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Teaching Approaches in Preschool Education: A Research Synthesis Paper

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Abstract: In preschool education, teachers will use some scattered and basic teaching approaches to help children broaden their sensory boundaries and collect information to support the teaching in science education. Children's understanding of scientific concepts needs to be complemented by richer teaching approaches, such as imagination and drama; Or a more complete teaching mode or teaching stage. Teaching moment and teaching forms also affect children's understanding of scientific concepts, but so far the researches has not been thoroughly discussed. Different teaching moments in the teaching process will produce different effects. Providing scientific concepts or detailed explanations at appropriate moment will facilitate understanding of the concepts. In terms of forms, discourse and body language fuse together to facilitate children's understanding of scientific concepts.

Keywords: teaching approach, scientific concepts, teaching moment

1. Introduction

Science education is one of the important contents in preschool education. More and more countries attach importance to science education. In China, the government has also taken some measures in recent years to ensure the quality of preschool science education. Such as improving the scientific literacy of preschool teachers.

In preschool, children's desire to explore the world becomes a prerequisite and proclivity for their scientific journey [1]. So in preschool education, teachers can easily attract children's attention to carry out teaching. Children's primitive attention and interest can not play a role continuously, which needs correct guidance to carry out orderly teaching. Also, teachers need maintain attention of children and help children to develop disposition of science [2]. On the other hand, although science is closely related to the world in which children live, scientific knowledge and scientific concepts are formed by refining the world of direct activities. Therefore, when it comes to choosing scientific phenomena for children, it's usually those that are direct and accessible [1]. For children, building a bridge from the world of direct activity, with personal understanding, to the world of science is what preschool science teaching should be about. But it also poses difficult questions for teachers. How to make the transition? In other words, how do teachers teach in preschool? Especially when it comes to understanding scientific concepts. Science is an evolving practice [3]. It is a long process for children to learn and understand scientific concepts, only through continuous experience can children become more and more clear about the scientific concepts they have learned. And if children start on the wrong path in understanding scientific concepts at the beginning, then it's very difficult for

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subsequent teaching. Teachers have to correct these misconceptions [4]. Just like when we want to draw a realistic painting, we may only be able to draw a general outline at the beginning, but as we learn cognitive methods and higher sensitivity, we will draw more and more realistic, close to the original appearance of things. However, if we get the first brush in the wrong place, it takes a lot of effort to correct it later in the course.

In addition to children's different interpretations of scientific concepts at different stages of development, children's personal experiences can also lead to different understandings of scientific concepts when they start to understand them, especially in cultural-historical concept [5]. If teachers want to make the transition from the world of children's immediate experience, It is important for teachers to find the appropriate approaches. Because these approaches need to be appropriate for each child's understanding of scientific concepts.

In preschool science education, teachers need to maintain children's attention, arouse their curiosity about science, while also helping them accurately understand scientific concepts. Pedagogical approaches obviously play a very important role.

This study focus on how teachers use teaching approaches combining discourse and body language to help children comprehend scientific concepts, whether these approaches have certain characteristics, and which moments are usually chosen by teachers to give detailed explanations of scientific phenomena. The study also hopes to provide teachers with some new teaching ideas.

2. Methodology

The search was conducted between 2010 to 2018. Due to Since still lack teaching approaches in preschool science education and the characteristics of teaching approaches are not limited by time, the second round of search was between 2005 to 2022. The key words used for literature review are "teaching approach", "preschool science", "discourse", "body language", "science concept", "teacher role" and "teaching moment." The study was initially planned to take the appropriate moment in teaching as a main part of this research, then adjusted it because existing researches have few related description about it. Search finished based on four databases include EMBASE, PUbMed, Springer and ProQuest. The first round of search yielded 806 records for screening. After rough reading the titles, abstracts and some main parts of passage, eliminate those repeated in the different databases, 97 articles were saved. The teaching process in the selected articles must take place in the preschool science field, and the teacher must use at least one or more teaching approaches. In addition, it is desirable to have content or dialogue that specifically describes the teaching process to provide direct information about the teaching moment, the role of the teacher and the medium. According to these standards, 22 articles in total were selected after carefully reading the abstracts and conclusions, they were left among the 97 articles. The 22 articles were then classified into different sections: "Teacher's role and competence", "Pedagogical approach in preschool science education", "Appropriate moment" and "Medium and form". Some articles are repeated in different sections. Then highlight important paragraphs, sentences, and phrases in these articles.

