



Relationship among Students' Epistemological Beliefs, Achievement Motivation, and Academic Achievement: A Path model

Öğrencilerin Epistemolojik İnançları, Başarı Motivasyonu ve Akademik Başarısı Arasındaki İlişki: Bir Path Modeli

Mahtab Pouratashi^{a*}, Chang Zhu^b, Asghar Zamani^a

^aInstitute for research & planning in higher education, Iran

^bVrije Universiteit Brussel, Brussel, Belgium

Abstract

One of the prominent factors on production and productivity in agricultural sector is related to the adept work-force. However, there are not sufficient number of empirical studies regarding effective factors on the agricultural students' achievement motivation and academic achievement. Therefore, this paper aims to investigate the effects of epistemological beliefs on the agricultural students' achievement motivation and academic achievement. 466 Iranian agricultural students contributed to the study, by filling out the questionnaire. The results showed that the agricultural students generally had sophisticated epistemological beliefs. The model analyzed in the study determined that epistemological beliefs dimensions had negative effects on motivation to achieve success (MAS) and positive effects on motivation to avoid failure (MAF). Based on the findings, it is recommendable that instructors use teaching and evaluation approaches that can assist improvement of more advanced epistemological beliefs.

Keywords: Epistemological beliefs, achievement motivation, academic achievement, agriculture.

Öz

Ziraat sektöründeki üretim ve verimlilikte en önemli faktörlerden biri de nitelikli iş gücüdür. Ancak ziraat fakültesi öğrencilerinin başarı motivasyonları ve akademik başarılarını etkileyen faktörlerle ilgili yeterli sayıda deneysel çalışma bulunmamaktadır. Bu sebeple, bu çalışma epistemolojik inançların ziraat fakültesinde okuyan öğrencilerin başarı motivasyonları ve akademik başarıları üzerine etkilerini incelemeyi amaçlamaktadır. Ziraat Fakültesinde okuyan 466 İranlı üniversite öğrencisi anket doldurarak çalışmaya katkı sağlamıştır. Araştırmanın sonuçları, öğrencilerin genellikle gelişmiş epistemolojik inançlara sahip olduklarını göstermiştir. Ayrıca, epistemolojik inanç boyutlarının başarı motivasyonu üzerine olumsuz, başarısızlıktan kaçınma motivasyonuna ise olumlu etkileri olduğu saptanmıştır. Bu sonuçlara göre, öğretim elemanlarının daha ileri epistemolojik inançların gelişmesine yardımcı olacak öğretim ve değerlendirme yaklaşımları kullanmaları önerilir.

Anahtar Kelimeler: Epistemolojik inanç, başarı motivasyonu, akademik başarı, ziraat.

© 2018 Başkent University Press, Başkent University Journal of Education. All rights reserved.

1. Introduction

Discovering the factors affecting differences in students' academic achievement has been important for educational psychologists. Understanding what factors are effective on academic achievement has significant implications for academic institutions and for teaching and learning (O'Connor & Paunonen, 2007). The previous studies have pointed out that students' characteristics, together with their opinions and motives, affect the learning process and academic

* ADDRESS FOR CORRESPONDENCE: Asst.Prof.Dr. Mahtab Pouratashi, Institute for research & planning in higher education, Iran. E-mail address: mah.pouratashi@gmail./ Tel: +98 21 22010616. ORCID ID: 0000-0002-8766-3709.

^b Prof.Dr. Chang Zhu, Vrije Universiteit Brussel, Brussel, Belgium. E-mail address: Chang.Zhu@vub.ac.be.

^a Asst.Prof.Dr. Asghar Zamani, Institute for research & planning in higher education, Iran. E-mail address: ofogh557@yahoo.com

Received Date: July 22nd, 2017. Acceptance Date: October 24th, 2017.

achievement (Mitchell, 1992; Chan, 2007). Amongst the beliefs are the ones concerning the nature of knowledge that shows students' epistemological beliefs (Cano, 2005; Schommer-Aikins et al., 2003; Schultz et al., 1993), which researchers pay a considerable attention to (Hofer & Pintrich, 1997; Schommer, 1990; Schraw & Sinitra, 2004).

