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Developmental Changes in Epistemological Beliefs in 9-Year-Old children

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Abstract

Purpose: Epistemological beliefs mean what people believe about the nature of knowledge and knowing that can be related to areas such as learning and theory of mind. The purpose of the present study was to investigate the growth of epistemological beliefs in 9-year-old girl children.

Methodology: This was a qualitative grounded theory study. The study population consisted of elementary third grade girl students in Babolsar city in 2018 and 2019. A sample of 20 students through purposeful sampling method with Theoretical saturation was selected and the epistemological beliefs of these participants were examined in two stages over a period of one year. The research tool was in-depth interviews with emphasis on "draw, write, tell" technique which was used in both stages. Coding was also used to analyze the data. The validity of the findings was evaluated by triangulation method including expert review, continuous comparison of data and different methods of data collection.

Findings: The epistemological beliefs of children emerged in five dimensions, including Ownership, Innateness, Exactness, simplicity and pace. Each of these dimensions was relatively complex, and developed over a period of one year, especially in dimension of ownership.

Conclusion: Based on the findings, it can be said that the development of girl children's epistemological beliefs towards more complex beliefs can occur if necessary conditions are in instructional Environments. Therefore, it is suggested that providing children with appropriate learning environments such as constructive learning environments and opportunities to reinforce the power of reasoning and argumentation.

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1. Introduction

Elementary school children see the mind as an active and constructive factor that selects and transforms information. They are particularly aware of the process of thinking and psychological reflection on performance, especially at the age of 9 entering middle school (Mohseni, 2014). Their children's awareness of the sources of knowledge and the process of knowing also increases; so that they can expand their knowledge not only by observing events directly and by talking to others but also by subjective inferences. This mentality can lead to beliefs about knowledge and knowing which are called epistemological beliefs. Epistemology is a phenomenon that asks how knowledge is acquired, how much can be known, its theories what it is and how it can be made. Epistemological beliefs are how individuals acquire their knowledge of the outside world and on what basis they must trust it, in other words, how people know something and what they believe about. They know that there are cases in the field of epistemological beliefs. That is, what do people believe about the nature of knowledge and knowing. For example, do they see knowledge as definitive, unchangeable, or fixed, or do they believe that knowledge is not constant and permanent, but can change over time or depending on circumstances, and in fact, relative knowledge? And it is experimental and based on evidence and evidence (Brownlee, 2015). The relationship between people's epistemological beliefs with areas such as learning, emotions, and motivation has been confirmed by research; so far, it seems that the type of people's epistemological beliefs can influence in their learning, attitudes. It has a great impact on their knowledge and process and their motivation to understand and acquire knowledge. In addition, epistemological beliefs are related to other areas such as conceptual change, self-regulated learning, theory of mind, and the nature of science (Feucht, 2010).

One of the most common ways to facilitate changes in people's epistemic beliefs is to encourage people to reflect on the nature of these beliefs, Brownlee, Schraw, and Berthelsen (2011). This awareness to enable individuals to think differently about their epistemic beliefs over time can facilitate the change of beliefs. Sinatra, kienhues, and Hofer (2014) change how individuals think and reason about the nature of knowledge itself, which can be more challenging than knowledge and knowledge. Attitudes change, as a major obstacle to the overall understanding of science. Sinatra and Chinn (2011) stated that epistemological beliefs are defined as the epistemological conceptual shift that individuals perceive not only science with misconceptions about scientific content, but also their understanding of science with misconceptions about the nature of knowledge, It is also the thinking and reasoning that must be overcome. Failure to change these misconceptions about knowledge can lead to simple epistemological beliefs. Therefore, the development of these beliefs is one of the issues that have been the focus of educational psychologists today. In other words, understanding the merits of children and adults in scientific reasoning, which requires a level of complexity in epistemological beliefs, is a constant concern of psychological research. If individuals can come up with complex beliefs, one can expect improvement in other areas related to their epistemological beliefs, such as learning and motivation (Conley, Pintrich, Vekiri & Harrison (2004); Wainryb, ET all (2004). Some research has shown an increase in complexity in students' epistemological beliefs as they improve their educational attainment like research: Önen (2011), Yilmaz-Tuzun & Topcu (2010), Trevors, ET all (2017), and Schommer-Aikins, Bird & Bakken (2019). Despite these studies, it is unclear which training, life experiences, physical maturity, or other factors lead to these changes. It is commonly thought that the development of complex epistemological views is part of cognitive development. The details of this cognitive development, including its relation to age and the stages of cognitive development of individuals, are controversial. For example, some theorists claim that epistemological maturity is an aspect of Piaget's contractual operations and can be reinforced by creating constructivist environments (Barzideh, Ghasemizad, Khajehei, Motamed, 2012). Other researches on the epistemological beliefs of elementary students also show that the epistemological beliefs of children grow