3. Teacher's Role and Competence

Teachers are becoming more and more capable, and they are taking on more and more complex roles in the teaching of preschool science. In recent years, with the attention to the education level of preschool education teachers, the education level of preschool education teachers has been improved. This ensures the quality of teachers to a certain extent. At this stage, the main task of teachers is unidirectional teaching, rather than child-centered [6]. However, some studies show that even if the education level of preschool teachers is improved, it is not enough to further improve the quality of classrooms. [7] On the one hand, it requires the development of a wider range of professional

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activities during training, and on the other hand, it indicates that teachers need to have higher abilities in actual teaching and familiarity about science topic. [8] According to the research of Tsung-Hui Tu and Wei Ying Hsiao [9], the role of teachers is more of a learner and researcher, developing different types of interaction. Teachers show more initiative in teaching. They are more confident that science concepts can be interpreted to children through teaching. This initiative role and positive attitude gradually manifested in teaching helps them to explore new pedagogical approaches. At the same time, they not only adjust their discourse and body language, but also pay attention to the teaching environment and available materials [10]. Combining these environments and materials can help them think out and enrich pedagogical approaches [11]. This gives the premise that the pedagogical approaches they use are complicated.

4. Pedagogical Approach in Preschool Science Education

The difficulty of teaching science knowledge in the preschool education is that how to use the pedagogical approach to transform the everyday experience that contains scientific knowledge into abstract scientific concepts for the preparation of subsequent science teaching. In this process, the pedagogical approach used by teachers become the springboard and bridge to achieve this step. In the early studies, scholars focused on the teaching model. Within this relatively fixed teaching framework, carefully structured activities helped to increase student initiative [12].

Siry mentioned in her research that science is an evolving, emerging practice [13]. Evolving science requires us to adopt a more inclusive or broader approach to teaching. Before studying this kind of pedagogical approach, it already existed and got certain development. Areljung ‘s research shows that teachers’ verbal moves between femininity and masculinity, which helps the practical development of preschool science education [14]. Among them, Experiment, observation, and drama are skillfully applied as the means often adopted by teachers [15]. Both because their apparent nature is consistent with science education, and the use of those approaches has been among the leading uses in education. Teachers themselves also influence the choice of pedagogical approach. Teachers prefer to use familiar and easy activities and pedagogical approaches, because they can pay attention to children’s problems without worrying about their own operations or whether they will deviate from the original plan while not feeling anxious. Similarly, such selective “elaborately-choosing” is not suitable for creative, quizzical individuals can limit the development of scientific skills in children and miss out on more educational opportunities [15].

Another path is to explore a broader model of teaching, or creating an “artificial” natural development environment that creates science worlds based on children’s imaginations [16]. This teaching mode does not strictly belong to the pedagogical approach, but to create a more suitable environment for the implementation of pedagogical approach and scientific practice. Children use their imagination and curiosity about a specific area of the world -- science -- as motivation to continue learning experiences and develop concepts. Creating an environment that makes a difference to the individual learner requires sustained effective teaching practice.