Although studies in the field of epistemological beliefs have received increasing attention, to the best of the researchers' knowledge, there is no research regarding epistemological beliefs of agricultural students. Agriculture is the engine of economic growth (Tsakok & Gardner, 2007) and the growth from agriculture is rather more related to poverty reducing than growth from outside of the agricultural sector (Christiaensen & Demery, 2007). Hence, a nation's economic welfare is connected to its capacity to develop a manpower equipped with the competencies essential to work in a growing complex work environment and position (Judy & D'Amico, 1997) and education is fundamental in the improvement of manpower (Krueger & Lindahl, 2001). In particular, empirical studies only with a narrow focus were done on the relationship between epistemological beliefs and achievement motivation of agricultural students. Since researchers stated that there were differences in epistemological beliefs of the students studying in various fields (Kurt, 2009; Jehn et al., 1993), and higher agricultural education contributes to the agricultural growth and poverty alleviation (Atchoarena & Holmes, 2004), this article aimed to investigate agricultural students' epistemological beliefs in order to find a unified model to understand relationship among the three variables: epistemological beliefs, achievement motivation, and academic achievement. To this end, the present study addressed the following objectives to pursue the stated aim:

- (1) Identifying students' epistemological beliefs, achievement motivation, and academic achievement,
- (2) Explaining variations in students' achievement motivation by means of epistemological beliefs,
- (3) Explaining variations in students' academic achievement by means epistemological beliefs and achievement motivation.

1.1. Research questions

The following research questions were put forth in this research: (Q1) Are there significant differences among the students with regard to their epistemological beliefs, achievement motivation, and academic achievement? (Q2) Is there a relationship among epistemological beliefs, achievement motivation, and academic performance?

1.2. Literature review

1.2.1. Epistemological beliefs

Epistemological beliefs refer to an individual's belief on the nature of human knowledge and his/her beliefs on what it means to know (Conley et al., 2004). Schommer (1990, 1993) developed a concept of epistemological beliefs that consists of five dimensions: stability of knowledge (CK), organization of knowledge (SK), speed of knowledge acquisition (QL), source of knowledge (OA), and ability to acquire knowledge (FA) (Schommer, 1990; 1993). A summary of each dimension is described as in the following: *Organization of knowledge* is related to the question, "Is knowledge separated and simple or is it unified and complex?" The students with naive beliefs in this dimension have a strong belief that knowledge is organized as pieces. Therefore, they are more likely to have difficulty comprehending complex text, less likely to be intrinsically motivated, and less likely to be a self-regulated learner (Paulsen & Feldman, 1999). *Stability of knowledge* addresses to the question, "Is knowledge absolute and certain, or is it experimental and constantly evolving?" The students who have a strong belief that knowledge is absolute have difficulty to accept experimental results (Schommer, 1990). *Speed of knowledge acquisition* refers to the question, "Is knowledge acquired quickly or gradually?" If students have a strong belief that learning quickly or never takes place, they probably do not think of calculation tasks that will take longer than a few minutes (Schoenfeld, 1983), and they are less likely to engage in elaborate learning approaches (Paulsen & Feldman, 1999). *Sources of knowledge* deals with the question, "Does knowledge originate from an omniscient authority or from personal experience?" The students with naive beliefs about the source of human knowledge presume that knowledge exists within the exterior authority (Hofer & Pintrich, 1997). *Ability to acquire knowledge*, however, addresses to the question, "Is the ability of learning innate or is it expanded through experience and over time?" (Schommer, 1990). The students with a strong belief of an innate ability to learning show distressed behaviors at the times they face difficult academic assignments (Dweck & Leggett, 1988).

Perry (1970) was the first researcher who studied epistemological beliefs in learning. Following Perry, many studies were conducted about students' epistemological beliefs (e.g. Schommer, 1990; Hofer, 2001). Jehng et al. (1993) examined students' epistemological beliefs according to the field and years of study. The students were grouped into hard fields (engineering/natural sciences and business) and soft fields (arts/humanities and social science) of study. The findings showed that the graduate students' scores on regular process, certainty of knowledge, and omniscient authority were significantly higher than the undergraduate students' scores. In other words, the undergraduate students

showed less complicated beliefs when compared to those of the graduates. The previous researches about the relationship between gender and epistemological beliefs revealed that male and female students were not different regarding to the development of knowledge, certainty of knowledge, source of knowledge, and justification of knowledge (Conley et al., 2004). However, Lodewky (2007) reported that the female students' beliefs in fixed knowledge, quick and certain learning were more sophisticated than those of male students. In general, there is no consensus as to the relationship between gender and epistemological beliefs because according to some researchers epistemological belief is not correlated with gender (Conley et al., 2004), while others state that gender and epistemological belief is correlated (Özkal, 2007; Topçu & Yılmaz-Tüzün, 2009; Kurt, 2009). On the other hand, the findings of several studies suggest that students' epistemological beliefs and achievement motivation are correlated (Paulsen & Feldman, 1999; as cited in Buehl, 2003).

