

## Relationship of Epistemological Development with Wisdom, Age, Gender and Education

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The present study investigated the relationship of epistemological development with age, gender, education and wisdom. The data were collected from 150 participants through convenient sampling. The sample included 83 men and 67 women in the age range of 17- 55 years with undergraduate, graduate, and post graduate levels of educational qualification. Epistemological development scheme as proposed by Perry (1968) was taken as the basis for measuring stages of epistemological development. It was hypothesized that epistemological development levels will show a significant positive relationship with wisdom, age, educational qualification and gender. The results indicated significant positive relationship of epistemological development with age, education and wisdom. Gender showed no inverse relationship with epistemological development levels. Results of two-way ANOVA also showed significant main effect of gender and educational qualification. Age however did not yield significant main effect on epistemological development among adolescents (17-21 years), young adults (22-40 years) and middle aged adults (41-55 years). The results and suggestions are discussed in the light of existing literature.

*Key-words:* epistemological development, gender, age, education, wisdom.

When adults, face socio psychological problems that have no prescribed formula for their solution, they have to think in complex ways to sort out such problems. This involves monitoring elements of thought processes, such as sources, criteria for certainty and limits of knowledge (King & Kitchener, 2004). Such problems include dilemmas such as death of a loved one or decision regarding marriage. To resolve these problems reflective thinking leads to change in epistemological assumptions about knowledge and knowing, especially “the limits of knowledge,” “the certainty of knowledge,” and “the criteria for knowing” (Kitchener, 1983, p.222). These three components change with growth of an individual in the physical and cognitive domains where epistemological development can be traced to post formal thought and which includes the role of context, identity and self, in determining the adult thinking beyond formal operational stage proposed by Piaget (Marchand, 2001) characterized by logical thought, experience and context (Labouvie-Vief, 1992).

The earliest systematic work on epistemological development was carried out in a longitudinal study at Harvard by Perry (1968) who conducted interviews of students regarding their conceptualization of knowledge and meaning making process. Over the course of 15 years and having interviewed around 500 students Perry (1968) came up with his nine stage categorization of development of epistemological assumptions which he called intellectual and ethical development in adulthood and included:

1. Dualism: Thinking is dichotomous. Person thinks that knowledge is absolute. At this stage, the person thinks that absolute knowledge which is uncontroversial, cannot be debated and universally true, exists. He would for example believe that scientific truth cannot be debated and that science is the only criteria to judge the truthfulness of a knowledge claim.
2. Multiplicity pre legitimate: Person begins to see that there is more than one answer which means that there is no single absolute answer.
3. Multiplicity legitimate but subordinate: Person realizes that more than one answers are present, which means that more than one view of knowledge is present but he still thinks that only one of these many views is the right one and he searches for it.
4. Multiplicity: person realizes that all perspectives on knowledge equally hold true. There is no absolute view of knowledge. He may stop searching the ‘truth’ because ‘truth’ in the sense of absolute reality does not exist.
5. Contextual relativism: Person becomes capable of evaluating the different views of knowledge keeping in mind the context. Some views are true in one context but not true in another context. Person begins to evaluate the argument.
6. Commitment foreseen: The person begins to understand that in the multiplicity of views of knowledge available, the only way out for him is to choose one particular view that suits his context and stay committed with it.
7. Initial commitment: This stage is marked by a person’s earliest experiences of commitment with what he deems to be true. Stages 8 and 9 are different mostly in qualitative terms and may not appear hierarchically very dissimilar.
8. Orientation in Implications of Commitment: At this stage the person explores the outcomes of commitment, which may not be as easy to handle were expected.
9. Stage 9 refers to maturity in dealing with the consequences of commitment experienced in earlier stages and a mellowness that

keeps on developing in this process of maturing.

Many theorists use different comprehensive terms to subscribe to these stages. For example reflective judgment (Kitchener & King, 1981), epistemological reflection (Magolda, 1992), argumentative reasoning (Kuhn, Cheney & Wienstock, 2000) and reflective thinking (Kember, Leung, Jones, Loke, McKay, Sinclair, Tse, Webb, Wong, Wong, and Yeung, 2000) presented their respective stage theories but their stages correspond among Perry's nine stages which forms the common thread running through these theories (Zhu, 2016).

