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Nature of Academic Programs, Epistemological Beliefs and Their Impact on Pakistani University Students' Academic Performance

^a Rafaquat Ali, ^b Bushra Shoukat, ^c Rabia Bahoo

^a Assistant Professor, Department of Education, The Islamia University of Bahawalpur, Bahawalnagar Campus, Pakistan,

Email: rafaquatiub@yahoo.com

^b Assistant Professor, Department of English, The Islamia University of Bahawalpur, Bahawalnagar Campus, Pakistan,

Email: bushra.shoukat@iub.edu.pk

^c Lecturer, Department of Education, Government Sadiq College Women University, Bahawalpur, Pakistan,

Email: rabia.bahoo@gscwu.edu.pk

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ABSTRACT

The students' academic behaviours and academic performance differ with their epistemological beliefs. Different social-cultural and educational contexts inculcate differences in students' epistemological beliefs. However, the impact of the nature of the academic programs on students' epistemological beliefs is most obvious. The students of different disciplines can have different epistemological beliefs. These different epistemological beliefs differ in their impact on students' academic performance and academic behaviour. Hence, the current study evaluated the interrelationships of various educational programs and epistemological beliefs and their importance in students' academic performance. The volunteer university students provided data about their academic programs, epistemological beliefs, and academic performance. Researchers used the Generalized Structured Component Analysis approach to calculate the suitability of specified measurement and structural models. The impact of subjects of the soft field of study such as Behavioural Sciences, English Literature was negative on naive epistemological beliefs in knowledge structure and omniscient authority compared to subjects of the hard field of studies such as Mathematical, Physical Sciences, and Biological Sciences. The Business Sciences from the soft applied field of study had the least noticeable negative impact on naive epistemological beliefs compared to other subjects of pure soft and pure hard field of studies. Only, the belief in quick learning had a significant negative impact on students' academic performance.

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Corresponding author's email address: rafaquatiub@yahoo.com

1. Introduction

Beliefs control every behavior of human character (Ali *et al.*, 2020; Grayling, 2011). Every so often, the beliefs can only justify and explain human actions (Grayling, 2011; Shermer, 2011). The five critical beliefs in self-control, self-competency, the value of task outcomes, reasons for choosing goals, and epistemology stimulate and instigate human behavior (Hoffman, 2015). However, the epistemological beliefs appear to regulate all important processes and beliefs related to academic performance and learning situations (Metallidou, 2013; Phan, 2009; Schommer-Aikins, 2004; Tümkaya, 2012; Young, 2005). The epistemological beliefs are about knowledge development, structure, source, certainty, and the ability to learn (Bendixen *et al.*, 1998). The beliefs in the ability to learn and learning speed seem more related to conceptions or beliefs of learning. However, these are very much connected with the process and acquisition of knowledge (Bendixen *et al.*, 1998; Schommer-Aikins, 2004). The impact of epistemological beliefs on students' academic performance is obvious and distinctive. Over the years, academicians have gathered mounting evidence about the importance and significance of these beliefs in human learning in different educational settings (Hofer, 2002). There is substantial evidence that the quality and kind of epistemological beliefs explain almost all human learning behavior (Hofer, 2002; Schommer-Aikins, 2004).

Although epistemological beliefs directly impact students' academic performance and learning outcomes, these beliefs are also, directly and indirectly, related to factors that influence students' learning outcomes and academic performance (Ali *et al.*, 2018; McBeth, 2010; Metallidou, 2013). These beliefs affect fundamental factors of students' educational outcomes such as learning goals and learning strategies (Harris, 2003), cognitive processing strategies (Phan, 2009), self-regulation of learning (Metallidou, 2013), motivation to learn, and interest in studies (Kizilgunes *et al.*, 2009), and conceptions of learning (Harris, 2003). Quite often, these beliefs have a direct impact on key factors of students' learning; however, these also mediate the relationships of different elements of students' learning with academic performance (Metallidou, 2013; Phan, 2009; Schommer-Aikins, 2004; Tümkaya, 2012; Young, 2005).