1.2.2. Achievement motivation

Achievement motivation refers to person's aspiration to work toward fulfilling challenging professional and personal aims (Byrne et al., 2004). McClelland (1955), the pioneer theorist on achievement motivation, suggested considering achievement motivation as a learned motive, which results from a reward or punishment. Basic structure of achievement motivation concept can be distinguished depending on the need of success and fear of failure (Atkinson, 1964). Engaging in achievement-oriented activities shows that the person is likely to behave to achieve success (Atkinson, 1964), while running away from the situations shows that the person is likely to behave to avoid failure (Maehr & Sjogren, 1971). Ligon (2006), for instance, reported that there was no difference between female and male respondents regarding achievement motivation, while Linenbrink and Pintrich (2002) and Wigfield and Eccles (2002) reported that achievement motivation scores differed significantly across different genders.

1.2.3. Academic achievement

Academic achievement is a concept with various explanations by different researchers depending on their field of interest. It can be defined as the learner's success which is the result of commitment and perseverance (Mangal, 2005). In general, academic achievement means learner's achievement, which implies assessing the learners' effort in the examinations of the courses. Cumulative grade point average (CGPA; Ko et al., 2011; Ebeunuwa-Okoh, 2010) and grade point average (GPA; Urtel, 2008) are two ways of measuring students' academic achievement. It is linked to the level of students' desire to success. Consequently, an individual's level of achievement motivation significantly affects his/her academic achievement (McClelland, 1955; Weiner, 1990).

1.3. Research framework

This research builds on the notion that epistemological beliefs and motivation can affect students' performance (Hofer, 2001; Fairchild et al., 2005; Scales & Roehlkepartain, 2003; Lens et al., 2005). According to Schommer et al. (1992), the more a student believes in uncomplicated knowledge, the worse his/her academic achievement will be. Schommer (1993) also stated that the more a student believed in characteristics such as "knowledge is simple, certain, and fixed", the lower GPA he/she obtains. Many studies supported her idea that epistemological beliefs and academic achievement are correlated (Zhu et al., 2008; Cano, 2005). To exemplify, Berry and Plecha (1999) findings on students' academic achievement and achievement motivation showed that the two variables had a direct relationship. Accordingly, we can draw the research framework as following for this study (Fig 1):

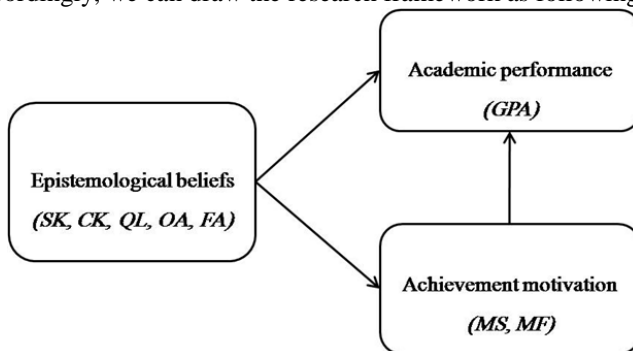


Figure 1. Research framework of the current study

2. Materials and methods

In this study, the agricultural students at selected universities of Iran constituted the statistical population (N= 11834). Via using Cochran's formula, 466 students were selected. To select the sample, proportional random sampling method was applied. 45.9% of the participants were male and 54.1% were female. Their mean age was 21.36 (ranging from 18 to 28). Of the respondents, 15.7% had agricultural experience before entering the university and studying at the Colleges of Agriculture.

A questionnaire (divided into four sections) was used for gathering the data from the target group. Epistemological belief inventory (EBI) (Schraw et al., 2002) was administered in order to identify the students' epistemological beliefs. This inventory had 32 items and assessed personal epistemological beliefs related to the stability of knowledge, organization of knowledge, speed of knowledge acquisition, ability to acquire knowledge, and sources of knowledge based on a five-point Likert scale assessment inventory(1= strongly disagree to 5= strongly agree). Higher scores on EBI indicates naive and less sophisticated epistemological beliefs (Ibid). Accordingly, a higher score on organization of knowledge shows belief on simple knowledge (SK). Moreover, a higher score on stability of knowledge, speed of knowledge acquisition, sources of knowledge, and ability to acquire knowledge shows the beliefs on certain knowledge (CK), quick learning (QL), omniscient authority (OA), and fixed ability (FA), respectively. The achievement motive scale (Fu, 2011) consists of two subscales; namely, motivation to achieve success (MAS) and motivation to avoid failure (MAF) -each composed of 15 items- was used to measure achievement motivation of the students via respondent's judgment on the basis of his/her own situations. GPA of the students at the end of the whole completed semesters was used to assess their academic achievement. Table 1 presents one item of each subscale.