The basic element of all the theories of epistemological development is 'reconsideration' of existing beliefs and knowledge to give newer meaning to a situation or a set of pieces of information. This reconsideration leads to transformation of perspectives on the problem situations validating newer perspectives. Thus people move from absolutist to multiplist to relative thinking.

If we look at the works based on epistemological development, we can find that it has usually been associated with certain variables such as age, education and gender. In terms of reflective judgment, King and Kitchener (2004) found consistent evidence for developmental patterns in literature. In another longitudinal study spanning six years from high school juniors to college juniors to doctoral students suggested that epistemological development was positively correlated with age (Kitchener & King, 1981). Education level was also found to be consistently associated with increasingly complex stages of reflective judgment, which suggested that increasing education levels improve epistemological development.

Where many theorists (Dittman-Kohli & Baltes, 1990; Baltes & Staudinger, 1993; Levinson, 1990; Pascual-Leone, 1990) describe self-reflective thinking as a part of development in adulthood. Many researches provide evidence which contradicts the idea that epistemological development is positively related with age for example Kuhn, Cheney and Wienstock (2000) found that complexity in cognitive development did not increase with age. They investigated the developmental pattern of cognitive development in aesthetic and truth judgment domains based on Kuhn's model, whose stages go parallel to the stages of epistemological development as presented by Perry (1968). The model consists of following three levels. Absolutist thinking, which is thinking in terms of either/ or such as when a student thinks that either the answer to an issue given by teacher A is right or the answer given on the same issue by teacher B is right. Multiplist thinking refers to being able to take up different viewpoints for example, when the student thinks that teacher A and B, both have the right to have their own perspectives even if their answers are different. Evaluativist thinking is the kind of thinking in which a person is able to weigh and evaluate a particular viewpoint in light of arguments such as evaluating the argument given by teacher A and teacher B each and then reaching one's own conclusion. The findings revealed that the progression from absolutist to multiplist thinking is equally common to adults from all cultural backgrounds. However, the movement from multiplist to evaluativist thinking, does not yield evidence of it being related with age, as many under graduates showed more evidence of evaluativist thinking in comparison with older adults.

Therefore, age cannot be considered as the only factor contributing to the increase in the complexity of epistemological beliefs. In fact, other factors such as active involvement in the environment around may be more likely factors to increase the complexity of epistemological assumptions.

Schaie (2005) explored the epistemological growth of 5000 adults over age 35 regarding decision making in situations of crisis and opportunity and found that intellectual ability does not necessarily deteriorate with age among people who stay involved in activities even in old age. This shows that cognitive complexity and intellectual ability are more strongly influenced by the activities people engage in regardless of their age.

Besides age, gender has also been considered as an important factor related with epistemological development. For example Belenky, Clinchy, Goldberger, and Tarule (1997) studied women's ways of knowing and came up with five stages of development of knowing which were named as silence, received knowledge, subjective knowledge, procedural knowledge and constructed knowledge. Progression of development of knowing is almost similar to Perry's stages of epistemological development with received knowledge going parallel to absolute knowledge in Perry's (1968) stages subjective knowledge being similar in meaning to multiplicity, procedural knowledge being similar in meaning to relativism and constructed knowledge comparable with commitment stages. The first stage, 'silence', however can be placed before the first stage of absolute knowledge in Perry's scheme. This stage is characterized by lack of any internal dialogue or the lack of confidence to put one's internal dialogue into words. This is different from Perry in the sense that Perry's stages begin with 'dualism', at which a person is at least expressing his/ her opinion and presenting ideas. So, this study uncovered how women's ways of meaning making are not exactly similar to some of the mainstream conceptualizations of epistemological thought.

Lodewyk (2007) studied the relationship among epistemological beliefs, academic performance, gender and performance on ill-structured and well-structured tasks using Measure of epistemological reflection (Baxter-Magolda, 1987). The results indicated gender differences in epistemological beliefs with boys having more naïve beliefs regarding ability being predetermined, knowledge being certain and learning being quick. Almost similar findings were reported by Schommer-Aikins and Hutter (2002). They explored the relationship between epistemological beliefs and thinking regarding everyday debatable issues. The results indicated gender differences in the complexity of thinking with women showing more complex thinking as well as having more propensity to look at issues from various perspectives rather than from a few.

