



Questionnaire of Personal Epistemology in Children: An Exploratory Mixed Research Method

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Abstract

The study of the belief of elementary students about the nature of knowledge and knowing has been considered as one of the most effective learning in recent years. The purpose of this study was to construct a personal epistemology questionnaire in Iranian children. The combined (qualitative-quantitative) study method was used for this study. At the qualitative stage, with the formation of focal groups for each grade, interview sessions with students from the third to sixth grades of the elementary school were formed first, and the components of personal epistemology were extracted. In the following, researches on personal epistemology were reviewed and related components were extracted. The extracted components in a Delphi study were examined by the experts. In the second stage of the research, which was done quantitatively, questionnaire questions were designed and investigated by field experiment to examine the factor structure. In analyzing the text of the interview with students in open coding, 25 categories and in axial coding based on the similarity of the subject, five categories were obtained. In addition, the research findings indicated that the factor structure of the questionnaire was fitted with the data, which was done using exploratory and confirmatory factor analysis.

Keywords: personal epistemology, factor structure, mixed method.



1. Introduction

In recent years, studies on recognizing people's beliefs about the nature of knowledge and knowing have provided extensive information on the capabilities of high school and university students. Although various studies have been conducted on this issue, there is a research gap in the field of research with children (Kuhn, Cheny & Winstock, 2000; Burr & Hofer, 2002; Conley, Pintrich, Vekiri & Harrison, 2004; Mason, Boldrin & Vanzetta, 2006; Wildenger, Hofer & Burr, 2010). In the way that the most empirical researches are focused on learners of high school and upper ages, and it seems that epistemological thinking in children is difficult to identify (Kuhn, 1991).

These studies have begun by the researches of Perry (1970) and a variety of models are presented for it. These models and the epistemological model can be categorized as follows: The first group, entitled "Classical Models", which includes the model of schemes of intellectual and ethical development of Perry (1970) that examines how students' beliefs develop about the nature of knowledge; King and Kitchener's (1994) reflective judgment model, which is a design of Perry and Dewey's study, and shows twenty years of longitudinal and cross-sectional study of students from high school to adulthood in this case; the Kuhn's (1991) argumentative judgment model which examines beliefs in the four age groups range from adolescence to the age of sixty. The characteristic of these models is that they consider beliefs as one-dimensional (models proposed by Hofer and Pintrich, 1997). The second group refers to studies that consider beliefs as a system of more or less independent beliefs (Schommer, 1990; Hofer & Pintrich, 1997) and the third group refers to studies that consider beliefs as a systems in relation to other systems and psychological theories entitled as "combined models" (Schommer-Aikins, 2004; Feucht, 2008; Westphal, 1990; Kattman, Duit, Gropengieser & Komorek, 1996; Hofer, 2001; Bendixsen & Rule 2004). But it is worth noting that these models and studies have tried to identify the dimensions of beliefs at high school and upper ages.

The tools used in these researches (Perry, 1970; Kuhn, 1991; King & Kitchner, 1994) in more classical studies performed in the form of qualitative and interviews with the participants. The use of questionnaire in the study of beliefs became common by the study of Schommer (1990), and most of the researches used it in spite of its methodological problems. On the other hand, the review of epistemological studies shows that the study of the role of beliefs in the intellectual, learning and teaching development formed from the earliest years of the study in the United States and has grown in recent years in different cultural environments. In addition, the primitive conceptualization of this concept has been with American students, and the early studies in which a model has been provided for the transformation of beliefs is done by white men in the US higher education – the Harvard University – in the 1950-1960. Thus, to a certain extent, this structure can be considered a Western structure, particularly American. More interestingly, with a glance at American researches, there is also a difference in the results. It is worth noting that, based on the difference in the fundamental assumptions about beliefs, this structure may not be followed in the same way for all cultures.

Therefore, one has to answer the question of whether other dimensions can be predicted for beliefs in other specific cultures that have not been considered in studies by American



scholars. On the other hand, is it possible to make changes in the type of suggested questions regarding personal epistemology, in terms of cultural necessity? Therefore, it is obvious that the examination of the nature of personal epistemology beyond the cultural context in which it is observed would not be appropriate (Schommer, 1993; Schommer-Aikins, 2004). It also seems that in different cultures, the underlying factors of the belief's concept is different, because beliefs are an abstract of a society's culture, and culture is the maker of beliefs (Mulger & Landbeck, 1997; Phan & Deo, 2007; Richardson, Landbeck & Muglar, 1995; Phan, 2006; Phan, 2008a). Consequently, beliefs cannot be studied outside of the cultural context, especially in making a tool that ultimately leads to the proposition of a factor structure for beliefs (Chan & Elliott, 2002; Youn, 2000). Therefore, one has to answer the question of whether other dimensions can be predicted for beliefs in other specific cultures that have not been seen in studies by American scholars. As a result, it is necessary first to identify the underlying factors of personal epistemology structure with qualitative studies. Finally, by a quantitative study, the factor structure of the questionnaire should be investigated.

Few researches that examine epistemology in children emphasize the existence of such a structure in relation to psychological factors, but making a tool for the study of personal epistemology in children is faced with challenges for several reasons. At first, is there a theoretical explanation to design a questionnaire that considers beliefs in its overall form, or is it necessary to design a questionnaire in a particular area such as mathematics, science, etc.? Generally, in the study of beliefs, in its general form, we face two problems; Firstly, different conceptualizations of beliefs are seen that exist in the various models to explain beliefs. Secondly, the methodological problems encountered in measuring beliefs have challenged these studies. In measuring beliefs, we need to answer the question of what we want to measure and how we measure it. Different conceptualizations of beliefs have made it difficult to answer these questions. In addition, some of the characteristics of personal epistemology may be a reason for some methodological problems. So the crucial question, in the first place, is the possibility to measure beliefs as pure beliefs, namely, to remove the effect of texture or content? Is there a basic and pivotal belief that can be measured by taking into account a particular area and texture?