Table 1
A sample of the scales items

Scale	Subscales	Item
Epistemological beliefs	SK	If I know more about a topic, there is more that I need to know
	CK	Since science has so many facts, it is not difficult to understand
	QL	If I haven't understood a subject matter for the first time completely, reading again is not useful and won't help
	OA	If an individual in authority tells me what to do, I generally do it
	FA	doing well in university is dependent on how smart I am
Achievement motivation	MAS	I like difficult and unknown works, even if they are risky
	MAF	I do not like doing works that needs me to exert myself

Face validity of the questionnaire was assessed through the judgments of some faculty members. Reliability of the scales was tested by applying coefficient Cronbach's alpha (CCA). CCA estimates interrelatedness degree of the items and variance among the items. A widely supported level of adequacy for Cronbach's alpha is at least 0.70 (Netemeyer et al., 2003). The reliability of the scales was found to be between 0.88 and 0.97, which met this criterion. As the scales of epistemological beliefs had not been tested for the agricultural students, construct validity of the scale was examined through confirmatory factor analysis (Table 2), using a maximum likelihood method of estimation (Hernandez, 2010). The findings revealed that the scale was a reliable and valid data collection tool.

Table 2
Results of confirmatory factor analysis for the scale of epistemological beliefs

SK			CK			QL			OA			FA		
Item	SE.	C.R.	Item	SE.	C.R.	Item	SE.	C.R.	Item	SE.	C.R.	Item	SE.	C.R.
X1	.670		X2	.757		X3	.772		X4	.754		X5	.737	
X10	.722	5.623***	X6	.669	5.929***	X9	.592	4.121***	X7	.496	3.644***	X8	.468	4.018***
X11	.709	5.231***	X14	.791	6.671***	X16	.754	6.509***	X20	.485	3.341***	X12	.571	5.041***
X13	.615	4.521***	X19	.511	4.651***	X21	.716	6.477***	X27	.727	6.012***	X15	.512	4.393***
X18	.455	3.724***	X22	.524	4.672***	X29	.437	3.200**	X28	.791	6.186***	X17	.621	5.485***
X24	.679	4.672***	X23	.475	2.987**							X26	.731	6.122***
X30	.439	2.302*	X25	.737	6.402***							X32	.569	4.576***
			X31	.551	4.739***									

Note: SE.= Standardized Estimate, C.R.= Critical Ratio

*: p<.05

** : p<.01

***: p<.001

In this study, to analyze the data, descriptive and inferential statistics were conducted, using SPSS/Windows and AMOS Graphic. To examine the students' academic achievement, achievement motivation, and epistemological

beliefs by gender, a t-test was conducted. The Path analysis was applied to assess the influences of the students' epistemological beliefs dimensions on achievement motivation and academic achievement. This technique allowed the assessment of correlations both directly and indirectly.

3. Results

The respondents' score of SK was 21.70 (out of 35). Their score of CK, QL, OA, and FA were 22.70 (out of 40), 17.37 (out of 25), 16.21 (out of 25), and 22.32 (out of 35) respectively. The means of the five scales were moderate. Significant differences between female and male participants on the basis of SK, QL and FA were observed (Table 3). The female participants had fairly advanced beliefs on the stability of knowledge than their female peers, but the scores were not significantly different. The female respondents, on the other hand, had relatively advanced beliefs regarding SK, QL, OA, and FA when compared to the males, with three of those significantly different (Table 3).

The students' MAS was 57.88 (of 75), which was more than the mid-point of the scale. In addition, their MAF was 37.97 (of 75), which was less than the mid-point of the scale. The males' MAS mean score was higher (but not significantly) than the females' mean score. In contrast, females' MAF was significantly ($p < .05$) higher than their male counterparts (Table 3).

As we mentioned earlier, the students' academic achievement was assessed through their total GPA at the end of passed semesters. Boys' academic achievement was significantly ($t = 2.030$, $p = .043$) higher than the girls' academic achievement (Table 3).

Table 3
Summary of t-test

Scale	Subscales	Gender				t-Value (Sig.)
		Male		Female		
		Mean	SD	Mean	SD	
<i>epistemological beliefs</i>						
	SK	22.44	6.07	21.07	6.80	2.293* (.022)
	CK	22.46	6.33	22.91	7.62	-.696 ^{ns} (.487)
	QL	17.98	3.52	16.85	4.35	3.038** (.003)
	OA	16.52	4.35	15.94	4.51	1.401 ^{ns} (.162)
	FA	23.11	5.94	21.65	6.55	2.488* (.013)
<i>achievement motivation</i>						
	MAS	58.20	11.37	57.60	11.07	.578 ^{ns} (.564)
	MAF	36.43	13.07	39.28	14.24	-2.236* (.026)
<i>academic achievement</i>						
	AP	16.08	1.58	15.79	1.54	2.030* (.043)