Evidence that women think in more complex ways was also reported in studies on epistemological thinking (Galotti, Clinchy, Ainsworth, Lavin & Mansfield, 1999) and on reasoning patterns and learning needs (Payn, 2009). The findings of these studies suggest that women are more likely to be empathic, connected and have interpersonal reasoning patterns, which reflect complex form of thinking that demands taking others' perspective and trying to connect with others' viewpoints.

Another variable that has been theorized by many experts as being related to epistemological development is education. Perry (1968) pioneering work implied relationship between epistemological development and education. Logically, as well more learned people are supposed to be ones having more complex thinking. As they have more pieces of knowledge that can be inter-connected in the process of meaning making. Simpson, Dalgaard, and O'Brien (1986) found evidence among medical students that their epistemological beliefs developed from dualistic to multiplistic as they progressed in their study program. Mines, King, Hood, and Wood (1990) in their study of graduate students also found similar trend of progression in epistemological stages as they moved on

from basic to advanced levels in their study program.

Pavelich and Moore (1996) studied how experiential curriculum helped engineering students develop skills to deal with real life, vague problems they would face in their profession as such problems do not have any readily available solutions. They predicted experiential curriculum to parallel stages of epistemological development (Perry, 1968). Their findings revealed that there was development in epistemological thinking of students from freshman to senior years up to stage 4 which is characterized by realizing and accepting multiplicity of perspectives on a single problem. However, only one quarter of students showed development beyond stage five which is highly desirable for students to deal with real life problems. The findings of this study suggest that with increase in education levels, students showed advancement in epistemological stages as well, however this was so only up to stage 4 (multiplicity legitimate) in Perry scheme and only one fourth of students were able to move beyond stage 4. Therefore, education can be considered as affecting epistemological development although only up to stage 4.

May and Etkina (2002) explored relationship between engineering students' conceptual learning in physics and epistemological development at Ohio. The results indicated that high levels of conceptual learning were related with complex epistemological thinking. This shows that the transformation which the process of education and learning are supposed to bring is accompanied by progress in epistemological thinking as well thus providing evidence for the relationship between epistemological reflection and education.

A meta-analysis conducted by Kitchener, Wood and Jensen (2003) on the studies using reasoning about current issues (RCI) revealed that educational level and epistemological beliefs were related. They found these results even after controlling for the effects of academic aptitude and previous academic achievement. Besides, King and Kitchener (2004) report and found support for the relationship between reflective judgment and education even when effects of age were controlled.

Payn (2009) however, discovered that educational level and epistemological development levels were not related, which contradicts the findings of many previous studies (Magolda, 1992a; Belenky, Clinchy, Goldberger, & Tarule, 1997; and Kitchener & King, 1981).

Considering higher stages of epistemological development as post formal thought, since, epistemological development has its roots in post formal thought (Marchand, 2001), it can be inferred from certain studies that education level is not associated with such complex forms of thinking. For example Falcone (2000), in his study on the relationship of post formal thought with conceptions of wisdom with age and education as mediators found that dialectical thinking is not related with education level.

Therefore, although common sense and a significant number of studies support the relationship between reflective thinking and education, a few studies with findings contradictory to this common sense association between education and reflective thinking make the relationship unclear and ambiguous.

Since epistemological reflection is considered to be a higher and more complex form of thinking, it can also be related with the concept of wisdom, which is another variable that the present study is interested in.

Wisdom can be identified in several ways and many researchers and theorists have tried to define this construct.

Ruisel (2005) describes wisdom as having two cognitive

components, one being relativistic thinking which is the ability to overcome one's biases and taking on others' perspective and the second one being dialectical thinking which refers to developing meaningful links between various problems as well as assimilating the various components of the same problem.

Baltes and Staudinger (1993) defined wisdom in their study as "an expert knowledge system in the fundamental pragmatics of life permitting exceptional insight, judgment and advice involving complex and uncertain matters of the human condition" (p.76).