On the other hand, despite the fact that the advantages of the use of the questionnaire is quite evident, and because it is applicable to a large group of people and easy to analyze, it has usually been used extensively in research, however, if adults are in trouble abstracting their thinking, this is far more in children. One of the implicit assumptions in designing questionnaires is whether the subjects have the ability to understand the questions in one form? This understanding seems to be limited by two reasons. One is about understanding the text and the other aspect is understanding the meaning. Therefore, most people are not aware of their beliefs. Hofer (2004) suggests that beliefs are operational at the metacognitive level. The question now is how can these beliefs, which are often unobvious for individuals, be measured? Accordingly, it is necessary to examine validity and credibility of a questionnaire for children aged 9-12 years by interviewing and connecting with elementary school students and taking into account evidences related to the evolution of these age groups. In fact, the view of children will be a scale to examine their beliefs.



The theoretical framework will be considered in the design of the Hofer and Pintrich (1997) and Hofer's (2000) studies. Accordingly, there are two general dimensions for personal epistemology comparable to philosophical foundations. These two are the nature of knowledge and the nature of knowing. These general dimensions embrace four dimensions: the certainty of knowledge (whether knowledge concepts are fixed or that they are developing); the simplicity of knowledge (whether knowledge is formed from scattered pieces of information or knowledge consists of concepts that are related to each other); the source of knowledge (whether knowledge is deduced from other experts or made individually) and the justification of knowledge (how is the knowledge justified using evidence that an expert provides).

These four dimensions are the axis known as epistemological theories. These beliefs are a part of a folk epistemology and, can be interpreted in terms of metacognition. In Hofer's study, these four dimensions were empirically investigated. The factor analysis of this tool supported the existence of a multi-dimensional epistemological model, but the certainty and simplicity of knowledge were not isolated factors. This result was similar to the Qian and Alveremmann (1995) study, which came to the same conclusion by factor analysis of the Schumer's questionnaire. These dimensions are designed to explain beliefs at the ages of high school students and university students. Now, one has to ask whether the personal epistemology in children is also made up of these dimensions. Moreover, can the cultural factor affect these dimensions in the Iranian survey group?

According to what was said and considering the limitations of quantitative methods in measuring the psychological and social concepts, in the present study, we measured and studied personal epistemology by using the qualitative method. In the following, the results of the qualitative study led to the presentation of a questionnaire that its psychometric properties were examined from different angles and the cultural issues involved in the proposed factor structure were explained.

3-Qualitative study

Method

The research method in this study is focal groups as one of the qualitative methods.

Participants

The research population consisted of all students who studying elementary school in Tehran during the school year of 2014-15. The targeted sampling method was used. In order to conduct qualitative interviews, six students were selected separately from each grade in girls' and boys' schools and participated in unorganized or semi-organized interviews in focal groups. Eventually, the number of participants was 72. Of course, this sample selection was based on the assumption that the number of sample members in such studies could not be determined in advance; therefore, for each group, six persons were considered, and it was intended that the process of sampling would continue to achieve the necessary theoretical adequacy.



By studying different perspectives on the dimensions of personal epistemology, semi-structured interviews were provided and questions were posed. The questions are set out in four axes of certainty, simplicity, source, and justification of knowledge. The manner in which the interviews were conducted was that in the beginning, the researcher introduced himself with his first name for the participants and asked them to introduce themselves. Subsequently, subjects were asked to provide their views with the permission of the researcher and respect others' views. At the end of the interview, each participant was given a gift of watercolor box for appreciation.

Data analysis method

The analysis carried out, in the first stage of the research answered the question of "What are the themes of epistemology?" Using the Glaser & Strauss (1967) method for constant comparison and using the recommendations of Miles & Huberman (1994) to codify the qualitative data, all the processes described by the participants in the interview were identified and classified. We performed this process with several repetitions.

First, we read the transcribed texts of the interviews to get an overview of the responses of the interviewees. Each line or paragraph was marginalized to allow initial coding. From these basic codes, a general categorization for participants' responses was made. Second, we identified the themes by arranging the primary grouping, labels of the categories and subjective subcategories. The grouping showed the similarity of responses and the number of responses. At least half of the contributors had an initial theme in the interview. In the following, we read the text of the interviews and environmental notes, in which we searched repeated phrases and unexpected material, which could be unusual evidence of the experiences of contributors. We reviewed these three themes in order to determine their degree of coordination with Hofer and Pintrich (1997) theory (Patton, 1990). At this point, we used two criteria: Does this information confirm our theory of personal epistemology? Moreover, does it provide a fresh insight into the interpretation of individuals from personal epistemology? At the same stage, we combined the initial themes and re-named them in five dimensions. Finally, the responses were read again and they were placed in one of the five final themes to ensure that the grouping was appropriate. After this stage, it became clear that the five themes reflect the responses provided by the contributors.

Results

In order to identify the components and factors associated with personal epistemology, after the group discourse, first similar sentences and phrases were extracted from the responses, then, categorized in the form of concepts. In this section, the text of the interviews is presented first. For this purpose, a summary of the most important and key points is presented. In this section, the coding and groupings of examining the interviews are presented in Table 1 and the extracted themes are shown in Table 2.