^{ns}: Non significant

*: $p < .05$

**.: $p < .01$

For estimating the effect size of epistemological beliefs on achievement motivation and academic achievement of the students, path analysis was used (Fig 2). Table 4 displays direct, indirect, and total effects of the research model. The effect of one variable to another (which has an arrow directed to the other variable) shows a direct effect. An indirect effect represents the effect that a determinant has on a target variable through mediating variables in the model. Finally, the sum of the two measured effects reveals a complete and total effect on a given variable. The effect sizes greater than 0.5 are presumed large. Moreover, the effect sizes 0.5-0.3 and 0.3-0.1 are presumed moderate and small, respectively (Cohen, 1988). In addition, the amounts smaller than 0.1 are presumed negligible.

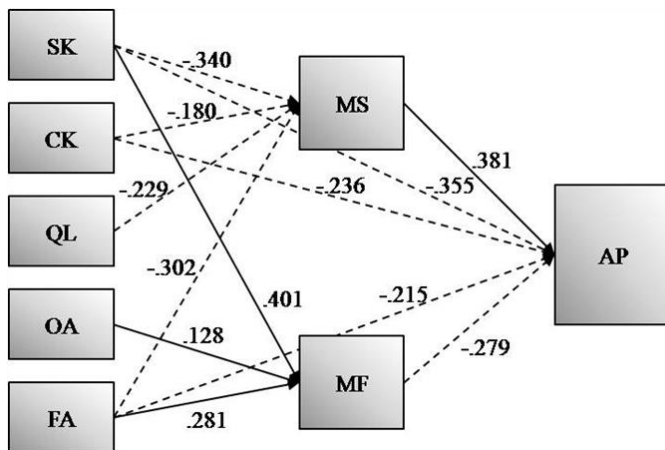


Figure 2. Path analysis diagram

By considering academic achievement and dependent variable, the R Square value reached 0.512. This means that 51.2% of variation in students' academic achievement could be explained by the independents variables. When considering MAS and MAF as dependent variables in regression analysis, the R Square value reached .327 and .293, respectively. According to the findings, the most dominant determinant of MAS and MAF was organization of knowledge with a total effect of -.340 and .401, respectively, which showed moderate effect sizes. The most dominant determinant of academic achievement was organization of knowledge with a total effect of -.595, which showed a large effect size.

Table 4
Effect sizes of the studied model (Direct, indirect, and total)

Variable	Determinant	Standardized estimates		
		Direct	Indirect	Total
Academic achievement	SK	-.355	-.240	-.595
	CK	-.236	-.068	-.304
	QL	-	-.087	-.087
	OA	-	-.036	-.036
	FA	-.215	-.193	-.408
	MAS	.381	-	.381
	MAF	-.279	-	-.279
Motivation to achieve success	SK	-.340	-	-.340
	CK	-.180	-	-.180
	QL	-.229	-	-.229
	FA	-.302	-	-.302
Motivation to avoid failure	SK	.401	-	.401
	OA	.128	-	.128
	FA	.281	-	.281

4. Discussion and conclusions

The influence of epistemological beliefs (EBs) on learning has some key educational implications because an individual's beliefs regarding human knowledge and the way knowing takes place influence his/her use of learning approaches (Hammer & Elby, 2002) and academic achievement. The survey conceptual framework was that epistemological beliefs differ according to field of the study (Jehng et al., 1993). In this study, four objectives were achieved. First, the findings revealed that the target group had a mixture of simple and advanced epistemological beliefs. For each dimension of EBs (SK, CK, QL, OA, and FA), the students achieved a mean score close to the middle, reflecting that in general, the students are inclined to suppose that knowledge was complex, constantly evolving, acquired gradually, and developed over time through experiences. Female participants had significantly more advanced beliefs in SK, QL, and FA when compared to the males. As Conley et al. (2004) reported, male and female participants had no different beliefs on the certainty of knowledge. According to Topçu and Yılmaz-Tüzün (2009), females had more complicated belief on quick learning and fixed ability. Neber and Schommer-Aikins (2002)