According to Sternberg (2008b) wisdom refers to using intelligence and experience keeping in view the values in order to work for some shared purpose.

Keeping in view these definitions of wisdom, association can be drawn between epistemological reflection and wisdom.

As change in epistemological assumptions through reflective thinking is assumed to accompany the development of wisdom. This can also be hypothesized from the theorization of wisdom by Smith (2012), who considered Erikson's idea of wisdom as maturity postulates that wisdom usually comes in middle or old adulthood period when a person is able to link and understand various opposing aspects of a situation.

Ardelt (2004) also proposed wisdom as having three components: cognitive, reflective and affective.

Relationship between wisdom and epistemological development can also be inferred from description of Dittman-Kohli and Baltes (1990) who suggest that usually wisdom is conceptualized as being related to practical intelligence which takes into consideration the context and knowledge related aspect of intelligence. This contextual reflective thinking can make one progress in the complexity of epistemological thinking.

The current study was conducted in order to investigate the relationship of epistemological development with age, gender, education and wisdom.

Previously most of the work on epistemological development is with reference to academic settings, focusing mostly on college students and teachers.

The present study however, explored epistemological development beyond academia and primarily focused on investigating how epistemological reflection is related with age. It was decided to study age groups including late young adulthood and middle adulthood because a person in these stages of adulthood has moved out of formal educational settings, into more practical, applied settings. Both in personal and professional life, the person faces real-life situations, where he has to respond cognitively as well as behaviorally. Therefore, the pressures and demands in these stages of life are expected to push a person into complex modes of reflection in the absence of any formal guidance and prescriptions. This is where we can actually see how epistemological assumptions and beliefs come into play in real life. Hofer and Pintrich (1997) also point to this gap that work on beliefs about knowledge has been done primarily in academic settings and the social and culture related factors that stimulate the higher forms of reflective thinking after the completion of formal education, have not been studied.

The present study aims to fill this gap by studying epistemological development not only among people who are still studying but those as well who are finished with their studies and have entered practical life settings.

## Objectives

To explore the relationship of epistemological development with

age, education, gender and wisdom.

## Hypotheses

To investigate the effect of age, education and gender on epistemological development.

1. Epistemological development would have significant positive relationship with age, education, gender and wisdom.
2. Individuals with varying levels of educational qualification would differ significantly in terms of epistemological development scores.
3. Older adults would score higher on epistemological development than the younger adults.
4. There would be significant gender differences in terms of epistemological development.

## Method

### Sample

One hundred and fifty participants, both men and women across the three age ranges, 17 – 21 years, 22 – 40 years and 41 – 55 years took part in the study on the basis of convenience sampling (see Table 1).

The inclusion criteria were the participants having minimum educational qualification of matriculation so that they could understand the questionnaires and provide written responses. People with educational qualification below matriculation were excluded from the study.

### Tables

#### Sample Characteristics

Characteristics	<i>N</i>	(%)
Gender		
Males	83	(55.3 %)
Females	67	(44.7 %)
Age		
Adolescents (17-21 years)	29	(19.3 %)
Young Adults (22-40 years)	97	(64.7 %)
Middle Aged Adults (41-55 years)	24	(16 %)
Education		
Undergraduates	49	(32.7 %)
Graduates	85	(56.7 %)
Post graduates	16	(10.7 %)
Marital Status		
Single	87	(58 %)
Married	59	(39.3 %)
Divorced	4	(2.7 %)

### Vignettes

For measuring epistemological development, three open ended responses were asked to the participants. Two socio psychological vignettes were used, to which the participants had to give open ended responses. The socio psychological vignettes were selected with the consensus of three judges, on the basis of their representation of Pakistani culture in terms of collectivist culture, caste issues in marriage and conflict between parents and children due to generation gap. Another reason these vignettes were selected was that the participants in all three age groups in the present study could somehow relate with the main characters in two vignettes.