Countries with different cultural backgrounds use different pedagogical approach. For example, one study compared classrooms in Norway with those in China [17]. The study found that in Norwegian preschool science classrooms, teachers prefer to use an open-frame teaching model to provide an educational learning environment for children. The teacher’s subsequent teaching follows the child’s curiosity. China’s preschool science classrooms tend to be programmed, and children have few opportunities to take initiative. Constructivism holds that meaning is created and constructed by learners themselves [18]. This coincides with the scientific process in preschool education. Under Constructivism’s idea, preschool science practice has developed a new teaching pattern -- 5E. 5E includes five phrases -- engage, explore, explain, elaborate, and evaluate. Through these five phrases to help children construct scientific concepts, actively construct their own knowledge and

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understanding [18]. Some researchers have classified specific pedagogical approach. For example, Paraskevi et al. divide pedagogical approach into experimental approach and contemporary approach [19]. Experimental approach tend to be based on the demonstration of the teacher, the teacher then transfer knowledge to explain the results of the demonstration; contemporary approach are based on children's predictions, using materials and appropriate equipment to help test their predictions. Martin et al. classify process-oriented approach [20]. There are observing, classifying, communicating, measuring, predicting and inferring. And more high level skills, integrated process includes identifying and controlling the variables, and formulating and testing hypotheses, and interpreting the data, defining operationally, Experimenting, Constructing models.

Teachers use these teaching approaches to achieve different purposes. For example, experiment, search for difference, perception and operation tend to achieve the objective purpose of perception of scientific things, drama and imagination tend to achieve the subjective purpose of understanding things; In the way of explaining things, teachers tend to cultivate logical thinking through theory and practice, and scientific intuition through communication and intuition [14]. Helping children use and understand scientific concepts through joint activities [10]. Of course, teaching methods will also have an impact on students' emotional experience. As for the observation method and investigation method, teachers can use them to enhance their confidence and find the answer by themselves [21].

4.1. Medium and Form of Pedagogical Approach

The medium of pedagogical approach is usually discourse, body language or others. Different combinations of speech and movement form different pedagogical approaches. Teachers using appropriate language can help children go beyond their daily experience and acquire new scientific concepts [22]. However, few researchers take discourse and body language as the criterion of dividing pedagogical approaches, because discourse and body language are so common in the teaching process, discourse and body language also become the clues hidden in other criterion of pedagogical approaches by researchers. At the same time, they also express the emotional attitude tendency accompanying the teaching process, such as praise, doubt, etc., which is not a special teaching pattern or teaching approach, because it is too common in the process. But they are indispensable. They can exist anywhere in the teaching, at any time, and get different results. Compared with oral language and communication, there is not much researches on body language in preschool science teaching. The study of body language mainly focuses on physical area and language teaching [23]. For example, in the study of Mavilidi et al. , children's learning of foreign language vocabulary was influenced by the cognitive effects of gestural practice of words [24]. It has a positive effect. This indicates that the correct use of body language can help to carry out teaching process well.

Scientific arrangement of speech and body language becomes a pedagogical approach, such as drama and responsive teaching [25]. Similarly, Soo-Young Hong, Karen E. Diamond clarifies two pedagogical approach: RT (Responsive Teaching) and RT-EI (Explicit Instruction). Teachers use RT to directly introduce and respond to scientific concepts, and on this basis, RT-EI be used in the implicit teaching process, which requires more coordination of discourse and body language. But different language in teaching does affect children's understanding of scientific concepts. For instance, Areljung's research shows that the use of verbs in preschool science education encourages children to use their bodies to make subsequent activities happen [26].

4.2. A Fusion of Discourse and Body Language in Teaching

According to the actual teaching process, discourse and body language should not be separated. But in mainly research, researchers tend to discuss them separately. But some studies have focused on

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discourse as well as body language, because it may represent interactions between teachers and children. They found that they use appropriate discourse in different functions can help children into the science learning process quickly and in the right mood [27]. The limitation of these studies is that they include body language under dialogue, so the analysis still fails to reflect the interaction between discourse and body language to some extent.