with age. In a study, Yang and Tsai (2010) found that nearly half of sixth-grade children had absolute epistemological beliefs, and other children who had multiple beliefs used more evidence and theory in their arguments. Boz, Aydemir and Aydemir (2011) also examined the epistemological beliefs of fourth, sixth and eighth grade children and found that their beliefs about the justification and evolution of knowledge were not merely focused on the evaluation of evidence, but rather on the knowledge-based. Internalized and composed of multiple correct answers. The variability of children's epistemological beliefs has also been addressed in other studies, including Solomon and Grimley (2011) study. They examined the epistemological beliefs of fifth- and sixth-grade children, and found that schools and teachers tended to influence the nature of these beliefs and could provide the basis for changing children's epistemological beliefs. Feucht (2017) also argues that levels of complexity of epistemological beliefs are not necessarily higher for adults and dependent on higher levels of development.

Despite research in the field of children's epistemological beliefs, the lack of research with a sample of third-grade children covering the age of 9 years can lead to inadequate understanding of these beliefs in children. Therefore, these questions still remain that, given the contextual factors influencing epistemological beliefs, can the beliefs of 9-year-old children also be complex at the same time? Did it? And what study can provide a deeper understanding of children's beliefs and their possible change? In this regard, since qualitative research involves in-depth study with limited sample and due to the ease of researcher entry into girls' schools, 9-year-old female students was selected to participate in the study, so that they could be enrolled for one year as students grow. At the age of 10, their epistemological beliefs will be identified and possible changes. Therefore, the purpose of the present study was to investigate the epistemological beliefs and the extent of these beliefs in 9-year-old girl children. Research questions also include: 1) what are the epistemological beliefs of 9-year-old girl children? And 2) Do these beliefs change over a year?

Adequate understanding of children's epistemological beliefs can raise teachers' awareness of these beliefs and help them develop appropriate epistemological beliefs and provide them with the opportunity to grow their children's epistemological beliefs and subsequently their academic progress. . Therefore, an in-depth examination of children's epistemological beliefs and the developmental changes in these beliefs may help answer such questions and provide new horizons for researchers on the nature of children's epistemological beliefs.

2. Methodology

This research is a qualitative research based on data theory. This method employs a series of regular procedures to theoretically investigate the phenomenon on the basis of the induction of the collected data. This method uses encoding, in which data is shredded, conceptualized, and then reconnected in newer ways (Corbin & Strauss, 2008). In addition, the possible growth of epistemological beliefs was examined by comparing the data obtained from the two stages of the research. The study population consisted of all female students of third grade elementary school in Babolsar city in the years 2008-2009. Twenty of these students were selected through purposeful sampling method to participate in this study. The target group was selected so that its members could provide the researcher with the necessary information and have the necessary characteristics for the purpose of the research. Thus, 20 sample members were selected according to the theoretical saturation criterion, because according to this criterion, when the researcher concludes that performing more data collection techniques, he does not have more information. In this case, it stops data gathering. These students were employed at a school and from the age of 9 to 10, during two academic years, from third grade to Fourth, they participated in the study.