The following are the two vignettes:

#### Vignette 1

Ayesha is a student of bachelors. She is 22 years of age. A few months back her class fellow proposed her for marriage. She has known him for three years as good friends and colleagues and has a good opinion about him. She likes him but is also faced with the constraint to marry within her caste. Her parents are very loving and kind but they are also very caste and ‘baradri’ oriented. Although she is not passionately in love with the guy, still, she realizes that good and reliable match for marriage is also hard to find these days. Besides, there is apparently no good match for her in her near relatives. She is thinking about going against this family tradition and marrying this guy no matter what.

Do you think she is going to take the right decision?

If yes, give your reasons.

If no, give your reasons.

What, in your opinion should be important considerations for her in taking the decision?

#### Vignette 2.

Umar is 28 years old. He lives with his mother and a younger sister. Few years back he was studying in Lahore. He was a very hard working and talented student with high ambitions for his future. He was about to get admission for further studies, when his father died. It was a sudden death and after that, Umar had to come back and stay with his mother and sister in a small city, in their family owned house. He had big dreams but now he is living in a small city doing a job that he does not like, with a monotonous routine of 9am to 5pm. He spends the rest of his time with his mother and sister, goes out with them and takes care of their needs. Although he loves his mother and sister and is deeply concerned about them, he does not feel satisfied with his life at all because of the un fulfillment of his dreams and ambitions.

Please explain:

How can he get out of this feeling of unfulfillment?

What is the reasoning behind whatever you think he should do?

What are the important considerations he should keep in mind according to you?

For the third open ended response, the participants had to provide description of one situation that they had experienced with the following instructions:

“Think of a situation in your life, when you had difficulty choosing among the multiple courses of action / multiple interpretations of the situation available to you. It does not matter you actually took the decision or not. Describe it in as much detail as possible.”

The open-ended responses to these vignettes were then judged by two independent raters. On the basis of their judgment, the raters assigned them any of the first six stages of epistemological development as given by Perry (1968). The responses were evaluated on the basis of cue lists developed by Mentkowski, Moeser and Strait (1983). Mentkowski, Moeser and Strait (1983) developed these cue lists in order to measure stages of epistemological development among students at Alverno. The cue list carries separate cues for each stage of epistemological development. These cues can be searched for in the text produced by the respondent and the stage whose largest number of cues is found in the text, is assigned to that particular respondent. For example, stage 2 was assigned if the largest number of stage 2 cues were found in a particular respondent’s text. The judgments were originally made independently but later if any differences were found between the two judges on the same response, the judges

discussed and agreed upon a single stage following the method of Mentkowski, Moeser and Strait (1983). Sample cues:

Stage 1. Believes that people in authority are right by definition.

Stage 2 Reacts against diffuseness, fuzziness and uncertainty. Values clear, straightforward (no nonsense) approach.

Stage 3, Recognizes three realms: Right; Wrong; and Not Yet Known. Stage 4 May move from the way of thinking to ways of thinking.

Stage 5, Shows an understanding of context.

Stage 6, Commitment is foreseen as a resolution of the problems of relativism but it has not yet been experienced.

Cronbach's alpha of the three vignettes was found to be .79. Evidence for convergent validity was provided by significant correlation .371\* between Openness dimension of a personality scale, HEXACO-60 (Lee & Ashton, 2013) and scores on epistemological vignettes.

Wisdom was measured by Wisdom Development Scale (Brown & Greene 2006), which is developed by and based on Brown's (2004b) model of wisdom development, which is a perspective that defines wisdom, explains its development and discusses the factors that affect it. It posits that six factors underlie the concept of wisdom, which are self-knowledge, understanding of others, judgment, life knowledge, life skills and willingness to learn.

However for the purpose of the present study, only four of these factors were administered, which included:

Self-Knowledge, which is related with knowledge about one's own qualities, faults, values and maintaining an internal locus of control across situations.

Sample item: I am well aware of all of my weaknesses. Judgment, which includes trying to take into consideration, various perspectives and situations before reaching a decision or making a judgment. Sample item: I take the context of the situation into consideration when making decisions. Life Knowledge, which refers to understanding deeper meaning of life through the ambiguities that life poses. Sample item: I accept there are uncertainties in life. Willingness to Learn, which is related with one's recurrent attempts to gain knowledge and to persistently keep learning new things. Sample item: I enjoy learning for the sake of learning.