Table 1. Coding and grouping extracted from interviews

Row	Code	Concepts (open coding and listing codes)	Group
1	1/ 1	<i>The contents of the textbooks are simple and usually easy to learn</i>	<i>Simplicity of the content of the books</i>
2	2/ 1	<i>Reading any confusing story should be put aside because you cannot finally understand it.</i>	<i>Failure to understand difficult material</i>
3	3/ 1	<i>The opinion of two people about a scientific issue may not similar at all</i>	<i>Disagreement on scientific issues</i>
4	4/ 1	<i>We like to have a laboratory and invent like scientists</i>	<i>Interest in scientific work of scientists</i>
5	5/ 1	<i>The methods used by all scientists are fixed</i>	<i>The same methods used by scientists</i>
6	6/ 1	<i>Teachers are literate people and their words are correct because they have read many books.</i>	<i>Teacher is all-knowing</i>
7	7/ 1	<i>Our lessons are much more difficult this year than last year, and we need to do more to learn it.</i>	<i>The difficulty of lessons in higher grades</i>
8	8/ 1	<i>Science is complex and difficult</i>	<i>The complexity of science</i>
9	9/ 1	<i>The good reward is the result of the efforts of scientists who are struggling to find out</i>	<i>Outcome of knowledge</i>
10	10/ 1	<i>The best way to know who tells the truth is to see it with our own eyes</i>	<i>Observing</i>
11	11/ 1	<i>Scientists are constantly investigating; They hypothesize, and then put their hypotheses into practice.</i>	<i>Hypothesis making</i>
12	12/ 1	<i>Scientists only understand what God says better than we do because they have large labs and have read more books.</i>	<i>Trust in the lack of change in divine source</i>
13	13/ 1	<i>Scientists never make mistakes.</i>	<i>Scientist is all-knowing</i>
14	14/ 1	<i>Higher than the scientists, are prophets who know everything</i>	<i>Trust in the knowledge of prophets</i>
15	15/ 1	<i>Our friends and classmates know as much as we know about scientific issues and they may make mistakes</i>	<i>The possibility of making mistakes in answering questions.</i>
16	16/ 1	<i>The efforts of scientists to solve problems are more important than their success or failure</i>	<i>The value of effort</i>
17	17/ 1	<i>Scientific books are unchangeable, but story books can be changed</i>	<i>Constant content of scientific books</i>
18	18/ 1	<i>The words of others cannot be one hundred percent trusted.</i>	<i>Uncertainty about what others say</i>
19	19/ 1	<i>If we try hard, we will finally understand very difficult material</i>	<i>Solvability of difficult issues</i>
20	20	<i>The reality of subjects is unchangeable</i>	<i>Non-changeability of</i>



	/1		realities
21	21 /1	Asking very much and curiosity is a waste of time because the answers have one response, and the people who ask a lot make people bored.	Certainty of responses
22	22 /1	The answers to the questions are in books and on the internet	Collecting information from books and the internet
23	23 /1	All knowledge and science is from God and only God - knows what will happen	The certainty of God's words
24	24 /1	Anything scientifically necessary to be known by scientist is stated in the Qur'an and is reliable. Scientists should only obey the Qur'an.	Qur'an the source of all the knowledge
25	25 /1	The result of scientists' efforts is serving humans	Trying for the sake of others

Table 2. Extracted themes from interviews

<i>Simplicity of knowledge</i>	<i>Certainty of knowledge</i>	<i>Source of knowledge</i>	<i>Outcome of knowledge</i>	<i>Justification of knowledge</i>
<i>Simplicity of the contents of the books</i>	<i>Non-changeability of realities</i>	<i>Teacher is all-knowing</i>	<i>The value of effort</i>	<i>Similarity of the methods applied by scientists</i>
<i>The complexity of science</i>	<i>Constant content of scientific books</i>	<i>Scientist is all-knowing</i>	<i>Outcome of knowledge</i>	<i>Interest in the scientific work of scientists</i>
<i>Solvability of difficult issues</i>	<i>Failure to understand difficult material</i>	<i>Uncertainty about what others say</i>	<i>Trying for the sake of others</i>	<i>Hypothesis making</i>
<i>The difficulty of lessons in higher grades</i>	<i>Trust in the lack of change in divine source</i>	<i>Trust in the knowledge of others</i>		<i>Observing</i>
	<i>Disagreement on scientific issues</i>	<i>The possibility of making mistakes in answering questions</i>		<i>Collecting information from books and the internet</i>
	<i>Certainty of responses</i>	<i>Qur'an, the source of all the knowledge</i>		
	<i>The certainty of God's words</i>			



In order to name extracted material, the main emphasis is on Schommer (1990) and Hofer (2000, 2001) studies. To select the factor's name, five expert opinions were used and, finally, the above name was selected. Another consideration is that the subjects raised the knowledge of God, the Prophets, and the Qur'an, which was not seen in the material themes of beliefs in other cultures. In addition, the main questions in the minds of these children, especially at higher levels, are religious and ethical issues.

Quantitative study

Method

The present study is descriptive and correlational.

Population, sample & sampling method

The participants of this study were 472 students (217 boys and 255 girls) from third, fourth, fifth, and sixth grade elementary students who were selected through multistage cluster sampling, from girls' and boys' school of Tehran. These numbers were randomly divided into two groups of 236 people for exploratory and confirmatory analysis. The sample group was selected in three stages using sampling units: first unit, district, second unit, school and third unit classes. The method of sampling was at first, among all the schools in 22 district of Tehran, which among them eight districts were randomly selected, then in each of the districts one public school was selected for girls and one for boys, and finally, in each school, which usually consisted of two classes at each grade, one class was randomly selected. Then, by going to schools on different days and in morning hours due to the more energy of the participants to respond, after explaining the goals of the research and attracting participants' contribution, students who were willing to respond were asked to cooperate with the interviewers. In the final stage, the collected data were analyzed.

Tools

In this section, the Conley et al. (2004) questionnaire was used to examine the structure validity of the convergence type. This questionnaire has 26 questions and is developed based on the 5-point Likert scale from totally disagree with 1 point, to totally agree with 5 points, and examines the beliefs of students in the field of science. The dimensions of this questionnaire include the source (5 questions, alpha 0/81), certainty (6 questions, alpha 0/78), evolution (6 questions, alpha 0/66) and justification (9 questions, alpha 0/76). As can be seen, this questionnaire does not show the simplicity of knowledge, but it does contain a factor called evolution.