The unsophisticated epistemological beliefs have a damaging effect on students' learning behaviour and academic performance. The belief in learning is quick, and the belief in the ability to learn is innate are naive beliefs, and these deter students' effort to learn, interest in learning, learning outcomes, and self-regulation of learning (Boffeli, 2007; Metallidou, 2013). These naive beliefs lower students' self-efficacy and students use surface learning strategies, and they rote learn the content (Chen & Usher, 2013). In the same way, students with beliefs in simple knowledge confine themselves to a shallow understanding of facts, and they do not strive to acquire a sense of a larger picture of the phenomenon (Boffeli, 2007; Köller, 2001). They memorize the information (Young, 2005) and suffer from academic procrastination (Boffeli, 2007). Likewise, beliefs in omniscient authority and stability of knowledge have adverse impacts on students' learning. The students who hold beliefs in omniscient authority and certain knowledge rely on the information delivered by teachers and presented in books (Ferguson, 2015). Consequently, the student's academic performance is adversely affected (Schommer *et al.*, 1992). Hence, epistemological beliefs can restrict or excite human learning.

Different factors affect the development of epistemological beliefs. Although epistemological beliefs have socioeconomic, cultural, and educational underpinnings (Demir & Ellett, 2014; Özkan & Tekkaya, 2011; Youn *et al.*, 2001), the impacts of gender, age, and disciplines of study on the development of epistemological beliefs are substantial. Generally, female students have sophisticated epistemological beliefs compared to male students (Lodewyk, 2007). Age is also related to the development of epistemological beliefs, and older students are likely to have mature beliefs (Hofer &

Pintrich, 1997). Furthermore, studies are consistently reporting the impacts of disciplines on epistemological beliefs over the years, which has generated views of domain-specific epistemological beliefs (Hofer, 2006). Therefore, academicians can expect differences in students' epistemological beliefs because of different content in different disciplines (Aditomo, 2018).

The literature supports the likelihood that social sciences students have more strong belief in learnability, health sciences students have a more intense belief in innate ability, and science students have less severe beliefs in knowledge certainty (Tümekaya, 2012). Within the pure and applied dichotomy of disciplines, students of the pure field of studies can have more sophisticated beliefs in simple knowledge, quick learning, and certainty of knowledge than students from the applied field of studies (Paulsen & Wells, 1998). However, the researchers have also observed the differences in students of the same discipline or field of study (O'Siochru, 2018). There might be more intense beliefs in omniscient authority in students of psychology and history than students of philosophy (O'Siochru, 2018). Whereas a stronger belief in intelligence or scholarship as justification of knowledge can exist in students of philosophy and sociology compared to students of history (O'Siochru, 2018).

It is also worth pointing out that interrelationships of epistemological belief with students' Grade Point Average (GPA) differ in different subjects. Aditomo (2018) found that the students' stronger belief in subjectivity of knowledge has a negative relationship with GPA in the hard field of studies, and the belief in knowledge uncertainty has a stronger relationship with GPA in the soft field of studies. In contrast, the relationship between the belief in authority and GPA can be insignificant in the hard and soft fields of study.

However, the caveat exists in accepting the notion of domain-specific epistemological beliefs because there might be similar beliefs across different disciplines. Several factors such as the organization of content, learning experience, and age also impact epistemological beliefs. Relationships of domains or fields of study with epistemological beliefs likely become minimized when researchers account for the impacts of all individual and circumstantial factors on epistemological beliefs (Schommer-Aikins *et al.*, 2003).

Different cultures, social settings, teaching-learning environments, and disciplines of study bring about different epistemological beliefs. Therefore, the studies about Pakistani university students' epistemological beliefs are important because these can assist academicians in cognising the development of epistemological beliefs in students of developing countries. Hence, the current study is about understanding the impact of academic programs and students' epistemological beliefs on their academic performance.

2. Conceptual Framework

The different teaching-learning approaches and subject matter stimulate different epistemological beliefs. The students of Science, as compared to students of Humanities and Arts might have less sophisticated beliefs. Researchers perceive that students of different academic programs will have different epistemological beliefs. Although similar teaching approaches implemented within different disciplines can result in similar epistemological beliefs; however, academic performance depends on students' epistemological beliefs. The researchers expect positive relationships between students' sophisticated epistemological beliefs and their educational outcomes. Therefore, the assumption is that students' naive epistemological beliefs will negatively influence their academic performance. Figure 1 describes the conceptual framework of this study:

Figure 1: Conceptual Framework

3. Objectives and Hypotheses of the study

The current study has the following objectives:

- To evaluate the effects of academic programs on Pakistani university students' epistemological beliefs.
- To evaluate the impact of Pakistani university students' epistemological beliefs on their academic grades.