The Cronbach's alpha for the full scale, calculated by Brown and Greene (2006) was .963. Inter-correlations between the subscales were between .5 and .8. On the current sample Cronbach's alpha for full scale was found to be .86.

Confirmatory factor analysis conducted by Brown and Greene (2006) for the sample from professional organization and that from an under graduate institution provided evidence in support of the construct validity of the scale. Most of the individual item standardized factor loadings were more than .4.

*Procedure*

Informed consent was taken. Convenience sampling technique was used. Correlational research design was followed in this study. Questionnaires were administered to the participants. The data were collected and open ended responses were sent to both judges for rating. There was high degree of inter-rater agreement on independent ratings of responses between the two judges, with Cohen's kappa,  $\kappa = .80$  (95% CI, .300 to .886),  $p < .000$ . The responses that were assigned different rating by the two judges were later assigned a single stage score through community approach by the two judges with mutual agreement. These ratings were then used as epistemological development stage scores.

**Results**

Correlation analysis indicated positive relationship of epistemological development stage scores with age, education, and wisdom. Epistemological development stage scores and the scores on WDS showed significant positive correlation both with the WDS total score ( $r = .43$ ,  $p < .01$ ) and the four subscales of WDS (see Table 2).

Two-way ANOVA indicated that main effect of age,  $F(2, 144) = 1.88$ ,  $p = ns$  was not significant whereas the main effect of gender  $F(1, 144) = 4.12$ ,  $p < .05$  was significant. The interaction of age and gender,  $F(2, 144) = 1.79$ ,  $p = ns$ , was found to be non-significant (see Table 3a and Table 3b).

A two-way ANOVA was also conducted on epistemological stage score by education and gender. The results indicated that main effect of education,  $F(2, 144) = 4.6$ ,  $p < .05$  was significant, with post graduates' group showing highest level of epistemological development ( $M = 3.9$ ,  $SD = .9$ ). The main effect of gender  $F(1, 144) = 7.3$ ,  $p < .01$  was also significant with males showing higher level of epistemological development ( $M = 3.3$ ,  $SD = 1$ ). However the interaction of education and gender,  $F(2, 144) = 2.5$ ,  $p = ns$  was found to be non-significant (see Table 4a. Descriptive Statistics of

Table 2  
*Correlation Matrix of Epistemological development scores, Age, Education, Gender, WDS and WDS Subscales*

Variables	1	2	3	4	5	6	7	8	9
1. Epistemological Reflection	-	.172*	.23**	-.129	.43**	.338**	.410**	.285**	.325**
2. Age		-	-.005	-.038	-.068	-.013	-.109	-.105	.06
3. Education			-	.007	.19*	.207*	.172*	.106	.131
4. Gender				-	-.005	.013	.002	.09	-.156
5. WDS total					-	.778**	.870**	.873**	.62**
6. WDS Willingness to learn							-.56**	.601**	.383**
7. WDS Life Knowledge								-.69**	.33**
8. WDS Judgment									.404**
9. WDS Emotion management									-

\*\*= $p < .01$ , \*= $p < .05$   
WDS = Wisdom Development Scale

Table 3(a)  
*Descriptive Statistics of males and females of different age groups on epistemological development stage scores*

Age group	Gender	<i>M (SD)</i>	<i>N</i>
Adolescents (17-21)	Men	2.88 (1.07)	18
	Women	2.90 (.83)	11
	Total	2.89 (.97)	29
Young Adults (22-40)	Men	3.37 (1.10)	48
	Women	3.14 (.88)	49
	Total	3.25 (1.00)	97
Middle aged Adults (41-55)	Men	3.47 (1.00)	17
	Women	2.42 (.78)	7
	Total	3.16 (1.04)	24
Total	Men	3.29 (1.08)	83
	Women	3.02 (.88)	67
	Total	3.17 (1.00)	150

Table 3(b)  
*Two-way ANOVA showing effects of Age and Gender on Epistemological Development Levels*

