

EPISTEMOLOGICAL BELIEFS OF STUDENTS AT HIGH SCHOOLS: A SURVEY STUDY IN MALAYSIA

Wail Ismail ^a, Nabeel Abedalaziz ^b, Zaharah Hussin ^c

^{a,c} Faculty of Education, Department of Educational Foundations, University of Malaya, Kuala Lumpur, Malaysia

^b Faculty of Education, Department of Educational Psychology and Counseling,
University of Malaya, Kuala Lumpur, Malaysia

^a Corresponding author: Wail77@yahoo.com

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Abstract: Epistemological beliefs reflect the viewpoint of the individual about what and how knowledge can be acquired and the degree of certainty. The present study sought answers to the following questions: What are the overall epistemological beliefs of students at high schools? Do epistemological beliefs of students at high schools differ by gender? Do epistemological beliefs of students at high schools differ by school type? Epistemological beliefs scale comprising 62 items measuring five components of beliefs (i.e. Quick Learning, knowledge, Certain Knowledge, Omniscient authority, innate ability, and simple knowledge) was administered to a sample of 301 form five students from public schools in Kuala Lumpur/Malaysia. Descriptive statistics, and MANOVA were used. Results indicated that: (1) participants had naive beliefs about Quick Learning, Certain Knowledge, Omniscient authority, innate ability, and simple knowledge, (2) no significant differences were found in students' beliefs due to gender and school type.

Keywords: Certain Knowledge, Innate ability, Omniscient authority, Quick Learning, Simple knowledge.

INTRODUCTION

Previous studies indicate that effective learning may be influenced by a somewhat different set of beliefs. These are called epistemological beliefs and refer to beliefs individuals have about the

nature and acquisition of knowledge [23]. Epistemological beliefs are those concerning the nature of knowledge and knowing, including definitions of knowledge, how knowledge is constructed, and how knowledge is evaluated. Perry suggested that "personal epistemology is unidimensional and develops in a fixed progression of stages" (cited in [13] p. 498). Epistemological beliefs were too complex to explain in a single dimension and she defined the personal epistemology as "a belief system that is composed of several more or less independent dimensions" [13].

Schommer [20, 21] believes that epistemological beliefs are more likely to be characterized by a multidimensional set of more or less independent beliefs. This means that individuals may hold both sophisticated and naive views about the nature of knowing. Students with simple epistemological beliefs view knowledge as absolute, black or white, handed down by authority, acquired quickly or not at all and that the ability to learn is fixed at birth. Whereas, students with sophisticated epistemological beliefs "embrace knowledge as complex and tentative" and the "source of knowledge shifts from the simple transfer of knowledge from authority to processes of rational thinking". ([15] p. 295).

Schommer, [13] proposed five dimensions to determine students' epistemological beliefs namely: (1) Certain knowledge: refers to the belief that knowledge is absolute. Students believe that things are black or white, true or false, right or wrong, (2)

simple knowledge: is the extent to which a person sees knowledge as a group of individual facts or as concepts that are related to each other [13]. (3) Omniscient Authority: is the extent to which students believe that knowledge is external and is transferred to persons from an outside authority such as teachers, or instructors [16]. (4) Quick learning: concerns beliefs about the speed of learning. Some learners believe that learning happens quickly or not at all, while others believe that learning happens gradually. (5) Innate ability: refers to the beliefs about the ability of learning [16]. Some students believe that the ability to learn is fixed at birth while others believe that people can learn how to learn and their ability developed. Schommer [14] investigated that the higher level of beliefs in the five dimension of epistemological beliefs, the higher the student's tendency to subscribe a simple view of knowledge, whereas the lower level of beliefs in the five dimensions represents a sophisticated view of the knowledge.

Many studies have investigated the influence of epistemological beliefs on learning strategies [28, 17] in traditional contexts. The results indicate students with naïve beliefs tend to use surface-level strategies to collect isolated facts, whereas, students with more sophisticated epistemological beliefs were likely to exhibit better learning strategies, metacognitive strategies and academic performance [28]. Epistemological beliefs are linked to cognitive processes such as reading comprehension [15], and a wide variety of reasoning skills [6]. A growing body of work provides evidence that personal epistemology is an important component of student learning. ([6] p. 377).

Several studies investigated students' beliefs about the nature of knowledge and knowing and focused on the factors influencing students' beliefs in the learning and teaching process, including gender, but their results are inconclusive. Several studies have found important gender differences in epistemological beliefs dimensions (e.g. [3, 24, 34]). In some studies, females showed more sophisticated or advanced beliefs than males [8, 12, 20, 32]. On the other hands, there are many other studies that find almost no gender differences in epistemological beliefs [5, 17, 19, 22, 29, 30, 31, 33, 35].