Following are the hypotheses of this study:

- The academic programs will have a significant impact on students' epistemological beliefs.
- The students' epistemological beliefs will have a significant impact on their academic grades.

4. Method

4.1 Sample

The study respondents were students in the sub-campus of a public sector Pakistani university in southern Punjab. There were 547 female and 448 male respondents. The respondents were from the Behavioral Sciences, Arts and Humanities, English Literature and Linguistics, Mathematical and Physical sciences, Computing, Business Sciences, and Biological sciences disciplines. These respondents were volunteers and were selected by convenient sampling.

4.2 Data Collection

The Epistemic Beliefs Inventory (EBI) of Bendixen *et al.* (1998) was used to measure students' epistemological beliefs in the certainty of knowledge, structure of knowledge, innate ability to learn, quick learning, and omniscient authority. The respondents responded to different statements on a five-point scale. The scale had the options strongly disagree, disagree, undecided/neutral, agree, and strongly agree. The researchers merged various academic programs into seven broader fields of study based on their commonalities. These emerged disciplines are the Behavioral Sciences, Arts and Humanities, English Literature and Linguistics, Mathematical and Physical sciences, Computing, Business Sciences, and Biological sciences disciplines. The researchers considered students' self-reported percentage of marks and grades in their last examination as academic performance.

4.3 Data Analysis

The Generalized Structured Component Analysis (GSCA) was used for structural equation modeling (SEM) in this study because the GSCA approach is recognized more efficient than other approaches of SEM (Cho & Choi, 2020; Ferezagia *et al.*, 2021). The GSCA is tolerant of assumptions of data normality and a small sample size (Cho & Choi, 2020). The researcher used GSCA Pro software to

estimate measurement and structural models in this study. Each academic program or field of study was assigned two values, 0 and 1. The GSCA does not provide alpha levels. The assumption of normality is inconsistent with GSCA (Cho & Choi, 2020). The GSCA approach provides confidence intervals, and if any confidence interval at 95% does not include zero, it is considered equal to 0.05 significance level (Das, 2019; Gardner & Altman, 1986; Rodríguez-Entrena *et al.*, 2018). However, using both p-values and confidence intervals is suggested for better decisions in hypothesis testing because both p-values and confidence intervals complement each other (du Prel *et al.*, 2009). Therefore, the researchers have provided both confidence intervals and p-values for different assumptions in this study.

5. Results

5.1 Model Fit Indices

Table No.1 presents the overall model fit measures. The FIT values indicate the proportion of variance explained by the GSCA model in items and latent variable scores (Hwang, 2009). The larger FIT values imply better model fit (Suk & Hwang, 2016). The FIT value of 0.44 (Table No. 1) indicates that the specified model explains total variance up to 44 percent in indicators and latent variables. Whereas FITs determine the extent to which the structural model describes the total variance in different constructs in the model (Hwang *et al.*, 2017). The FITs value is 0.71 in this model, which indicates the success of the specified structural model to explain variance in latent variables up to 71 percent. The FITm specifies the extent to which the measurement model defines the variance in all indicators (Hwang & Takane, 2014). Table No. 1 shows that the measurement model explains the variance in indicators of the model up to 44.7 percent in this study.

Table No. 1				
Model Fit Measures				
FIT	FITs	FITm	GFI	SRMR
0.449	0.71	0.447	0.976	0.039

The goodness of fit index (GFI) value is 0.976, whereas the standardized root mean square residual (SRMR) value is 0.039 in this model. It means that this model has an acceptable fit (Hwang & Takane, 2014).

5.2 Measurement Model

Table 2 and Figure 2 show that 14 items were loaded on five dimensions of epistemological beliefs; certain knowledge, quick learning, innate ability, structure knowledge, and omniscient authority. Hair *et al.* (2014) have advised that an item's loading should be above 0.5 to consider it suitable for the related component or latent variable. The 12 items have loading estimates on relevant components or latent variables above 0.5. The confidence interval, T-statistics, and P-values in Table 2 and Figure 2 show that these item loadings are significant.