The main tools used for data collection were in-depth and unstructured interviews with individuals, as well as the analysis and analysis of the content of their paintings and writings, which were performed using the drawing, writing, telling technique. In accordance with this technique, participants were asked to

answer the question "What do they find in their classroom like knowledge?" in the form of paintings. So, in a 45-minute session, they were asked to draw a black pencil and an A4 sheet of what they thought would be the answer. Then, in another 45-minute session, they were asked to write in a separate A4 sheet about at least two outlines of what they know to be more like others than "what they think they look like "Knowledge?" Further, in-depth interviews based on the paintings and writings of the individuals were further collected and analyzed by coding. To determine if there was a change in the students' epistemological beliefs, data were collected in two stages using the tools and techniques used in the first step, which were approximately one academic year apart Is, In each of the two stages, the participants' drawings, writings and statements were analyzed separately and then compared. Triangulation method was used to calculate the validity and reliability of the data and analysis results. This included expert reviews, continuous comparison of data and various methods of data collection. Finally, a good agreement was reached between the experts' opinions and the findings of the various data analyzes.

3. Findings

All participants in the study were from an urban area and most of them were from a family of four. Some of the demographic characteristics of this sample are listed in Table 1.

Table1. Demographic characteristics of research participants

Father's job		Mother's job		Father's education		Mother's education		Number of siblings	
Secretary	2	housewife	18	Masters	7	Masters	5	single child	2
Employee	3	Employee	1	Associate	1	Associate	1	1 sister	7
manual worker	4	Nurse	1	Diploma	9	Diploma	12	1 brother	7
Free	11			High school	3	High school	1	two sister	1
				illiterate	-	illiterate	1	1 Sister-2 Brother	1

Based on the analysis of the paintings, almost all children (n = 20) at both stages saw the sources of knowledge as completely external sources, indicating external knowledge objects or authorities. The topics outlined in the first step are listed in Table 2.

Table2. Topics outlined in the first phase of the research

Classroom instructional materials	classmates	the watch	Class tableau	Book	Drawn topics
10	18	5	14	15	Number
Authority figures	Laptops and Video Projection	Incentive chart	Handmade by students	Educational content (such as multiplication and science)	Drawn topics
19	4	6	8	14	Number

The authority figures depicted in the first phase mainly depicted human factors within the school such as the principal, the instructor, and the teacher; and, with the exception of a second of the participants, the others depicted the teacher along with at least two students they were showing their classmates. The children's paintings represented more of an external source of knowledge, pointing to a one-way interaction where the child had no part in the construction of knowledge, except for the latter two children who had drawn the research directly. And fewer than other contributors had outsourced knowledge. As a result of analyzing the interviews through coding and comparing with the data on the drawings and writings, the issue of multidimensional epistemological beliefs emerged in 5 dimensions, details of which are given in Table 3.

Table3. Concepts and categories extracted from data

concepts	Basic categories	Major categories	The role of major categories
Teacher authority, virtual resource authority, trust authority, external authority, expert authority	The wise authority	Possession of knowledge	
Simple Personal Reasoning, Comparison: Knowledge Balance, Evidence Evaluation, Information Justification, Research: Knowledge Assessment Tool	Reasoning		
A level of basic intelligence	Being intrinsic	Being intrinsic	Multidimensional epistemological beliefs
Acquired knowledge, Acquired learning, Developmental knowledge, Knowledge transfer,	Adventitious		
The uncertainty of knowledge with doubt	certain	The certainty	
Variable knowledge, relative knowledge, uncertainty, temporality of knowledge	Experimental and temporary		
Content retention	Simple	Simplicity	
Wide field of science, knowledge complexity, knowledge space, complex knowledge	Complex		
Content-dependent speed (domain specific)	Fast	Speed	
Gradual learning, Moderate learning speed, Growth effect on learning speed, Individual differences in learning speed	Gradually		

According to Table 3, the dimensions identified in this study included knowledge acquisition, being intrinsic, certainty, simplicity and speed. The dimensions of certainty, simplicity and acquisition of knowledge refer to the nature of knowledge and the nature of learning being inherent and the speed of learning to the nature of knowing. Each of these dimensions can be displayed in parallel with a continuum from simple to complex.