For examples, Lodewyk [8] indicated that the girls had significantly more sophisticated beliefs in fixed and quick ability to learn and certain knowledge than boys. The boys had naïve beliefs that one's ability is predetermined, that learning occurs quickly, and that knowledge is certain. In contrast, Trautwein and Lüdtke [19] indicated that no significant correlation existed between certainty beliefs and gender. Also, Schommer-Aikins and Easter [17] found that there

was no gender difference with respect to epistemological beliefs. Cano [3] indicated that boys were significantly different in quick learning, fixed ability, and certain knowledge at the three school levels; boys' epistemological beliefs become less naïve and more realistic as they advance through high school. On the other hand, the girls had significant differences in simple knowledge, fixed ability, and certain knowledge with respect to school level; girls' epistemological beliefs also become more realistic as they went through high school. Conley, Pintrich, Vekiri, and Harrison [4] found no main effects of gender, whereas Schommer and Dunnell [12] found a significant difference between boys and girls with respect to fixed ability and quick learning, with boys more likely to believe in these dimensions. Elder [5] indicated that epistemological beliefs do not differ by gender.

THE PURPOSE OF THE STUDY

The importance of epistemological beliefs appears in its impact upon the beliefs that are related to learning and teaching in some cases and on the way the individual deals with learning and teaching in certain cases. This is important to the individuals who prepare teachers and desire to help students in developing accumulating thoughts about teaching and learning. In addition, the students' epistemological beliefs appear at the levels of knowledge participation in classroom academic assignments particularly when the students are keen to continue the assignment. Concerned studies show that academic performance of students is affected by their beliefs about the nature of knowledge.

Several studies investigated students' beliefs about nature of knowledge and knowing and focused on the factors influencing students' beliefs in the learning and teaching process. Among them gender, age, and grade level. Briefly these studies revealed that epistemological beliefs change as a function of students' gender. In the light of these findings, the current study is conducted to determine the students' epistemological beliefs with respect to gender, and school type.

In this study, high school students' epistemological beliefs are examined to provide a contribution to the learning process. This study provides opportunity to determine whether there is a gender related difference in students' epistemological beliefs or not. Furthermore, this study tries to explore the impact of the school type on students' epistemological beliefs. The results obtained from the current study may be used to enhance students' learning process, learning environment, the teachers' teaching methods, and the counselors' counseling techniques. By knowing the students' epistemological beliefs the teachers have an idea and may plan instructional activities to develop

students' epistemological beliefs. On the other hand, in Malaysia the studies about high school students' epistemological beliefs are rare. To date there was no study investigating effect of school type on epistemological beliefs of the students in Malaysia. In conclusion, this study can be considered as one of the initial attempts to provide information about the students' beliefs about nature of knowledge and knowing to arrange the conditions of learning and instruction.

Also, the present study tried to investigate the validity of these assumptions within the students at high schools. It identifies the level of Epistemological beliefs of the students, and examines the existence of difference in the beliefs of students about the nature of knowledge with the difference in school type and gender. Then, the purpose of the present study is to seek answers for the following questions: What are the overall Epistemological beliefs of high school students? Do epistemological beliefs of high school students differ by gender? Do epistemological beliefs of high school students differ by school type?

METHODOLOGY

Samples

A total of 350 Form Five students from three types of high schools participated in the present study. Table 1 shows the distribution of the samples by gender and school type.

Instrument

The Epistemological Beliefs Scale developed by Schommer [13], was adapted to assess students' epistemological beliefs. The scale consists of 62 statements of Likert-type representing five dimensions, namely: (Quick Learning, knowledge, Certain Knowledge, Omniscient authority, innate ability, and simple knowledge). Responses are made on a 5-point Likert scale and the response categories are assigned weights from 1 to 5, and the positive items were scored by the following key: 5 = *strongly agree*, 4 = *agree*, 3 = *undecided*, 2 = *disagree*, and 1 = *strongly disagree*. The negative items were reversed coded in order that meaningful analyses at the sub-scale level could be conducted.

According to Birisci, Metin, and Karakas [2], ranges of agreement with the attributions on the survey were determined by using the $(n-1)/n$ formula and after calculation the interval width of the range between 1 through 5 was calculated as 0.8. As such, the interval width of 1-1.80 showed very low level (strongly disagree), the 1.81-2.60 interval showed low level (disagree), the 2.61-3.40 interval showed medium level (undecided), the 3.41-4.20 interval showed high level (agree) and the 4.21-5.00 interval showed very

high level (strongly agree) of agreement with the statement on the survey.

