity by permission to leave it (go to the toilet and start a planned physical activity).

The work with information is finished exactly at the given time following the teacher's authorization. In communication, the teacher often uses positive expressions (diminutives of words) and positive praise («excellent», «great», «amazing») to create a pleasant atmosphere. Emphasis is placed on adherence to rules, yet, the approach does not evoke in children a significant enough need to be more considerate in the group. The teacher focuses on the development of children's sensitive thinking about nature (specifically about birds), but despite the teacher's verbally strong emotional guidance, children's interest in the issue is not significantly provoked. The teacher also places an emphasis on systematicity of activities and their succession, which mostly leads to children's obedience, but not their own activity and creative

autonomy. The teacher uses many unscrupulous instructions, sanctions and motivations to perform.

3.3.2. I will equip the child with knowledge – a teacher focused on a goal-oriented curriculum

The teacher assigns and controls many tasks, carefully plans, prepares activities in detail, adheres to documents and plans, and demands knowledge and performance from children. She proceeds as follows: **the teacher's instructions** (assignment of a task with a set procedure, provision of learning materials) − **gathering of information** (using models, visual demonstration, explanation, listening and repetition, tasks in a group) − **practice** (reinforcement of the gathered information by art and manual activities, poems, songs, practising numbers, completing right answers and doing tasks with one correct solution) − **knowing beings** (child's description, recitation and presentation of the remembered information). Characteristic features of this didactic procedure include careful preparation and work according to the school's as well as the teacher's own detailed plans. The teacher knows well and aims at the expected outcomes set in the Czech Framework Educational Programme, creates a rich stack of self-made aids, such as visualized poetic texts, graphical representations of phenomena (e. g., of growth from a seed), worksheets, pictures and photographs of natural phenomena, and topics and links stored in social networks, where she is a member of a group comprised of teachers and creatively oriented people. This didactic procedure model is characterized by the assignment of a number of tasks leading to children's acquisition of the content of scientific knowledge, and by checking children's knowledge, using a gentle tone of speech. Other typical features include the attempt to equip the child with knowledge and skills supposedly necessary for admission to primary school and testing such knowledge and skills. In practice, the teacher inclines to a target-oriented curriculum. Although she attempts to focus on the child and partial characteristics of child-oriented curriculum appear in her teaching, her procedure is rather transmissive.

3.3.3. Let us try it – a teacher as a facilitator of children's knowledge

The teacher observes children's self-expressions to learn about their interests and potentials, and prepares an environment which enables children to develop them. She plans and thinks through activities, yet, at the same time, adjusts them in cooperation with children and alters them according to children's activities and levels of understanding. She grants children the right to partner problem-solving and leads them to cooperation.

Her didactic procedure consists of the following steps: **experience** (surprise, an activity, materials, an excursion, a walk) − **problem** (questions, work with questions, work with material, work with a picture, a problem-solving task) -− **cooperation** (brainstorming, suggestions of solutions, discussion, project, work with materials, pictures and technical means, experiment, fulfilment of the task using one's own method) − **new scientific knowledge** (supporting children to formulate concepts and relationships among them themselves, pedagogical improvisation, description, application and verification of experience, graphic design, cooperation among teachers) − **new interest** (children's presentations of their own work, application of their experi-

ences to formulate new interests, brainstorming, preparation of a new project, experiment and observation).

Unlike others, this model has a progressively increasing tendency. She starts from the children themselves. She plans activities strategically from the point of view of a teacher as a facilitator. It is evident that the teacher understands the background of learning and is familiar with various theories aimed at developing communication, divergent thinking and causal thinking. She works in accordance with constructivist ideas and follows the principles of IBSE, working with children's preconceptions. She makes children learn from their experiences. Communication is conceived as a partnership dialogue; the teacher directs children but does not test them. She effectively makes use of the current situation, adjusts operatively the educational content (improvises pedagogically) based on children's suggestions, and guides children.

3.3.4. I will prepare well-being – a teacher preferring a child-oriented curriculum

The teacher offers children a wide range of opportunities to find out their interests, which she supports and develops. She focuses on joyful experiences of children and gives children the right to influence the course of the educational process.

The teacher proceeds according to the following path: **preparation by the teacher** (prepared environment, surprise, close contact, dialogues) – **child's well-being** (discussion, children's suggestions, experiential learning, sensory cognition, effective communication, analysis, comparison) – **coincidence** (use of real, newly created and random situations, solution of problems by children, asking questions) – **strong personality** (independent decisions by children, reflection).

The procedure is characterized by a lesser degree of strategic planning but is certainly not unprepared. A typical feature is that the teacher relies heavily on her own intuition, empathy and creative improvisation. However, she does not work without objectives, but admits the possibility of their modification when it is justified by the current situation, which is naturally followed by an adjustment of ways that leads to the objectives. The composition of activities is fluid, following children's interests and adapted primarily to their feelings. Personal well-being plays an important role, and the teacher changes or even abandons her original intention in order to ensure children's well-being. She focuses on a wider cross-cutting involvement of scientific experience, which, although not systematically applied in chronological order of the topics planned to be «covered» by a teacher, can freely intertwine with regard to topic and time and, at the same time, be multimodally applicable. Children draw on different kinds of experiences: sensory, information-based, jointly discussed, past and present, and experiences that concurrently touch the foundations of several science fields. The teacher's work reflects her interiorization of the ideas of a humanistic personal approach. She is clearly influenced by a constructivist approach to education and aims at the role of a teacher as a facilitator of children's knowledge. Through exploration of artefacts, manipulation and implemention of their own ideas, children themselves form a concept of the given term. The teacher gently facilitates them to guide the direction of their work.