found that male students had naive beliefs in quick learning. Second, the findings revealed that males had non-significantly higher level of MAS and significantly lower level of MAF when compared to females. Linenbrink and Pintrich (2002) stated that achievement motivation scores differed across different genders. Third, the findings showed that amongst students, males had significantly higher academic achievement than females. Fourth, the students' epistemological beliefs affected achievement motivation. The finding showed conformity with those of Paulsen & Feldman (1999; cited in Buehl, 2003), that epistemological beliefs and achievement motivation were related. The students who had more sophisticated epistemological beliefs had higher levels of performance. This result is similar to the reports of Bird (2005) and Schultz et al. (1993). According to our findings, the students who believed knowledge was simple and stable, and the ability to acquire knowledge was innate, were more likely to have lower levels of academic achievement. The close association between organization of knowledge and academic achievement (as documented by significant coefficients between the two notion dimensions) offers that if the students believe in simple knowledge, their grade point averages are likely to be lower. According to the findings, we can conclude that a student believing that knowledge is composed of unrelated parts of information uses memorization and rote learning as an approach to learning in place of a deeper process such as integration. The influence of epistemological beliefs on students' learning approaches was stated by Kizilgunes et al. (2009). The findings also indicated that students' motivation is one of the most critical determinants of academic achievement. Consequently, if students' motivation is to avoid failure, they tend to use surface learning. Hence, it is imperative that instructors use evaluation methods which require the students to think critically and to interpret and integrate information from different sources to solve the problems. Therefore, the students might apply deep learning strategies in their learning that help them understand the material better. It can be recommended that the instructors use constructivist approaches instead of traditional approaches in their teaching. Constructivist approach mentions the notion that a student is keen to construct his/her views by interpreting his/her experiences (Kegan, 1994). In contrast, the common idea of teaching refers to applying teacher-centered teaching strategies (Cheng et al., 2009).

According to the findings, it is imperative that colleges of agriculture assess students' epistemological beliefs. This might allow colleges to identify students who need more guidance for developing more sophisticated epistemological beliefs which can lead to higher academic achievement. Given that five dimensions of epistemological beliefs are somewhat independent (Schommer-Aikins et al., 2003), they may not develop at the same rate. Cano (2005) also states that it is possible for a student to have an advanced belief in one or some dimensions, but not certainly in the other dimensions. Therefore, colleges of agriculture should carefully assess all dimensions and counselors in colleges can provide proper information to students with regard to the EBs dimensions that could be developed. The findings showed that the survey participants differ in their epistemological beliefs. Hence, the instructors should pay attention to students' epistemological beliefs. In addition, understanding that there are individual differences among students regarding their epistemological beliefs can be helpful for the instructors to try to provide differentiated support for students.

The results of this study offered a useful model to test the results of agricultural students' epistemological beliefs on achievement motivation and academic achievement. However, as in any studies, this research has its own limitations. In the present research, we measured the students' epistemological beliefs. It would be helpful also to assess instructors' epistemological beliefs because the teachers' beliefs play a key role on teaching and influence how they teach (Lantin & Sangalang, 2009; cited in Said et al., 2011). If there would be many differences between the instructors and students on epistemological beliefs, students' motivation and achievement will be affected. Surely, other researches are needed to answer the aforementioned issues. Another limitation of this study is that it only investigated the relationship between epistemological beliefs, achievement motivation, and academic achievement. There can be other variables that can influence the variables examined. Hence, other researches can be conducted to investigate factors such as educational environments and course contents that affect the students' epistemological beliefs.

References

- Atchoarena, D. & Holmes, K. (2004). The role of agricultural colleges and universities in rural development and lifelong learning in Asia. *Paper presented at the 15th Conference of the Asian Association of Agricultural Colleges and Universities*, held in Nagoya, Japan on 27–30 September 2004. *Asian Journal of Agriculture and Development*, 2(1&2), 15-24.
- Atkinson, J. W. (1964). *An introduction to motivation*. Princeton, NJ: Van Nostrand.
- Berry, J. J., & Plecha, M. D. (1999). *Academic achievement as a function of achievement motivation; achievement beliefs, and affect states*. Oakland, MI: Community College Clearinghouse. (ERIC Document Reproduction Service Number ED460723)