Results

The findings are presented in two parts: validity and reliability, and are examined in each part from different angles. To determine the validity of the data collection tool, the questionnaire was examined in two stages. In the first stage and before the final implementation, a sample of 50 students responded to the questions. In order to test the validity of the questionnaire, the subjects again responded the questions after a month, and in the second stage, the internal consistency of the questions of questionnaire with the final sample (472 people) was evaluated through Cronbach's alpha calculation. The results of these examinations are included in Table 3.



Table 3. Cronbach's alpha and total score of children's personal epistemology questionnaire

<i>Variables</i>	<i>Study (1)</i> <i>n=(50)</i>	<i>Study (2)</i> <i>n= (50)</i>	<i>Study (3)</i> <i>n= (472)</i>
<i>Simplicity</i>	0/69	0/78	0/77
<i>Certainly</i>	0/82	0/76	0/85
<i>Source</i>	0/68	0/80	0/78
<i>Outcome</i>	0/88	0/72	0/82
<i>Justification</i>	0/64	0/68	0/73

Based on the results of the above table, the obtained factors are valid in terms of credibility by the method of retest, in the third independent study, have a good status and can be cited in future researches. Subsequently, questions regarding content validity, exploratory factor analysis, confirmatory factor analysis and convergent validity are examined.

This important issue was evaluated using three indicators of content validity ratio index and content validity index and referral to experts. Based on the results, nine questions were deleted and the rest of the questions have the content ability to measure personal epistemology in children. After reviewing the content validity and credibility, the correlation between the questions and the total score was examined. Accordingly, in terms of correlation ratio, the designed questions were in good agreement with the total score of the test. Accordingly, 36 questions were considered in the final exploratory factor analysis.

4- Exploratory factor analysis

Considering that the research tool was designed for the first time in this study, exploratory factor analysis was used to elucidate the correlation model between the items of each domain. For this purpose, in the first step, exploratory factor analysis in the software was performed without fixing the number of factors. In the second step, the four and six-factor competitor models with fixed factors in the proposed model were investigated. Accordingly, the amount of sampling adequacy index indicates the adequacy of the sample. In addition, Bartlett's test showed that the data correlation matrix in the population is not zero and therefore, the factor finding is justifiable. The determinant was 0/01. Table 4 shows the operating weights of each material after varimax rotation. In general, the eigenvalues of the five factors were more than one. Five factors that explain (68/53) percent of total variance, were proposed based on the plot of the eigenvalues chart (skew scheme) and factor weight model.



Table 4. Statistical results of epistemology questionnaire of children by main component analysis

Item/ Factor	Factor load
<i>Factor 1 (simplicity of knowledge versus complexity of knowledge)</i>	
2. There are many things that I have not learned since last year and I do not think I'll learn any more.	0/55
8. Now I know that I have read the answer to some of the teacher's questions in last year's books.	0/43
22. I sometimes get nervous that I do not know the right answer to the questions.	0/53
25. If we want to succeed in learning the lessons, we should start with books first and gradually proceed.	0/51
27. The contents of our textbooks are simple and anyone can learn them.	0/62
35. Older people make use of more complex scientific material.	0/66
40. The content of textbooks is simpler than to spend a lot of time learning them.	0/43
41. The content of textbooks is simpler than to spend a lot of time learning them.	0/45
42. My teacher can teach me any complicated things in simple language.	0/50
44. I like science material because I cannot easily find a response to complex issues.	0/63
<i>Factor 2 (certainty of knowledge versus changeability of knowledge)</i>	
5. We live in a more advanced age than our elderly does, and our lives are constantly improving.	0/31
12. When two people argue together, one is usually more correct.	0/54
13. The more we grow up, we learn more.	0/67
28. Our best teacher is a teacher who can teach us very hard subjects too.	0/50
33. Human beings must observe the laws of society in all circumstances.	0/72
34. Sometimes, there are no answers for some questions.	0/52
<i>Factor 3 (worldly external source of knowledge acquisition versus divine external source of knowledge acquisition)</i>	



<i>6. Scientists with great effort will eventually get the right answer.</i>	0/41
<i>9. If we try as much as scientists do, we will not be able to find the answer to our questions.</i>	0/66
<i>1. All the materials we read in the textbooks are correct.</i>	0/61
<i>11. Teachers are more knowledgeable than we are because they know the response to all our questions.</i>	0/52
<i>15. Even prophets may make a mistake.</i>	0/44
<i>17. Our parents are duty-bound to teach us everything we need to live.</i>	0/54
<i>18. The answer to all human questions is in the book of the Qur'an and does not require the researches of scientists.</i>	0/65
<i>30. If a scientist fails to achieve a right answer, then he should not be trusted again.</i>	0/43

Factor 4 (Outcome of knowledge versus knowing process)

<i>20. God bless those who try to learn knowledge, even if they do not succeed.</i>	0/54
<i>23. In my opinion, if the outcome of effort in the lessons is not good, this effort is worthless.</i>	0/51
<i>24. It does not matter if a scientist makes mistake, the attempt he makes to serve human beings is important.</i>	0/31
<i>32. When I read a storybook, I want to know what happens in the end of the story as soon as possible.</i>	0/37

Factor 5 (justification of knowing)

<i>10. The only way to make sure that something is right is to ask the elders about its correctness.</i>	0/49
<i>14. I do not believe in anything until I see it myself.</i>	0/68
<i>16. I use the Internet and books to find the answer to a question.</i>	0/54
<i>19. The methods scientists use to answer questions is always fixed.</i>	0/57
<i>21. There is no way to understand the correctness of the words of the scientists.</i>	0/63



<i>26. If God does not want, no scientific problem will be resolved.</i>	0/31
<i>29. Whenever we suspect something, we must see what God's opinion is about that.</i>	0/51
<i>31. Scientists answer questions in ways they know only themselves.</i>	0/39

Based on the results of the above table, five factors of simplicity of knowledge, certainty of knowledge, source of knowledge, outcome of knowledge and justification of knowledge are the underlying factors that comprise personal epistemology in Iranian children aged 9-12 years.