4. CONCLUSION

The participant observation revealed that the teachers adopt different didactic procedures, in which a different type of content transfer method and a different sequence of partial procedures are used. The interviews with teachers uncovered the teachers' views on subjectively perceived optimal practices in (science) education. Their opinions influence the choices of their procedures and are reflected in the following categorization: performing the plan procedure, systematic procedure, strategically open procedure and improvisationally creative procedure. After the data were processed, a typology of teachers based on their didactic procedures was created:

1. *I do not disturb the well-established practice*: the method of content transfer is strongly transmissive; the teacher is oriented on the goals and children's performances and adheres to plans and proven methodologies. Children are required to fulfil given tasks. 2. *I will equip the child with knowledge*: the method of content transfer is transmissive, goal-oriented and performance-oriented, but also with a tendency to incline towards a child-oriented curriculum. 3. *Let us try it*: the method of content transfer is constructivist. The teacher consciously builds on the idea of a teacher as a children's facilitator and potentially inclines towards the student agency perspective. 4. *I will prepare a well-being*: the method of content transfer applies constructivist partial procedures and is child-oriented.

The connecting element of all the types of didactic procedures is the effort to create a pleasant climate that creates favourable conditions for learning and acquiring (science) knowledge. This is not always effectively achieved. Some communication techniques and directive methods applied in controlled activities tend to hinder the development of children's well-being. Another unifying feature is the effort to make children learn by experience. However, the term «experience» is perceived differently in the four approaches, and the experience necessary for (scientific) cognition is implemented with full understanding only in two cases. All the teachers significantly build on communication, which is natural and inherent in all the areas of pre-school education. The way teachers work with communication and how actively they develop it in children are among key determinants of (science) knowledge development. Teachers who attempt to develop children's communication skills by asking questions that check their knowledge may, on the contrary, achieve stagnation of children's activities and even pose a danger of inhibiting children's scientific thinking in the future. Teachers work with heterogeneity in different ways. The teachers applying a strategically open and an improvisationally creative procedure prefer cooperation on activities open to all age groups, when children divide the work among themselves based on their interest in the type of activity. The teacher adopting a systematic procedure differentiates a heterogeneous class into small homogeneous age groups in controlled activities, while the teacher employing a performing the plan procedure does not use group work, adopts mainly frontal teaching and assigns tasks to individuals according to their age. Children in the last year of pre-school education (which is compulsory in the Czech Republic) have to complete a higher number of compulsory tasks. The teachers adopting a systematic procedure and a performing the plan procedure do not use modern methods and do not seem to have a deeper understanding of a particular theory of child learning. The other two teachers consciously try to cultivate

children's thinking in constructivist ways, with one of them being strongly influenced by the personality-developing approach. In these two cases, children's learning takes place at a social game level and is based on children's daily experiences and interests, which the teachers draw on to create science experience for children. The two teachers adapt educational support to children's possibilities and needs. This stems from their skills to better perceive the potential of everyday situations for (scientific) cognition and development of scientific thinking, to provide adequate support to children, and to better understand psycho-didactic findings and recommendations; and last but not least, it is a result of their personal beliefs that determine their choice of procedures, methods and techniques. These two teachers have higher qualifications in pre-primary education than the other two.

U1 perceives herself as a guardian of the child (her ward), who she is supposed to primarily take care of and carefully protect, and for whom she should create a cosy environment and order. U2 aims to prepare as many incentives as possible for children so that they become «a better version of themselves» and successful schoolchildren, while ensuring a child-friendly environment. U3 has a good knowledge of developmental psychology and learning theories, believes in the ideas of constructivist education and tries to cultivate children's thinking. U4 focuses on the beauty of the children's soul, and, by using a child-oriented approach, aims to enable children to fully develop their personality. At the same time, she is influenced by constructivist ideas, which she tries to incorporate and thus increase the development of children's personalities.

The teachers' knowledge of (science) content as well as their pedagogical skills and abilities given by their knowledge of psychodidactics and influenced by their beliefs determine their choices of didactic procedures and are prerequisites for the successful development of children's thinking. The research reveals (similarly [1; 5; 18; 20] etc.) that the teacher's didactic procedure and its effectiveness are determined by both practical experience and their didactic, psychodidactic and natural science knowledge. A teacher with more knowledge is more skilful in using different methods and procedures to increase the effectiveness of their work, as also shown by studies on preschool teachers' skills and competences (e. g. [8] etc.), sees problems in a broader context, and more easily considers the benefits for children and includes children's real needs.

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