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>
Age	3.70	2	1.85	1.88
Gender	4.06	1	4.06	4.12*
Age x Gender	3.5	2	1.76	1.79
Error	141.78	144	.985	

Table 4(a)  
*Descriptive Statistics of males and females of different education levels on epistemological development stage scores*

Gender	Education	<i>N</i>	<i>M</i>	<i>SD</i>
Males	Under graduates	30	3.0	(.99)
	Graduates	44	3.2	(1.0)
	Post graduates	09	4.4	(.72)
	Total	83	3.3	(1.0)
Females	Under graduates	19	2.8	(.5)
	Graduates	41	3.0	(1.0)
	Post graduates	07	3.1	(.7)
	Total	67	3.0	(.8)
Total	Under graduates	49	2.9	(.84)
	Graduates	85	3.1	(1.05)
	Post graduates	16	3.9	(.95)
	Total	150	3.1	(1.00)

Table 4(b)  
*Two-way ANOVA showing effects of Education and Gender on Epistemological Development Levels*

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>
Education	8.6	3	4.3	4.6*
Gender	6.8	1	6.8	7.3**
Education x Gender	4.6	2	2.3	2.5
Error	133.8	144	.93	

males and females of different education levels on epistemological development stage scores and Table 4b. Two-way ANOVA showing effects of Education and Gender on Epistemological Development Levels).

## Discussion

The findings of the present study revealed epistemological development to be significantly positively related with age, education and wisdom. Regarding the positive relationship between epistemological development and age this finding is in line with some of the previous researches that have found age to be significantly related with epistemological reflection, such as that by King and Kitchener (2004) and with meta cognition by Vukman (2005). The results of two-way ANOVA for age and gender as independent variables however do not reveal any significant main effect of age. The findings are partly supported by the researches on brain functioning by Geert and Fischer (2009) and Fischer and Rose (1994) who provided evidence that brain keeps developing in terms of processing complex emotions and thought processes up to mid 40s. That is probably why people can think in increasingly complex ways up to mid 40s. However, the existing literature as well, does not provide consistent evidence for the relationship of epistemological development and age. For example there are studies that have found epistemological development to be unrelated with age (Kuhn, Cheney & Wienstock, 2000; Payn, 2009). The present study as well although provides evidence for age and epistemological development to be related, reveals main effect of age to be non-significant on epistemological development. This contradictory finding of the current study might be attributed to the grouping of age ranges for two-way ANOVA. It can be speculated that probably epistemological development progresses with age but the differences in epistemological development do not become visible enough to produce significant main effect of age in the current age groups. However this speculation needs to be tested.

The results of the present study also indicated that a significant positive correlation exists between epistemological development and education. Moreover the findings indicated that epistemological development levels differ among individuals with varying levels of educational qualification. Similar findings have been discovered by many studies (Kitchener & King, 1981; Schommer, 1994; Magolda, 1992a; Perry, 1968; Mines, King, Hood, & Wood, 1990; Simpson, Dalgaard, & O'Brien, 1986). This finding was also strongly expected, because increasingly higher levels of education are supposed to impart and encourage increasingly complex modes of thinking. Besides, post graduate education, makes people increasingly surrounded by actual issues and decision making situations, as opposed to the hypothetical situations and theoretical solutions that are a part of under graduate academic learning. This pushes a person further on to higher modes of thinking. Hofer and Pintrich (1997) have given similar explanation that graduate studies inculcate logical and scholarly thinking style and this skill is what students are supposed to learn and show in assessments. Therefore, logical and intellectual thinking becomes an essential ingredient of graduate learning and becomes even more consolidated with increasingly higher levels of education.

However, on the other hand certain studies, such as that by Payn (2009) provide evidence that education is unrelated with a person's epistemological beliefs. As far as the findings of Payn (2009) are concerned, the difference in education attainment was not large enough to have caused statistically non-significant difference among the groups. Another possible explanation for non-significant relationship of education with epistemological beliefs is that the domains in which a person gets a certain kind of academic training, is exposed to a certain kind of instructor and the kinds of activities they do, may become strong and complex (Palmer & Marra, 2004)

in terms of epistemological beliefs and the domains which are not the subject of academic activities, a person may not show any effect of education in them.