Figure 2: Academic Programs, Epistemological Beliefs, and Academic Grades

Table No. 2							
Item Loadings							
Epistemological Beliefs Dimensions	Items	Estimate	SE	95%CI		T-Statistics	P-Value
				LL	UL		
Quick Learning	EBS9	0.733	0.022	0.682	0.77	33.31	< .0001
	EBS21	0.763	0.018	0.73	0.795	42.38	< .0001
	EBS29	0.751	0.022	0.705	0.789	34.13	< .0001
Innate Ability	EBS8	0.732	0.024	0.683	0.776	30.5	< .0001
	EBS17	0.747	0.023	0.698	0.788	32.47	< .0001
	EBS26	0.686	0.029	0.622	0.743	23.65	< .0001
Structure Knowledge	EBS11	0.715	0.022	0.674	0.755	32.5	< .0001
	EBS22	0.743	0.022	0.699	0.785	33.77	< .0001
	EBS24	0.724	0.026	0.666	0.77	27.84	< .0001
Omniscient Authority	EBS4	0.759	0.026	0.705	0.801	29.19	< .0001
	EBS7	0.759	0.024	0.713	0.8	31.62	< .0001
	EBS27	0.597	0.046	0.474	0.667	12.97	< .0001
Certain Knowledge	EBS6	0.798	0.011	0.778	0.823	72.54	< .0001
	EBS31	0.793	0.01	0.773	0.814	79.3	< .0001

Table No.3 shows different construct quality measures. According to Hair *et al.* (2014), the proportion of variance explained (PVE) by each latent variable should be more than 0.50, and the composite reliability index Rho should be above 0.7. The PVE values of latent variables in this measurement model are above 0.5, and the composite reliability measure Rho values are also above 0.7 (Table No.3). It suggests that the latent variables have construct validity as well as composite reliability. Furthermore, Table No. 3 shows that the dimensionality of all components is not greater than 1. It means that indicators associated with related components only stand for the connected component (Hwang *et al.*, 2021).

Table No.3					
Construct quality measures					
Measure	Quick Learning	Innate Ability	Structure Knowledge	Omniscient Authority	Certain Knowledge
PVE	0.561	0.522	0.529	0.503	0.633
Alpha	0.609	0.541	0.555	0.501	0.42
Rho	0.793	0.766	0.771	0.75	0.775
Dimensionality	1	1	1	1	1

Table No. 4 shows the Heterotrait-monotrait ratio (HTMT) of the correlations. According to Henseler *et al.* (2015), the upper limit of HTMT is inconclusive. However, a value above 0.90 is a threat to discriminant validity. Table No. 4 illustrates that the HTMT estimates are under 0.90 except for the HTMT ratio between omniscient authority and the structure knowledge, which is 0.96. As a result, almost all components in this structural model have discriminant validity. Another suggested measure of discriminant validity is the Fornell-Larcker criterion. According to the Fornell-Larcker criterion, the components in the measurement model should have root squared of AVE values higher than their relationships with other constructs in the model (Henseler *et al.*, 2016). All components in this model have discriminant validity because the interrelationships of components in the measurement model (Table No.5) are less than the root squared value of PVE of the involved latent variable (Henseler *et al.*, 2016). It insinuates that different variables in the model have discriminant validity.

Table No. 4									
Heterotrait-Monotrait (HTMT)									
QL ↔ IA	QL ↔ SK	QL ↔ OA	QL ↔ CK	IA ↔ SK	IA ↔ OA	IA ↔ CK	SK ↔ OA	SK ↔ CK	OA ↔ CK
0.86	0.324	0.267	0.903	0.638	0.601	0.819	0.965	0.596	0.426
QL=Quick Learning, SK=Structure Knowledge, OA=Omniscient Authority, CK=Certain Knowledge, IA=Innate Ability									