- Bird, M. (2005). *Linking epistemological beliefs to cognitive development and academic achievement*. Unpublished Master thesis, Wichita State University, Wichita, KS.
- Buehl, M.M. (2003). *At the crossroads of epistemology and motivation: modeling the relations between students' domain-specific epistemological beliefs, achievement motivation, and task performance*. Doctoral Dissertation, Faculty of Graduate School, University of Maryland.
- Byrne, Z.S., Mueller-Hanson, R.A., Cardador, J.M., Thornton, G.C., Schuler, H., Frintrup, A. & Fox, Sh. (2004). Measuring achievement motivation: tests of equivalency for English, German, and Israeli versions of the achievement motivation inventory. *Personality and Individual Differences*, 37 (2004), 203–217.
- Cano, F. & Cardelle-Elawar, M. (2004). An integrated analysis of secondary students' conceptions and beliefs about learning. *European Journal of Educational Psychology*, 19(2), 167–187.
- Cano, F. (2005). Epistemological beliefs and approaches to learning: Their change through secondary school and their influence on academic achievement. *British Journal of Educational Psychology*, 75(2), 203-221. DOI: 10.1348/000709904X22683
- Chan, K.W. (2007). Hong Kong teacher education students' epistemological beliefs and their relations with conceptions of learning and learning strategies. *The Asia Pacific Education Researcher*, 16(2), 199-214.
- Cheng, M. M. H., Chan, K. W., Tang, S. Y. F., & Cheng, A. Y. N. (2009). Pre-service teacher education students' epistemological beliefs and their conceptions of teaching. *Teaching and Teacher Education*, 25, 319-327. DOI: 10.1016/j.tate.2008.09.018
- Christiansen, L. & L. Demery (2007). *Down to Earth Agriculture and Poverty Reduction in Africa*. The World Bank Group.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Ed.). New Jersey: Lawrence Erlbaum
- Conley, A. M., Pintrich, P. R., Vekiri, I., & Harrison, D. (2004). Changes in epistemological beliefs in elementary science students. *Contemporary Educational Psychology*, 29, 186-204. DOI: 10.1016/j.cedpsych.2004.01.004
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256–273.
- Ebenuwa-Okoh, E.E. (2010). Influence of Age, Financial Status, and Gender on Academic achievement among Undergraduates. *Journal of Psychology*, 1 (2), 99-103.
- Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist*, 34, 169–189.
- Fairchild, A. J., Jeanne Horst, S., Finney, S. J., & Barron, K. E. (2005). Evaluating existing and new validity evidence for the academic motivation scale. *Contemporary Educational Psychology*, 30, 331–358.
- Fu, J. (2011). *The relationships among self-efficacy, achievement motivation, and work values for regular four-year university students and community college students in China*. Unpublished doctoral dissertation, University of Illinois, Urbana-Champaign.
- Hammer, D. & Elby, A. (2002). On the form of a personal epistemology. In B. Hofer and P. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 169-190). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Hofer, B. K. & Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research*, 67, 88-140.
- Hofer, B. K. (2001). Personal epistemology research: Implications for learning and teaching. *Educational Psychology Review*, 13(4), 353-383. DOI: 10.1023/A:1011965830686
- Jehng, J.J., Johnson, S.D., & Anderson, R.C. (1993). Schooling and students' epistemological beliefs about leaning. *Contemporary Educational Psychology*, 18, 23-35.
- Judy, R.W. & D'Amico, C. (1997). *Workforce 2020: Work and workers in the 21st Century*. Indianapolis: Hudson Institute.
- Kegan, R. (1994). *In over our heads: The mental demands of modern life*. Cambridge, MA: Harvard University Press.
- Kizilgunes, B., Tekkaya, C. & Sungur, S. (2009). Modeling the relations among students' epistemological beliefs, motivation, learning approach, and achievement. *The Journal of Educational Research*, 102(4), 243-255.
- Ko, K., Atwater, D. & Gwin, C. (2011). When academic achievement alone is no longer enough. *Business Education Digest Foundation*, XVIII, 1-11.
- Krueger, A., & Lindahl, M. (2001). Education for growth: why and for whom? *Journal of Economic Literature*, 39, 1101–1136. DOI: 10.1257/jel.39.4.1101
- Kurt, F. (2009). *Investigating Students Scientific Epistemological Beliefs through Gender, Grade level and Fields of the study*. Unpublished Master Thesis, Middle East Technical University, Ankara.
- Lens, W., Matos, L., Simons, J., Soenens, B., & Vanseenkiste, M. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomysupportive versus internally controlling communication style on early adolescents; academic achievement. *Child Development*, 76(2), 483-501.