The findings of the present study however attest to the possibility that education helps in development of higher levels of epistemological thinking

Epistemological beliefs also showed significant positive relationship with wisdom. Although there has not been done a great deal of work on the relationship between epistemological development and wisdom, the available work suggests that wisdom and complex thinking are strongly related (Jeste, Ardel, Blazer, Kraemer, Vaillant & Meek, 2010).

Gender differences in epistemological development were also found to be significant. Most of the previous findings, such as those by Schommer-Aikins and Hutter (2002) and Galotti, Clinchy, Ainsworth, Lavin, and Mansfield (1999) also report gender differences in complexity of thinking pattern.

However the unexpected difference of the present research finding from the findings of the previous works lies in the fact that female participants showed relatively lower levels of epistemological development as compared with males. One reason for this might be the eloquence in written expression. Women probably in Pakistani culture are more comfortable in expressing themselves when they talk rather than when they write about their thoughts. Another reason can be that the gender role socialization inculcates in women the tendency to be less expressive. Probably this is the reason that women despite going through dilemmas and conflicts are unable to logically express their thoughts and feelings and hence score lower on epistemological stages.

This gender difference can also be attributed to the fact that males have real-world exposure at their workplace while more women stay at home in rather protected and not frequently changing environment. Therefore, women get lesser exposure to multiplicity existing in the world out there. However, in-depth interviewing may shed more light on this difference in epistemological development between the two genders.

Epistemological development also showed significant relationship with wisdom. Although there has not been done a great deal of work on the relationship between epistemological development and wisdom, the available work suggests that wisdom and complex thinking are strongly related. For example, the works of Jeste, Ardel, Blazer, Kraemer, Vaillant, and Meeks (2010) and Orwoll and Perlmutter (1990) on wisdom suggest that wisdom is accompanied by complex modes of thinking or reflection. Ardel (2004) proposed wisdom as having three components: cognitive, reflective and affective. The reflective aspect refers to complex modes of epistemological development. In another study, Jeste, Ardel, Blazer, Kraemer, Vaillant, & Meeks (2010) proposed the idea that measurement of wisdom should also utilize qualitative analyses of interviews regarding how have people tackled difficult situations in their life and what have they acquired from such experiences. This tackling of difficult life situations certainly involves reflective thinking, which therefore becomes an essential ingredient of wisdom.

Dittman-Kohli and Baltes (1990) also suggest that usually wisdom is conceptualized as being related to practical intelligence which takes into consideration the context and knowledge related aspect of intelligence which are exactly the processes that constitute higher epistemological levels.

In the light of the findings we can infer that epistemological development is positively related with age, education and wisdom.

Furthermore age, gender, education significantly affect the progress along epistemological development trajectory.

### Conclusion

The findings of the present study show that age and gender are related with epistemological reflection with males showing increasing complexity in epistemological reflection with age. Females whereas, do not show marked increase in epistemological reflection with increasing age.

Education also seems to impart higher levels of epistemological assumptions as people with increasingly higher educational qualifications show increasingly higher and complex modes of epistemological development.

Wisdom and epistemological development have been found to be strongly related. This can be probably because of the ability to reflect that leads to development of wisdom and makes it possible to accept and understand complexity.

### Limitations and suggestions

The present study employed common socio psychological issues as vignettes to assess epistemological development. However, more specific, domain related vignettes such as political, historical and scientific knowledge related vignettes should also be studied across different age groups and in terms of gender. This would highlight the difference in domain related epistemological beliefs across different strata of society.

Another interesting idea would be to study the epistemological beliefs and higher modes of epistemological development among groups like trans-genders and people with disabilities.

### Implications

The results suggest that development of wisdom can be encouraged by stimulating higher modes of epistemological beliefs, which in turn can be done by presenting more ill structured problems to students as a part of their curriculum.

As aging and epistemological development are related, people in middle adulthood must be given opportunities to actively engage in the formal and informal educational settings, sharing the process of change in their epistemological assumptions. This would enrich formal education specifically in social sciences by bringing in more concrete and experienced examples of progress in epistemological beliefs for students.

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