The possible range is 62 to 310 with a mean of 186. The total scores indicate students' epistemological beliefs. The reliability of the scale is .92 as reported by its authors and calculated by split-half method and corrected by Spearman Brown Profecy Formula. The inner consistency coefficient or alpha coefficient is .91.

RESULTS

Overall profile of the students' Epistemological beliefs were measured in terms of the quick learning, certain knowledge, omniscient authority, innate ability, and simple knowledge. All 301 participants responded to all items in the scale and no missing data was found in the survey. The mean scores and standard deviations were used to explain the students' epistemological beliefs profile. As can be seen in Table 2, the results of the descriptive statistics showed that students generally had naive epistemological beliefs as indicated by the mean scores ranging from 3.43 to 3.95 on a five point scale. Certain knowledge dimension had the highest mean value ($Mean=3.95$, $SD= 4.41$), followed by Simple knowledge ($Mean=3.76$, $SD= 6.37$), then by Innate ability ($M=3.59$, $SD= 4.24$) and then by Quick learning ($Mean=3.44$, $SD= 4.13$). The lowest mean score appeared for the Omniscient authority dimension ($Mean=3.43$, $SD= 4.15$). The mean scores indicated that the participants have a highly level of naive belief in quick learning, certain knowledge, omniscient authority, innate ability, and simple knowledge.

These results imply that the participants of this study generally agreed with the idea that knowledge is not an evolving and changing subject, that knowledge is certain and there may be one right answer and that knowledge is constructed only by the teachers and other experts. When descriptive statistics results were examined with respect to gender and school type, it was seen that, in general, mean scores of all variables were above the middle point of the five-point scale. Furthermore, the boys' mean scores and girls' mean scores were nearly equal for the five dimension. Also, students at different schools had nearly equal mean scores.

Assumptions were checked before conducting Multivariate analysis (two-way MANOVA). MANOVA has seven assumptions: sample size, independence of observations, normality, outliers, linearity, multicollinearity and singularity, and homogeneity of variance-covariance matrices [25]. No violations were found on multivariate normality and equality of variance.

| | | Number of students | Percentage |
|---------------|----------------------------|--------------------|------------|
| Gender | Male | 162 | 54 |
| | Female | 139 | 46 |
| School | Malaysian secondary school | 110 | 37 |
| | Boarding secondary school | 101 | 34 |
| | Islamic secondary school | 90 | 29 |
| Total | | 301 | 100 |

Table 1: Samples distribution by gender and school type

| | | | Quick learning | Certain knowledge | Omniscient authority | Innate ability | Simple knowledge |
|--------|-----------|--------------------|----------------|-------------------|----------------------|----------------|------------------|
| Gender | Male | Mean | 3.46 | 3.95 | 3.44 | 3.61 | 3.76 |
| | | Standard deviation | 4.52 | 4.41 | 4.17 | 4.52 | 7.00 |
| | Female | Mean | 3.43 | 3.87 | 3.42 | 3.56 | 3.71 |
| | | Standard deviation | 3.61 | 3.93 | 4.13 | 3.87 | 5.54 |
| School | Malaysian | Mean | 3.43 | 3.95 | 3.42 | 3.58 | 3.75 |
| | | Standard deviation | 4.37 | 4.41 | 4.81 | 4.29 | 6.12 |
| | Boarding | Mean | 3.46 | 3.87 | 3.45 | 3.58 | 3.73 |
| | | Standard deviation | 4.34 | 3.93 | 3.97 | 4.76 | 7.32 |
| | Islamic | Mean | 3.43 | 3.92 | 3.42 | 3.60 | 3.73 |
| | | Standard deviation | 3.61 | 4.21 | 3.43 | 3.53 | 5.54 |
| | Total | Mean | 3.44 | 3.95 | 3.43 | 3.59 | 3.76 |
| | | Standard deviation | 4.13 | 4.41 | 4.15 | 4.24 | 6.37 |

Table 2: Descriptive statistics for each subscale (n=301)