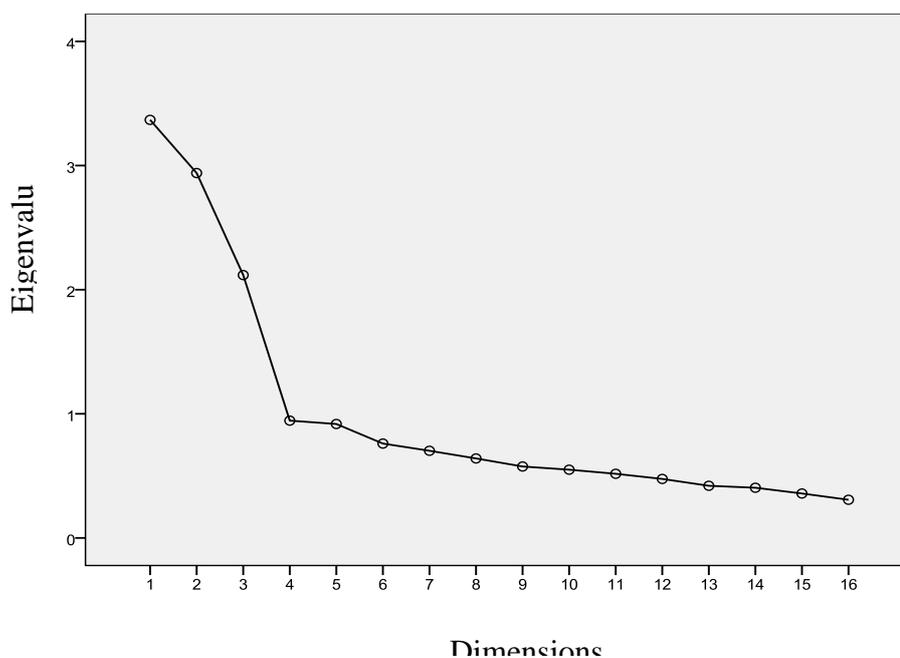


Figure 1. Scree plot for the extracted factors from children's personal epistemology questionnaire

Confirmatory factor analysis

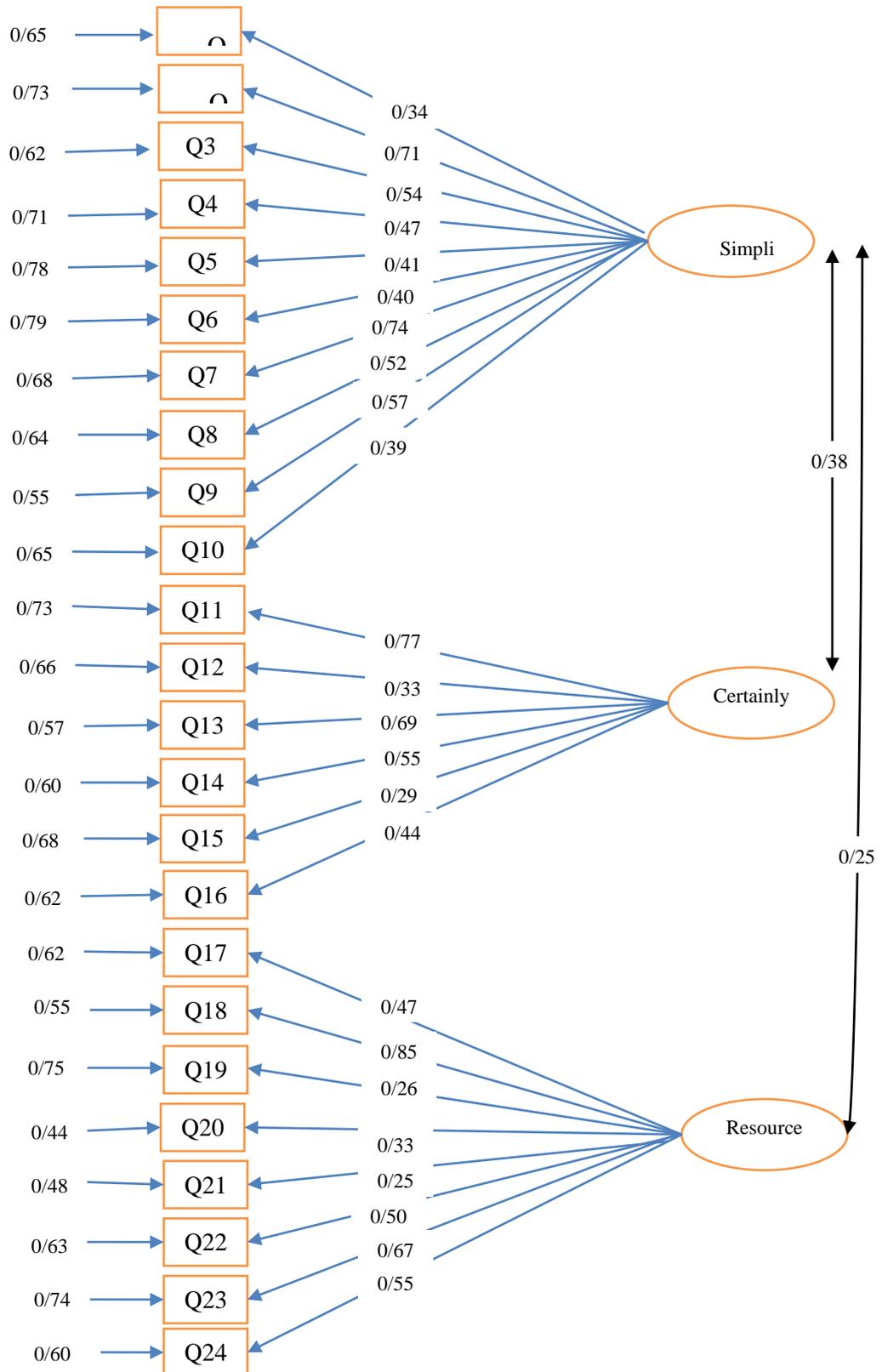
The confirmatory factor analysis of the reflection thinking scale was investigated using the Lisrel 8.5 tool. The indicators of the model fitting are shown in Table 5 and the results of the confirmatory factor analysis are shown in Fig. 2. It should be noted that the numbering of questions in the model has been determined from the first question under the sub-factor of simplicity of knowledge to the end, respectively.