Table No. 5														
Fornell-Larcker criterion values														
		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Behavioural Sciences	1												
2	Arts & Humanities	- 0.12 7	1											
3	English	- 0.2 99	- 0.11 9	1										
4	Mathematics & Physical Sciences	- 0.15 9	- 0.0 63	- 0.14 9	1									
5	Computing	- 0.3 28	- 0.13 1	- 0.3 07	- 0.16 3	1								
6	Quick Learning	0.0 46	0.01 1	- 0.0 32	- 0.10 8	0.0 96	0.7 49							
7	Business Sciences	- 0.0 75	- 0.0 3	- 0.0 7	- 0.0 37	- 0.0 77	0.0 09	1						
8	Biological Sciences	- 0.2 05	- 0.0 82	- 0.19 2	- 0.10 2	- 0.21 1	- 0.0 73	- 0.0 48	1					
9	Innate Ability	- 0.0 01	- 0.0 27	- 0.0 22	- 0.0 24	0.0 39	0.4 92	- 0.0 08	0.0 06	0.7 22				
10	Grades	0.0 21	- 0.01 3	- 0.0 76	0.0 65	- 0.10 2	- 0.10 7	- 0.01 4	0.13	- 0.0 7	1			
11	Structure Knowledge	- 0.11	- 0.0 79	- 0.0 3	0.0 46	0.0 35	0.18 6	- 0.01 6	0.0 95	0.35	0.0 32	0.7 27		
12	Omniscient Authority	- 0.10 3	- 0.0 37	0	0.0 22	0.01 9	0.13 3	0.0 27	0.0 62	0.3 02	0.0 35	0.4 98	0.7 09	
13	Certain Knowledge	0.0 32	- 0.0 38	- 0.01 6	- 0.0 51	0.0 51	0.4 57	- 0.0 09	- 0.0 38	0.3 92	- 0.0 59	0.2 86	0.18 4	0.7 96

5.3 Structural Model

Table No. 6 and Figure 2 illustrate the significance of different path estimates. The academic programs have different effects on students' epistemological beliefs. There were no significant positive or negative effects of academic programs on students' beliefs in quick learning, innate ability, and certain knowledge. Although, the different academic programs included in this study negatively affect students' beliefs in structure knowledge. However, these effects vary in magnitude. At the same time, the Behavioral Sciences, Arts and Humanities, English, and Computing academic programs have negative effects on belief in omniscient authority. The academic programs of Mathematics and Physical Sciences, Business Sciences, and Biological Sciences have no significant impact on belief in omniscient authority. Among the five epistemological beliefs' dimensions, only the belief in quick learning significantly negatively affects students' academic grades. The rest of the four dimensions of epistemological beliefs also negatively impact students' academic grades, but these impacts were not significant.

Table No. 6						
Path coefficients						
Path	Estimate	SE	95%CI		T-Statistics	P-Value
			LL	UL		
Academic Programs → Epistemological Beliefs						
Academic Programs → Belief in Quick Learning						
Behavioural Sciences→ Quick Learning	0.041	0.08	-0.114	0.169	0.513	0.608
Arts & Humanities → Quick Learning	0.013	0.051	-0.092	0.108	0.255	0.799
English → Quick Learning	-0.02	0.079	-0.173	0.099	-0.253	0.800
Mathematical and Physical Sciences → Quick Learning	-0.097	0.052	-0.207	-0.008	-1.865	0.062
Computing → Quick Learning	0.078	0.077	-0.054	0.206	1.013	0.311
Business Sciences → Quick Learning	0.011	0.044	-0.077	0.094	0.25	0.803
Biological Sciences → Quick Learning	-0.06	0.065	-0.189	0.053	-0.923	0.356
Academic Programs → Belief in Innate Ability						
Behavioural Sciences → Innate Ability	-0.051	0.088	-0.219	0.118	-0.580	0.562
Arts & Humanities → Innate Ability	-0.051	0.054	-0.165	0.046	-0.944	0.345
English → Innate Ability	-0.066	0.084	-0.21	0.122	-0.786	0.432
Mathematical and Physical Sciences → Innate Ability	-0.053	0.064	-0.176	0.068	-0.828	0.408
Computing → Innate Ability	-0.022	0.087	-0.171	0.167	-0.253	0.800
Business Sciences → Innate Ability	-0.023	0.046	-0.103	0.073	-0.5	0.617