A two-way multivariate analysis was conducted to investigate the effects of gender and school type on students' epistemological beliefs (i.e., quick learning, certain knowledge, omniscient authority, innate ability, and simple knowledge). In order to evaluate multivariate significance, Wilks Lambda statistic was used. MANOVA results regarding the gender and school type are presented in Table 3. The results indicated no statistically significant gender effect on the combined dependent variables ($F(5,296) = .605$, Wilks lambda = .990, partial Eta = .010, $p = .696$). The partial eta squared value of .010 represented that the 1.0 % of the variance in dependent variables could be explained by gender. Moreover, no statistically significant school type effect on the

combined dependent variables were found ($F(10, 200) = .340$, Wilks lambda = .880, partial Eta = .006, $p = .696$). The partial Eta squared value of .006 showed that the 0.6 % of the variance in dependent variables could be explained by grade level. In order to

evaluate effect size in gender and school type, Partial Eta Squared results should be considered. The values were .010 and .006 for gender and grade level respectively. These result suggested a small effect for gender and school type [27]. The results also indicated no statistically significant interaction between gender and school type ($F(10, 200) = .887$, Wilks lambda = .970, partial Eta = .015, $p = .545$). In other words, the school type effect depended on gender (and vice versa) with respect to dependent variables. The partial Eta value of .015 indicated that the 1.5% of the variance in collective dependent variables was explained by school type and gender together and was considered as small effect size.

In order to investigate which dependent variables students with different gender (girls and boys) and school type (Malaysian, Boarding, and Islamic) students differed, multivariate analyses of variance was conducted. Table 4 shows the summary results of MANOVA analysis.

| Effect | Wilks lamda | F | Hypothesis df | Error df | p-value | Partial Eta Squared |
|--------------------|-------------|------|---------------|----------|---------|---------------------|
| Gender | .990 | .605 | 5 | 291 | .696 | .010 |
| School type | .988 | .340 | 10 | 582 | .970 | .006 |
| Gender*school type | .970 | .887 | 10 | 582 | .545 | .015 |

Table 3: MANOVA Results for Gender and Grade Level

| Source | Dependent variable | Type III Sum of Squares | df | Mean square | F-value | p-value | Partial Eta Squared |
|---------------------------|----------------------|-------------------------|-----|-------------|---------|---------|---------------------|
| Gender | Quick learning | 19.669 | 1 | 19.669 | 1.141 | .286 | .004 |
| | Certain knowledge | 45.409 | 1 | 45.409 | 2.548 | .112 | .009 |
| | Omniscient authority | 4.398 | 1 | 4.398 | .254 | .614 | .001 |
| | Innate ability | 32.771 | 1 | 32.771 | 1.811 | .179 | .006 |
| | Simple knowledge | 58.441 | 1 | 58.441 | 1.442 | .231 | .005 |
| School type | Quick learning | 4.269 | 2 | 2.134 | .124 | .884 | .001 |
| | Certain knowledge | 6.861 | 2 | 3.431 | .192 | .825 | .001 |
| | Omniscient authority | 10.108 | 2 | 5.054 | .292 | .747 | .002 |
| | Innate ability | 3.671 | 2 | 1.835 | .101 | .904 | .001 |
| | Simple knowledge | 7.812 | 2 | 3.906 | .096 | .908 | .001 |
| School type*Gender | Quick learning | 6.358 | 2 | 3.179 | .184 | .832 | .001 |
| | Certain knowledge | 2.810 | 2 | 1.405 | .079 | .924 | .001 |
| | Omniscient authority | 43.799 | 2 | 21.900 | 1.267 | .283 | .009 |
| | Innate ability | 14.573 | 2 | 7.286 | .403 | .669 | .003 |
| | Simple knowledge | 156.108 | 2 | 78.054 | 1.926 | .148 | .013 |
| Error | Quick learning | 5084.133 | 295 | 17.234 | | | |
| | Certain knowledge | 5257.754 | 295 | 17.823 | | | |
| | Omniscient authority | 5099.617 | 295 | 17.287 | | | |
| | Innate ability | 5338.410 | 295 | 18.096 | | | |
| | Simple knowledge | 11958.106 | 295 | 40.536 | | | |

Table 4: Results of Two way MANOVA Analysis for Differences Between the Means of the Students in the Four Educational Levels (years) in The Components of Epistemological beliefs.

Table 4 shows that males and females are similar in Quick learning; $F(1, 295)= 1.141, p > .05$; Certain knowledge $F(1, 295)= 2.548, p > .05$; Omniscient authority $F(1, 295)= .254, p > .05$; innate ability $F(1, 295)= 1.811$; and Simple knowledge $F(1, 295)= 1.442, p > .05$. Moreover, the three groups (school type domain) are similar in Quick learning; $F(1, 295)= .124, p > .05$; Certain knowledge $F(1, 295)= .192, p > .05$; Omniscient authority $F(1, 295)= .292, p > .05$; innate ability $F(1, 295)= .101$; and Simple knowledge $F(1, 252)= .096, p > .05$. Also, there are no significant effects for the interaction between school type and gender for Quick learning; $F(1, 295)= .184, p > .05$; Certain knowledge $F(1, 295)= .079, p > .05$; Omniscient authority $F(1, 295)= 1.267, p > .05$; innate ability $F(1, 295)= .403$; and Simple knowledge $F(1, 252)= 1.926, p > .05$.