5. Appropriate Moment in Teaching

The right teaching time is also very important. In preschool science teaching, some teachers will ignore this detail, thus affecting the effect of teachers' teaching methods. Studies have shown that teachers are not aware of the ubiquitous plants available in the environment, and rarely discuss these things with children that can develop instructional conversations. Teachers do not provide enough science activities and miss out on teaching opportunities that could be used [10]. Although there are not many studies focusing on teaching timing, teaching timing is inevitably mentioned when explaining teaching methods. Andersson and Gullberg, for example, studied the ability of preschool teachers to conduct science activities in the classroom [28]. They found that when children make conclusions in science situations, they need to be followed up by the teacher to follow up the conclusions. Otherwise, students may misunderstand science concepts. In the other group, the teacher set up a situation where something heavy and light was floating. When presented with a situation contrary to the child's expectation that "heavy objects must sink and light objects must float". The wonder piqued the child's interest. Teachers also find this to be a good starting point for teaching concepts. Teachers tend to choose when children are curious and interested to carry out teaching. For some teaching approaches, their "choice" of timing is also more strict. For example, before using approach about inferring, the child should actively ask why the scientific phenomenon is happening. Teachers need to encourage children to draw inferences from evidence whenever possible. Then the teacher will explain the scientific phenomenon in detail [20].

6. Conclusion and Discussion

It is found that in current preschool science education, teachers usually use active teaching approach to help children understand scientific concepts, such as Experiment and observation. These approaches help children use their senses as much as possible to gather information from the outside world of science. We still need children to make the connection after we have gathered enough information. Therefore, in the actual teaching, most teachers will create an "artificial" environment to achieve this step [16]. In this environment, teachers help children achieve the purpose of understanding scientific concepts and things through drama and imagination [14]. In some cases, teachers will also use the programmed teaching model to define their own teaching stages, so as to help children understand scientific concepts. Different combinations of text and body language form different teaching approaches. In preschool science education, there are not many studies that only study discourse or body language. But they do affect children's understanding of scientific concepts. Teachers who use verbs to encourage children to use their bodies to carry out follow-up activities can help children participate in teaching [24]. Different cultural background and teachers' own level and status will also affect the practical application of teaching methods. If teachers are more familiar with scientific concepts, they will develop different types of interactions and teaching approaches with children [9] [11]. Teachers are more like an integrated role, who should take the environment, teaching materials, content, children and themselves into consideration in the teaching process. Develop an effective teaching process to help children understand scientific concepts. Instructional moments are also referenced. The best time to start teaching is when children are curious, surprised

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and confused about something scientific. In teaching, teachers pay special attention to “the moment of children’s conclusions” and “the moment of inference” [20, 28].

This research mainly reviews the literature related to teaching approaches in preschool science. Compared with previous research, this research also paid attention to “teaching moment” and “form of teaching approach”. In present, there are not many studies on these two parts. Although “teaching moment” and “form of teaching approach” are not individually described in detail in main research, they are unavoidable contents that need to be explained in their research. In the appropriate teaching moment, the development of a variety of teaching approaches are conducive to preschool children’s understanding of scientific concepts. In the teaching approach discussed in this research, although a lot of research has yet to the conversation and body language in the form of spun off from the teaching methods, the research also should further analysis of these teaching approaches classification, the role of body language and discourse in the approaches, but this research did not reflect this, failed to in-depth analysis.

This study aims to classify and analyze the teaching approach used in the previous research on preschool science education. Especially when teachers explain scientific concepts, what are the characteristics of effective teaching approach? How discourse and body language should be properly integrated and at what time should appropriate teaching moment appear. The organizing and analysis of these contents can help teachers to rationally choose teaching approach in practical application and find the appropriate moment to help children understand scientific concepts. Although this study focuses on the teaching moment, few studies focus on the teaching moment in the whole teaching process, and there are many contents about the beginning of teaching. In the process, when do teachers confirm whether children understand the concept? At what point do teachers need to let children’s imaginations run wild? None of these questions has a definite answer yet. It need to be further discussed.

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