Possession of knowledge: Possession of knowledge, that is, the person believing that the source of knowledge exists outside it and can be acquired through the authority of the wise and powerful, or that it can be obtained by deducing empirical evidence and reasoning. It can be said that a person who knows the source of knowledge and considers credible evidence necessary to acquire knowledge has reached a level of complex belief in this dimension; such a person views knowledge on the basis of evidence and reasoning. Slow. Participating children in the first phase of this study believe in an external, one-way source, so that most (14 people) describe knowledge acquisition rather than a meaning-making process as a task-based learning process. Such as study, querying others and searching for virtual resources. Child number 18 said, "Asking, I mean if we don't know something, we should ask you questions, we should ask the informants." Child number 5 also said, referring to parents and external sources of knowledge, "… as if we were to ask our parents something or to go from where it was very good or safe to ask." However, in a number of cases (n = 6), children's views did not reflect a fully passive role, and some also referred to their role of thinking. For example, child number 19 saw observation and thinking necessary to know and said, "Observation … we look good on paper, that is, we compare. We first write our own opinion, and then we go to others. We have to look at the paper well, see which one is better, which one is worse. "For example, we cut down one piece of paper, and then the last one is better than the others." Child number 17 cited his use of intelligence as a source of knowledge and said, "For example, you … ask a scientist question. For example, we do not need to get it from the Internet, we can use our knowledge. This is like science … our own intelligence. Things We Know. For example, we have the knowledge, we use it. "Secondly, in addition to the fact that the participants referred to external sources, their internal resources and their role in knowledge acquisition were also highlighted. For example, the external sources referred to in the second step are listed in Table 4.

Table4. Topics outlined in the second phase of the study

Drawn topics	Teacher	Book	Educational content	Scientists	the watch
Number	14	19	8	1	10
Drawn topics	Student	experiment	Interactions in conversation	Educational tools (such as maps, magnifiers, earths)	Video projection Class tableau
Number	10	6	4	3	6

The interactions in the classroom, the student's active involvement in the learning process, and the surroundings were among the drawings of the second phase. Also, the diagrams that clearly illustrated the interaction between the teacher and the student, and included the exchanges between the two, showed the student being active in the process of acquiring knowledge. In addition, 5 children referred directly to the "science question" and "class scientist card donation ceremony", which was one of the methods implemented by the teacher in the classroom. In the second phase, they also cited these as interesting knowledge and activities that were excluded from the activities in the new school year. Challenging themselves, they knew of issues that made the learning process attractive to them, and in some ways led them to seek, question, think more, and thereby lead to observation and reason. This guidance was replaced in the second phase by the students' own experiments and engaging in the practical learning process with interpersonal interactions. The analysis of writings was similar, with the exception of the library and books (19), the teacher (11), the wall newspaper, and the internet (2 each); others referred to different items including classroom facilities such as the Earth, Maps, classroom materials, audio and visual aids (on average 3 people each). Four people pointed directly to the experiment, which also confirmed their drawings on the emphasis on experimentation. Two people pointed directly to the human brain. And on average, 2 people mentioned each item carefully, the environment, the pencil and the blank sheet, technology, knowledge, and the symbol of knowledge such as the owl, the talker, and the students themselves. On average, 3 people cited each question item, the multiplication table as a symbol of difficulty, and the Golden Tips Bureau, indicating their emphasis on the lesson.