Biological Sciences → Innate Ability	-0.033	0.068	- 0.166	0.122	-0.485	0.628
Academic Programs → Belief in Structure Knowledge						
Behavioural Sciences → Structure Knowledge	-0.364	0.055	- 0.466	- 0.255	-6.618	< .0001
Arts & Humanities → Structure Knowledge	-0.216	0.047	- 0.299	- 0.123	-4.596	< .0001
English → Structure Knowledge	-0.294	0.05	- 0.386	-0.19	-5.88	< .0001
Mathematical and Physical Sciences → Structure Knowledge	-0.128	0.042	-0.21	- 0.045	-3.048	0.002
Computing → Structure Knowledge	-0.258	0.053	- 0.355	-0.16	-4.868	< .0001
Business Sciences → Structure Knowledge	-0.1	0.033	- 0.164	- 0.025	-3.030	0.003
Biological Sciences → Structure Knowledge	-0.126	0.048	- 0.212	- 0.025	-2.625	0.009
Academic Programs → Belief in Omniscient Authority						
Behavioural Sciences → Omniscient Authority	-0.27	0.067	- 0.396	-0.141	-4.030	< .0001
Arts & Humanities → Omniscient Authority	-0.131	0.047	- 0.224	- 0.054	-2.787	0.005
English → Omniscient Authority	-0.185	0.066	- 0.302	- 0.056	-2.803	0.005
Mathematical and Physical Sciences → Omniscient Authority	-0.096	0.049	-0.18	0.002	-1.959	0.050 3
Computing → Omniscient Authority	-0.18	0.072	- 0.312	- 0.047	-2.5	0.013
Business Sciences → Omniscient Authority	-0.032	0.036	- 0.094	0.045	-0.889	0.374
Biological Sciences → Omniscient Authority	-0.089	0.055	- 0.196	0.026	-1.618	0.106
Academic Programs → Certain Knowledge						
Behavioural Sciences → Certain Knowledge	-0.047	0.096	- 0.225	0.13	-0.490	0.625
Arts & Humanities → Certain Knowledge	-0.072	0.055	- 0.188	0.045	-1.309	0.191
English → Certain Knowledge	-0.081	0.093	- 0.241	0.095	-0.870	0.384
Mathematical and Physical Sciences → Certain Knowledge	-0.091	0.06	- 0.198	0.028	-1.517	0.130
Computing → Certain Knowledge	-0.035	0.093	- 0.205	0.159	-0.376	0.707
Business Sciences → Certain Knowledge	-0.031	0.039	-0.09	0.048	-0.795	0.427
Biological Sciences → Certain Knowledge	-0.087	0.076	-0.22	0.05	-1.145	0.253

Epistemological Beliefs → Academic Grades						
Quick Learning → Grades	-0.088	0.037	- 0.166	- 0.019	-2.378	0.018
Innate Ability → Grades	-0.048	0.037	- 0.123	0.025	-1.297	0.194
Structure Knowledge → Grades	0.052	0.037	- 0.031	0.106	1.405	0.160
Omniscient Authority → Grades	0.039	0.035	- 0.037	0.104	1.114	0.265
Certain Knowledge → Grades	-0.022	0.037	- 0.091	0.05	-0.595	0.552

The path estimates revealed that all academic programs included in this study have a significant negative effect on students' beliefs in structure knowledge. However, the researchers drew graphs of confidence intervals and calculated the average overlapping of confidence intervals to determine the statistical differences between significant path estimates. Table No. 7, Figures 3, and 4 show the relative significance of differences in the negative effects of various academic programs on students' beliefs in structure knowledge and omniscient authority. The decision rule is that if the confidence intervals have overlapping of less than 50%, then the path estimates are statistically different at a $p < 0.05$ significance level (Cumming, 2007; Cumming & Finch, 2005). The decision about less than 50% overlapping of confidence intervals can be made by looking at the confidence interval graphs and computing the average overlapped confidence interval in an overlapped limit or boundary (Cumming, 2009; Cumming & Finch, 2005).

Figure 3 Differences in impact of Academic Programs on Belief in Structure of Knowledge

Figure 4 Differences in impact of Academic Programs on Belief in Omniscient Authority

Figure 3 and Table No. 7 show that the Behavioral Sciences academic program has the highest negative effect on students' belief in structure knowledge compared to Mathematical and Physical Sciences, Biological Sciences, and Business Sciences academic programs. The English Literature academic program has the second larger significant negative effect on students' belief in structure knowledge compared to Biological and Business Sciences programs. In contrast, the Computing academic program has a greater negative impact on structure knowledge belief than the Business Science academic program. In this way, academic programs of psychology and English from the soft disciplines' category have a more negative impact on the structure of knowledge beliefs than the academic programs of Science from the hard discipline category and the Business Sciences academic program of applied discipline category. The Business Science students have simple beliefs in the structure of knowledge compared to students of Science, Humanities, Language and Behavioral Sciences. In a way, the Behavioral Sciences discipline has the strongest negative impact on naive belief in the structure of knowledge compared to Business Sciences. The Business Sciences academic program has the least negative impact on naive belief in the structure of knowledge.