DISCUSSION

Results of the present study revealed that the participants generally had highly naive beliefs about nature of knowledge and knowing. For the five dimension (i.e., quick learning, certain knowledge, omniscient authority, innate ability, and simple knowledge) students obtained a mean value that was higher than the mid-point of the five-point scale, implying that participants generally tended to believe that (a) learning happens quickly, (b) knowledge cannot change in time, and a person sees knowledge as a group of individual facts, (c) knowledge is certain, (d) knowledge is constructed by only authority (e.g., teachers, books), and (e) the ability to learn is fixed at birth. These results were inconsistent with those reported in the literature (e.g., [4, 7, 10, 26]). For instance, Kızılgüneş [7] reported that the students generally have tentative epistemological beliefs. Özkal [10] found that students tended to believe scientific knowledge can change with time and that it is not certain. Conley et al. [4] reported that students' beliefs that knowledge is not constructed by only teachers and other experts and knowledge is not certain.

Results showed that there were no statistically significant gender differences in Quick learning, Certain knowledge, Omniscient authority, Innate ability, and Simple knowledge. These findings seem to be consistent with some of the previous studies (e.g. [4, 5, 12, 18]). For instance, Conley et al. [4] found that boys and girls were not different with respect to Source of Knowledge, Certainty of Knowledge, and Development of Knowledge. They observed that boys and girls had similar beliefs about nature of knowledge and knowing. On the other hand, Elder [5] reported that there were no differences between girls and boys with respect to authority, certainty, developing, and reasoning.

Results of the present study are inconsistent with some of the previous studies (e.g., [1, 8, 9, 10, 11, 12, 18]). For example, Topçu and Yılmaz-Tüzün [18] identified that the girls attending fourth and fifth grade had more sophisticated beliefs in Quick Learning, and the girls attending sixth and eighth grade had less sophisticated beliefs in Omniscient Authority. Also, Schommer [14] stated that girls were less likely to believe in fixed ability and quick learning. Furthermore, Lodewyk [8] stated that the girls had significantly more sophisticated beliefs in Fixed and Quick Ability to learn and certain knowledge than boys. Lodewyk argued that boys tended to believe that learning occurs quickly and knowledge is certain.

The present study failed to indicate a statistically significant difference between girls and boys with respect to Quick learning, Certainty of knowledge, Omniscient authority, innate ability and Simple knowledge which means that girls and boys tended to have very similar beliefs about these epistemological beliefs. This result is encouraging in terms of reducing the gender gap at least in Source of Knowledge, Development of Knowledge, and Certainty of Knowledge. Furthermore, the Malaysian government offers the same opportunities for both males and females in each sector of life.

Results of the present study also indicated that there was no statistically significant effect of school type (Malaysian, Boarding, and Islamic) in Quick learning, Certain knowledge, innate ability, Omniscient authority, and Simple knowledge. On the other hand, the results of the current study revealed that there was no interaction between school type and gender with respect to the dimensions of epistemological beliefs. The similarity of students' beliefs may be due to the students being from public schools.

Several points emerge from the findings of the present study, such as: (a) the teachers should be informed about the importance of epistemological beliefs and should be explained how they can develop students' epistemological beliefs, (b) the teachers should encourage boys and girls to develop more sophisticated epistemological beliefs by using appropriate methods of instruction, (c) the instructional methods, classroom activities, and constructivist learning environment may be arranged for instruction in order to develop students' epistemological beliefs, (d) the curriculum should be arranged to develop the epistemological beliefs of the students, (e) teachers should encourage students to explicate whether knowledge is certain or uncertain, and also whether knowledge is a fixed or changing subject, and (f) further studies, can be conducted to examine the change of students' epistemological

beliefs and whether the girls' and boys' epistemological beliefs develop throughout school time; to compare the students' beliefs in different types of schools; to compare the students' beliefs in different grade levels in different states of Malaysia; and to determine the effects of the age, grade level, field of study, socio economic status, ethnicity, and academic achievement on students' epistemological beliefs. Finally, qualitative researches are needed to explore students' epistemological beliefs.

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