Table 5. Indicators of model fitness

<i>statistics</i>	χ^2	<i>df</i>	<i>Sig</i>	<i>RMSEA</i>	<i>GFI</i>	<i>AGFI</i>
<i>value</i>	312/371	212	0/001	0/031	0/91	0/92

According to Table 5, the examination of indicators of the five-factor model's fitness in the children's epistemology questionnaire on the sample of the present study shows that Chi square with a value of 312/371 with a degree of freedom of 212 and a significant level less than 0/001 shows an appropriate fitting of the model with the data. The Root Mean Error of Approximation index is 0/031, which is less than 0/05, and the goodness fit index and adjusted goodness of fit index are 0/91 and 0/92, respectively, which are more than 0/9, and the fit of the model with data is approved. Regarding the values of goodness of fit indicators, this sample is recognized to be suitable for Iranian students.



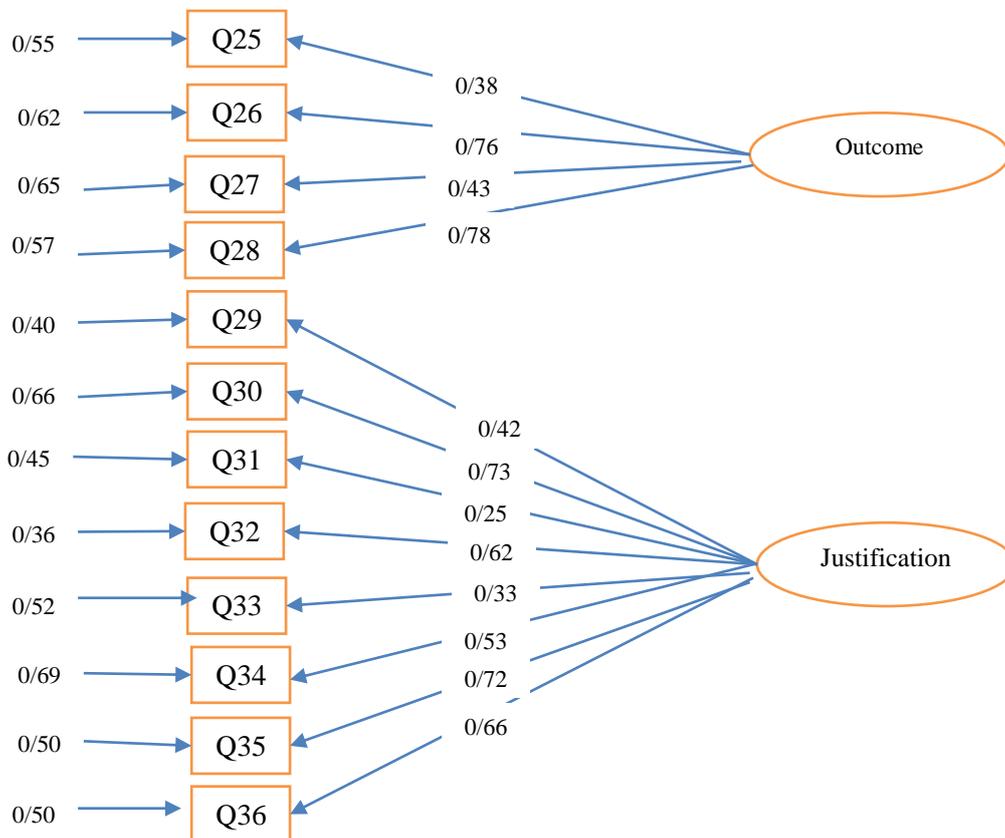


Figure 2. Results of the hypothesized model

In order to examine the convergent validity, the correlation between the subscales of the Conley et al. (2004) questionnaire and the present questionnaire were examined. The results are presented in Table 6.

Table 6. Correlation between subscales of two questionnaire

<i>factors</i>	<i>simplicity</i>	<i>certainly</i>	<i>resource</i>	<i>outcome</i>	<i>justification</i>
<i>Source</i>	**0/45	**0/53	*0/51	*0/42	*0/59
<i>Certainly</i>	**_0/61	**0/73	*0/68	*0/39	*0/58
<i>Development</i>	**0/61	*0/59	**0/72	*0/62	**0/42
<i>Justification</i>	*_0/70	*0/71	*0/63	*0/75	*0/82

*p<0/05, **p<0/00



Based on the results of the above table, there is a significant correlation between the subscales of the two questionnaires. Therefore, it is worth considering the fact that both the scales, evaluate the same structure.