Overall, of the 20 participants, 17 were knowledgeable and 12 were self-referential and 3 as self-explanatory and three did not. The wise authority merely mentioned the role of evidence-based thinking, creativity and thought as the source of knowledge. This number, as well as the type of statements they make about the importance of their thinking and their role in thinking and understanding, may represent a kind of growth in the participants' epistemological belief about the dimension of authority or knowledge acquisition. Phrases such as 'clever thinking', 'creativity and energy from interactions and teamwork' and 'use of the brain and intellect' can be a confirmation of their belief in the role of thinking and inference in knowledge acquisition that is evident in the first stage of research. It wasn't. Contributor 18 despite mentioning a number of external sources of knowledge such as books and virtual resources, the role of individuals such as teachers is important only in terms of confirming knowledge claims and testing the main source of knowledge. In his view, student activities and the events that occurred during the experiment led to his understanding of the knowledge that he could attain only through direct experience during the experiment. Referring to the internalization of the science of experimentation, he says, "For example, what we understand from it, first that we do not understand, but again by doing it, as in some experiments, we understand things." Participant 12 also says, "If we do science experiments, we can advance in science and learn cool and intelligent things." He goes on to say, "Clever and cool": "Clever, I mean doing experiments to find things that are clever. That is to say, for example, understanding what this lesson is. This lesson is what explains it to us. Let's do it, maybe we can understand this lesson. But if we did that experiment and didn't understand it, we wouldn't know what our lesson was … cool,

meaning funny things, like something you want to smoke somewhere else! There are things like this … well, I'm surprised. "

Inheritance: This dimension refers to the belief that one's ability to learn is inherent or irreversible or that, on the other hand, he / she sees growth and change in the ability to learn as self-evident and based on the opportunities that It has the advantage of trying to know more. All of the children in this study pointed to the acquisition of learning ability and, although they found a level of intelligence and aptitude necessary for learning, they were insufficient. For some, even intelligence could be enhanced through greater effort. Child No. 9 pointed to intelligence as a learning ability, pointing out that people's learning ability can be improved by effort, and said: "Some may not be good at first, but they will try again. …Yeah. "If they practice a lot, for example, they can practice a lot of lessons, so they can be smart." All participants in the second phase also had the same belief that learning ability was acquired.

Certainty means that one considers scientific findings to be absolute subjects, or to consider them temporary and subject to re-testing. Data analysis of the first stage of the study showed that the children participating in the study believed that knowledge was uncertain. In this regard, Child No. 5 said: "No … it is different. There wasn't much then but now. Other year's things will be different and these will be different. " In the second phase of the study, children also believed in the temporality and temporality of knowledge. Contributing 17, referring to the scalability of the scientists' discovery, says: "It may be that newer technology or information or smart things come to life when that information is destroyed and that what they did is wrong. ».

Simplicity: For a person who believes in the simplicity of knowledge, the most important feature of knowledge is that it provides separate (information) facts that relate to each other, whereas the person who believes in the complexity of knowledge defines the concepts Monolith knows that there is a complex intrinsic relationship between them. Although most children in this study pointed to the complexity of knowledge, for some, according to the type of content, knowledge could be simple or complex. Child No. 7 pointed out that the level of simplicity of knowledge is context-dependent, which he considers to be complex and specific questions, and said: "… when I answer a question a lot, for example … It is very difficult for me, but I realize that this is a special question, this question is intelligence … When that question is not difficult for me, I can easily answer it, I realize it is not a question of intelligence. " Secondly, all participants believed that this complexity was context-dependent while believing that knowledge was complex. In other words, they believe that the type of content determines the level of complexity of knowledge. Collaborator 2 likens knowledge to thinking it requires effort and says: "Knowledge can be anything. For example, what you write here might be a prayer or a multiplication table. Knowledge is like thinking. For example, I think about other things. For example, how do I make bricks? How was the carpet made? Or how was this yarn made? "

Speed: The speed dimension implies that one does not find it necessary to believe in fast learning, to engage in continuous learning and to engage in learning because it considers learning to be fast and in the least possible time. But, on the other hand, a person who believes that learning is gradual takes more time and effort to do so, and requires constant practice and rethinking of learning. All of the children involved in this study referred to gradual learning and found it necessary to spend time, practice, and continuous effort. Child number 10 said: "… there is a notebook inside my mind. It means that what he writes, I write in it and I remember … for example, it takes a long time to learn. "Secondly, all participants believed that learning was gradual and that the process was gradual and that content was gradual. In addition, in terms of learning speed, most participants cited the average speed for the learning process, which seems to depend on the content of the learning speed from their point of view.