- Ligon, N. Y. (2006). Assessing the achievement motivation across grades and gender. Dissertation Abstracts International Section A. *Humanities and Social Sciences*, 67(6-A), p. 2052.
- Linnenbrink, E. A. & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review*, 31, 313-327.
- Lodewyk, K. R. (2007). Relations among epistemological beliefs, academic achievement, and task performance in secondary school students. *Educational Psychology*, 27(3), 307-327. DOI: 10.1080/01443410601104080
- Maehr, M. L. & Sjogren, D. (1971). Atkinson's theory of achievement motivation: First step toward a theory of academic motivation? *Review Educational Research*. 41, 143-161.
- Mangal, S. K. (2005). Advanced educational psychology. New Delhi: Prentice Hall of India Ltd.
- McClelland, D.C. (1955). Some social consequences of achievement motivation. In M.R. Jones (Ed.). *Nebraska symposium on motivation*. Lincoln: University of Nebraska.
- Mitchell, J. V. Jr. (1992). Interrelationships and predictive efficacy for indices of intrinsic, extrinsic, and self-assessed motivation for learning. *Journal of Research and Development in Education*, 25(3), 149-155.
- Neber, H. & Schommer-Aikins, M. (2002). Self-regulated science learning with highly gifted students: the role of cognitive, motivational, epistemological, and environmental variables. *High Ability Studies*, 13(1), 59-74.
- Netemeyer, R.G., Bearden, W.O. & Sharma, S. (2003). *Scaling procedures: Issues and applications*. Thousand Oaks, CA: Sage Publications, Inc.
- O'Connor, M.C. & Paunonen, S.V. (2007). Big five personality predicts of post- secondary academic achievement. *Personality and Individual Differences*, 43(2007), 971-990.
- Özkal, K. (2007). *Scientific epistemological beliefs, perceptions of constructivist learning environment and attitude towards science as determinants of students approaches to learning*. Master Thesis, Middle East Technical University, Ankara.
- Paulsen, M. B. & Feldman, K. A. (1999). Epistemological beliefs and self-regulated learning. *Journal of Staff Program and Organization Development*, 16, 83-91.
- Perry, W. G., Jr. (1970). *Forms of intellectual and ethical development in the college years*. New York: Academic Press.
- Said, H., Bakri Badru, B. & Shahid, M. (2011). Confirmatory factor analysis (CFA) for testing validity and reliability instrument in the study of education. *Australian Journal of Basic and Applied Sciences*, 5(12), 1098-1103.
- Scales, P. C. & Roehlkepartain, E. C. (2003). Boosting student achievement: New research on the power of developmental assets. *Search Institute Insights and Evidence*, 7(1), 1-10.
- Schoenfeld, A.H. (1983). Beyond the purely cognitive: Belief systems, social cognitions, and metacognitions as driving forces in intellectual performance. *Cognitive Science*, 7, 329-363.
- Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 82(3), 498-504. DOI: 10.1037/0022-0663.82.3.498
- Schommer, M. (1993). Epistemological development and academic achievement among secondary students. *Journal of Educational Psychology*, 85(3), 406-411. DOI: 10.1037/0022-0663.85.3.406
- Schommer, M. (1998). The influence of age and schooling on epistemological belief. *The British Journal of Educational Psychology*, 68(4), 551-560.
- Schommer, M., Crouse, A., & Rhodes, N. (1992). Epistemological beliefs and mathematical text comprehension: Believing it is simple does not make it so. *Journal of Educational Psychology*, 84(4), 435-443. DOI: 10.1037/0022-0663.84.4.435
- Schommer-Aikins, M., Duell, O.K. & Barker, S. (2003). Epistemological beliefs across domains using Biglan's classification of academic disciplines. *Research in Higher Education*, 44(3), 347-366.
- Schraw, G. & Sinatra, G. M. (2004). Epistemological development and its impact on cognition in academic domains. *Contemporary Educational Psychology*, 29, 95-102. DOI: 10.1016/j.cedpsych.2004.01.005
- Schraw, G., Bendixen, L. D., & Dunkle, M. E. (2002). Development and validation of the Epistemic Belief Inventory (EBI). In: B. K. Hofer & P. R. Pintrich (Eds.). *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 261-275). Mahwah, NJ: Erlbaum.
- Schutz, P.A., Pintrich, R.A. & Young, A.J. (1993). Epistemological Beliefs, Motivation, and Student Learning. *Paper presented at the Annual Meeting of the American Educational Research Association*, Atlanta, GA.
- Topçu, M. S. & Yılmaz-Tüzün, Ö. (2009). Elementary students' metacognition and epistemological beliefs considering science achievement, gender and socioeconomic status. *Elementary Education Online*, 8(3), 676-693.
- Tsakok, I. & Gardner, B. (2007). Agriculture in economic development: primary engine of growth or chicken and egg? *American Journal of Agricultural Economics*, 89(5), 1145-1151. DOI: 10.1111/j.1467-8276.2007.01075.x
- Urtel, M.G. (2008). Assessing academic achievement between traditional and distance education course formats. *Educational Technology & Society*, 11 (1), 322-330.

- Weiner, B. (1990). History of motivational research in education, *Journal of Educational Psychology*, 82, 616-622.
- Wigfield, A., & Eccles, J. S. (2002). *Development of achievement motivation*. San Diego, CA: Academic Press.
- Zhu, Ch., Valcke, M. & Schellens, T. (2008). The relationship between epistemological beliefs, learning conceptions, and approaches to study: a cross-cultural structural model?, *Asia Pacific Journal of Education*, 28(4), 411–423.