5-Conclusion

One of the research gaps in the review study of Hofer and Pintrich (1997) is to conceptualize the dimensions or elements that constitute the epistemic beliefs of individuals. Another major gap is dealing with the structure of this concept in children below the age of high school and university students, which has attracted many educative specialists. Therefore, the present study aims to explore the components constituting personal epistemology in children in a qualitative study with the axis of focal group. In addition to making a tool for children's personal epistemology and the study of the factor structure and psychometric properties of this scale for Iranian students of the third, fourth, fifth and sixth grade in order to examine them by preparing a simple and practical tool for epistemic beliefs.

The results of the interview showed that the response of children of this age to personal epistemology questions could cover the epistemic dimensions of higher ages. However, evaluating responses to some extent suggests that in their responses, these children were highly influenced by the cultural infrastructure, which constituted their beliefs. In a way that most of the responses were based on moral, ethical, and religious affairs. It seemed that they could not simply distinguish scientific issues from ethical issues and had epistemological judgments mainly dependent on the special context of their school. Likewise, personal epistemology, as well as many psychological structures, seems to have an evolving nature. Accordingly, the main emphasis is on naming the categories based on Schommer (1990) and Hofer's (2000) studies, which are called concepts derived from writings. The categories obtained are as follows:

Simplicity of knowledge: As conceptualized by Schommer (1990, 1993) and Schommer-Aikins (2004), knowledge is on a continuum of accumulation of facts to related concepts. In addition, at a low level, knowledge is placed separately, objectively, and with known facts, and at a higher level, the knowledge in people's perspective is relative, conditional and dependent on the context. The analysis of the responses of participants in the interviews shows that lower-age children and in the early years of elementary school, have more naive judgments and a lower level of understanding of the complexities and relationships of scientific concepts. In a way that they also consider learning as simple as possible. One of the questions asked of the subjects was "How many times do we read something to learn it?" Examining the responses of participants in the interviews showed that the third grade students have somewhat understood the complexity of the lessons compared to the last year. However, this understanding is still unripe. Therefore, this component can be addressed in a continuum, on which the one side is the simplicity of knowledge, and on the other side, it is the complexity of knowledge. By increasing the age and level of education of individuals, beliefs move from rawness towards ripeness and wisdom of acting. In addition, students at higher levels understood the difficulty of different lessons and knew the lessons in which they had weakness and needed to study more and spend more time. This ability, on the one hand, overlaps with the metacognitive development (Flavell, 1985; Kuhn, 2000a, b) in this age



group, and on the other hand, indicates the more specificity of beliefs in the various fields that could be the basis for future researches in this field and show more points of intersection.

Certainty of knowledge: the degree to which a person thinks knowledge is fixed or fluid. Based on a theoretical basis and from an evolution perspective, this dimension is likely to change in a continuum from a fixed perspective to a fluid perspective. At a lower level, there is an absolute truth with certainty. At higher levels, knowledge is empirical and evolving. Reflecting on the responses of the participants, some possible explanations can be derived. The most significant point, such as the previous components, is the evolution of this factor. As we grow older, we are witnessing the emergence of beliefs that are far wiser than beliefs at lower ages. The students of the first three years, especially the first and second grades of the elementary school, know science to be almost unchangeable. In their perspective, if a knowledge that was made and presented in the books changed, then education would be meaningless.

Source of knowledge: At a lower level, most epistemic models, knowledge is obtained out of itself and through the expert, and transmitted through them as well. In order to understand the views of the children of this age from the source of their knowledge, such questions were asked: Can scientists also make a mistake? How much do you trust the content of the books you read? Is your teacher able to answer all your questions? Therefore, the expectation was met that children of lower ages found knowledge and claims in the hands of the powerful to be inevitable accepted. However, at higher ages, people had become structuralism, that is, they, with all their abilities, gave meaning to the environment and their receptions from the environment, so that they doubted the accuracy of the content they received from different people. In their integrated model for epistemological development, Bendixsen and Rule (2004) introduced one of the factors influencing epistemological development to be epistemological doubt. Therefore, the source of knowledge can also be examined in a continuum. A continuum on which, one side is source of knowledge out of person, and on the other side, the source of one's knowledge is the constructor of every meaning and concept.

Justification of knowledge: This dimension emphasizes on how individuals evaluate claims about knowledge, including the use of evidence, the use of sources of production by experts, and evaluating them from expert opinions. In the reflecting judgment model, individuals at low epistemic levels justify beliefs by observing or relying on expert opinions, or based on what they feel to be right. Only at higher levels, people use research rules and begin to evaluate and integrate expert opinions individually and internally. The question raised in the interview to obtain the students' point of view about this component was: Has a question occupied your mind? What did you do to find the right answer?

Investigating the responses of the participants shows that, despite the expectation of a development in this component like other components, the students of the elementary school do not have a clear understanding of the process of scientific research. It seems that the type of education to these people has provided the easiest way to find answers to questions. So that asking adults and internet referrals is the only suggested solution for these children. Asking questions in a challenging way can be helpful. Moreover, the fact that schools should be equipped in terms of facilities so that ultimately students play a role in the research



process in the sense of their own science and find the answer to their questions themselves. In addition, excessive emphasis on abstract questions, which usually have no definite answer, while leaving the mind from certainty, reduces the ability of scientific arguments, which will have consequences in the coming years, in universities and in the working environment.