4. Discussion

Epistemological beliefs, that is, people's beliefs about knowledge and knowing, are subjects that are related to understanding science and learning. Individuals may have simple beliefs that make knowledge absolute, immutable, obtainable from a valid external source and consider the process of knowledge to be fast; Made by evidence-based individual reasoning as well as believe in the gradual process of knowing. The purpose of this study was to investigate the development of epistemological beliefs in 9-year-old girl children in order to investigate the development of these beliefs over a period of one year.

The findings indicated that the epistemological beliefs of 9-year-old girl children included five dimensions of knowledge acquisition, intrinsic, certainty, simplicity and speed. The dimensions of certainty, simplicity and acquisition of knowledge refer to the nature of knowledge and the nature of learning being inherent and the speed of learning to the nature of knowing. Also, each of these dimensions can be represented in parallel with a continuum of simple to complex epistemological beliefs. The emerging dimension of epistemological beliefs was almost identical to Schommer (1994, 1990, 1998) findings. It introduced multidimensional theory of epistemological beliefs. In addition, the epistemological beliefs of the participants had developed over the course of one academic year, especially in the knowledge acquisition domain. The importance of their thinking and their role in thinking and understanding for the participants, which emerged in the findings of the second phase of the study, may reflect their growth in knowledge acquisition. Understanding scientific claims requires evidence-based reasoning. Therefore, in line with the findings of Holma and Hyytinen (2015) and Zhang, Koehler and Gao (2015), the belief in the justification of knowledge based on thought and reasoning along with credible evidence also increased in them. Research believed in the acquisition of learning ability and did not consider intrinsic intelligence and talent insufficient; rather, they found it necessary to strive for knowledge. They also considered knowledge to be changeable and experimental. From the very beginning of the research, they believed that knowledge claims could be changed and updated according to different circumstances. All children from the beginning of the research believed in the complexity of the knowledge and the gradual process of knowing, although consistent. According to the findings of Duran and Mihladiz (2014), the degree of simplicity or complexity of knowledge and its speed of acquisition were found to be content dependent and their belief in the content content of simplicity and speed increased throughout the study. It was found that all dimensions the epistemological beliefs of 9-year-old girl children are relatively complex, consistent with Feucht (2017) finding that levels of complexity of beliefs Epistemology is not necessarily for adult and dependent on higher levels of development. The results, in line with the findings of Conley, Pintrich, Vekiri & Harrison (2004), Wainryb, et all (2004), Boz, Aydemir and Aydemir (2011), Önen(2011) showed that knowledge beliefs Children's ontology has a tendency to grow into more complex beliefs; Overall, consistent with the findings of Yilmaz- Tuzun and Topcu (2010), Braten (2016), Trevors, et all (2017) and Schommer-Aikins, Bird, and Bakken (2019), the study also found that As the educational process progresses, the epistemological beliefs of 9-year-old girl children also grow.

The classroom-based knowledge climate seems to be able to oblige participants to adhere to a specific framework based on these expectations by emphasizing the classroom goals and expectations of the participants in the role of "student". The teacher's methodology and the epistemic messages contained in the educational content can provide an epistemic atmosphere that will lead the child toward maintaining simple or complex beliefs. It is therefore suggested that education practitioners provide conditions in the educational environment to reinforce epistemic-rich components including teaching facilities, content and procedures, and teacher epistemic beliefs, and pave the way for the development of epistemological beliefs. Children pave the way for more complex beliefs. It is also recommended that teachers, especially elementary third grade teachers, use strategies such as discussions, scientific experiments with objective

evidence, and the application of different scientific theories on specific topics to draw learners' attention to diverse perspectives in the classroom, to provide students with a better understanding of the complexity of their assignments and scientific issues. These actions can improve students' reasoning and, in addition to reinforcing epistemological beliefs, play an important role in strengthening the ability to justify knowledge claims.

The results obtained from qualitative research in a sample of 20 9-year-old girl children in Babolsar city and these results may be different with respect to other situational contexts. Therefore, it is suggested to do similar research with the male sample and consider the role of gender in it. In addition, it is suggested that combined research involving both quantitative and qualitative research be conducted in this field to investigate epistemological beliefs in samples older than 9 years of age.

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