Based on the results of the quantitative study, the Cronbach's alpha coefficients in two retests was obtained from 0.64 to 0.85 for the whole scale and its factors, and in the third study, it was obtained from 0.73 to 0.85, indicating that personal epistemology scale has an acceptable and satisfactory credibility. In terms of validity review, content validity was considered by experts and was prepared by performing structural analysis modifications. The results of exploratory factor analysis using main components' analysis showed that this questionnaire is a multi-factor scale. Accordingly, five factors of simplicity of knowledge, certainty of knowledge, source of knowledge, outcome of knowledge and justifying knowledge were obtained. In addition, the extraction factors from the questionnaire show that the factors of simplicity of knowledge, certainty of knowledge and justification of knowledge, was also seen in the Iranian sample like the factors proposed by Hofer and Pintrich (1997); the factor of the outcome of knowledge was one of the explanatory dimensions of the present research. The source of knowledge is different from the notion of the source of knowledge cited in previous studies. In the background of studies, the factor of source of knowledge on both sides of the continuum has changed its meaning from the external source in the hands of specialists versus the internal source that one makes knowledge himself and knows it in its own hands to the meaning of source in the hands of specialists versus divine source. In addition, the results of the confirmatory factor analysis confirmed the existence of the five factors. In the following, four and six factor competing models were examined. The proposed five-factor model seems to be more acceptable. Moreover, the convergent validity of the present questionnaire with the Conley et al. (2004) questionnaire also emphasized the correlation between the subscales of the two questionnaires.

Accordingly, the extracted factors of simplicity, certainty and source of knowledge in this study are consistent with the results of the studies of Schommer (1990) and Hofer (2000), and the reason for the validity of the knowledge was also found in Hofer's (2000) study. Of course, these two questionnaires provided a tool for high school students. Conley et al. (2004) also emphasized the source and certainty factors of knowledge as well as the justification of knowledge. The questionnaire also studied beliefs in elementary school children in the field of science. Therefore, the results of this study are somehow in line with the findings of these studies. Nevertheless conceptually, the source of knowledge can be explored in some other way in the present study.

Participant children in the study emphasized the external source in the hands of all-knowing expert, but placed it against a divine source, which was primarily in the hands of God and was given to the prophets through heavenly books. It seems that the subject of epistemology in the sample is largely mixed with ontology. In general, one of the goals of Iranian education is to achieve a pure life as the ultimate goal. Pure life assures a development in the individual and social dimensions of human life based on inclination to God. This goal is also somehow seen in the educational philosophy that teachers take into account, as well, the content of textbooks is also formed based on these goals. Therefore, it is



clear that the type of student thinking in such a system will be based on religious perspectives and God will be at the center of every things. On the other hand, the existing views in Islamic philosophy that are observed in the system of Islamic and Iranian education, especially the philosophy of illumination, are largely in line with theories of existentialism in Western culture. In fact, it is necessary to make a fundamental change in the philosophical principles of conceptualization of beliefs, and existentialism should be considered more. However, in some respects, existentialism and Islamic philosophy are different. In Islamic philosophy, ontology and the spiritual perspective, considering the ultimate end, that is, the God is the most controversial issue. In existentialism, emphasis is on individuality, and in fact, existence is prior to nature. Under such circumstances, it is clear that the major responses of Iranian students to epistemological questions are mixed with the existential concepts and divine targeting and are reflected in the dimensions of personal epistemology.

On the other hand, the exploratory factor analysis of the questions posed indicates a correlation between some of the questions that are introduced as the outcome of knowledge versus the process of knowledge. These students, in response to questions asked about the source of knowledge, often acknowledged that even if scientists were wrong, there was no problem because they had done enough effort and their work was respected. It seems that these children, in addition to the spiritual thinking that came from the educational system, have done a special explanation of the epistemological questions regarding the stage of moral development in which they are located. This group of children were mostly in the first stage of the ethics standard, that is, "the good boy, the good girl". At this stage, good behavior is a behavior that brings upon others' approval and confirmation or satisfaction and make them happy. Because of the diminution of the child's self-control, which is associated with the objective stage, the child can put himself in others' shoes. Therefore, considers the feelings of others in his own behavior. Of course, it is important to note that this factor is exploratory and its questions have been removed in four- and six-factor models or placed under other factors. It seems that future researches can provide more information about this factor.

Therefore, personal epistemology is a cultural factor. In general, culture is the core of accepted beliefs, and commonly used collective practices, and from another glance, it is a set of assumptions, values, and behaviors that result from phenomena such as learning and beliefs of individuals. Therefore, it can interact with personal epistemology. In addition, a value that learners have for understanding learning and belief in knowledge has different meanings in different cultures. Hence, some researches emphasize the importance of placing personal epistemology in social and cultural frameworks and know its formation as the result of culture. Achieving factors apart from the factors in other studies shows largely the role of culture in explaining beliefs. It seems that the concept of dependence in some collective societies is capable of influencing learners' beliefs; while in individualist societies, personal beliefs about knowledge are formed more in relation to acceptance of contracts with independent thinking. In societies that hierarchy of power is considered, learners accept teacher with a higher level of knowledge and expertise, in relation to themselves. However, this gap of power can be defined in another way in societies with a religious perspective. In general, Iranian students had a dual and somewhat absolute and definitive view towards changing beliefs, which largely refers back to the religious worldview governing the educational system. In fact, they saw the worldly science in the hands of scientists and



specialists to be changeable, but they also saw the change in God's providence. It seems that in the hierarchy of power and relations, the highest power is in the hands of God and then of the prophets, and certainty is only meaningful in this category.

The results of this study confirm the validity and reliability of the questionnaire of personal epistemology at the same time with limitations. These limitations, especially in the context of examining the types of validity of a scale that is a continuous process, are more evident. Accordingly, the preparation of research projects in order to complete the validation process of this scale and even the repetition of some researches to confirm the findings are proposed as a necessity. In spite of the proper fit and the acceptable psychometric characteristics of this tool, its broader acceptance is conditional on its greater use, especially in different contexts. In addition, factor analysis of higher rankings can yield more results. In general, the proper psychometric characteristics, the short duration and ease of implementation of this questionnaire, provide the conditions for extensive use of researchers. This scale can be used in educational and research situations and provides the basis for numerous researches in the field of educational and developmental psychology in children.

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