The Behavioral Sciences, English, Computing, Arts, and Humanities academic programs significantly negatively affect students' belief in omniscient authority. Although, the magnitude of path estimates show that these academic programs might have significant differences in their impact on omniscient authority beliefs. However, there were no significant differences in their significant negative effects on belief in omniscient authority (Table No. 7 and Figure 4).

Table No.7		
Differences in Significant Impacts of Academic Programs on Epistemological Beliefs Based on Overlapping of Confidence Intervals		
Path A	Path B	Difference Between Paths A & B
Differences in impact of Academic Programs on Belief in Structure of Knowledge		
Behavioural Sciences → Structure Knowledge (-0.364***), Cis = -0.466, -0.255	English → Structure Knowledge , (-0.294***), Cis= -0.386, -0.19	-0.07 ^{N.S}
	Computing → Structure Knowledge, (-0.258***), Cis= -0.355, -0.16	-0.106 ^{N.S}
	Arts & Humanities → Structure Knowledge, (-0.216***), Cis= -0.299, -0.123	-0.148 ^{N.S}
	Mathematical and Physical Sciences → Structure Knowledge, (-0.128**), Cis= -0.21, -0.045	-0.236 [*]
	Biological Sciences → Structure Knowledge, (-0.126**), Cis= -0.212, -0.025	-0.238 [*]
	Business Sciences → Structure Knowledge, (-0.1**), Cis= -0.164, -0.025	-0.264 [*]
English → Structure Knowledge (-0.294***), Cis= -0.386, -0.19	Computing → Structure Knowledge, (-0.258***), Cis= -0.355, -0.16	-0.036 ^{N.S}
	Arts & Humanities → Structure Knowledge, (-0.216***), Cis= -0.299, -0.123	-0.078 ^{N.S}
	Mathematical and Physical Sciences → Structure Knowledge, (-0.128**), Cis= -0.21, -0.045	-0.166 ^{N.S}
	Biological Sciences → Structure Knowledge , (-0.126**), Cis= -0.212, -0.025	-0.168 [*]
	Business Sciences → Structure Knowledge , (-0.1**), Cis= -0.164, -0.025	-0.194 [*]
Computing → Structure Knowledge (-0.258***), Cis= -0.355, -0.16	Arts & Humanities → Structure Knowledge , (-0.216***), Cis= -0.299, -0.123	-0.042 ^{N.S}
	Mathematical and Physical Sciences → Structure Knowledge , (-0.128**), Cis= -0.21, -0.045	-0.13 ^{N.S}
	Biological Sciences → Structure Knowledge , (-0.126**), Cis= -0.212, -0.025	-0.132 ^{N.S}
	Business Sciences → Structure Knowledge , (-0.1**), Cis= -0.164, -0.025	-0.158 [*]

Arts & Humanities → Structure Knowledge (-0.216***), Cis= -0.299, -0.123	Mathematical and Physical Sciences → Structure Knowledge , (-0.128**), Cis= -0.21, -0.045	-0.088 ^{N.S}
	Biological Sciences → Structure Knowledge , (-0.126**), Cis= -0.212, -0.025	-0.09 ^{N.S}
	Business Sciences → Structure Knowledge , (-0.1**), Cis= -0.164, -0.025	-0.116 ^{N.S}
Mathematical and Physical Sciences → Structure Knowledge (-0.128**), Cis= -0.21, -0.045	Biological Sciences → Structure Knowledge , (-0.126**), Cis= -0.212, -0.025	-0.002 ^{N.S}
	Business Sciences → Structure Knowledge , (-0.1**), Cis= -0.164, -0.025	-0.028 ^{N.S}
Biological Sciences → Structure Knowledge (-0.126**), Cis= -0.212, -0.025	Business Sciences → Structure Knowledge , (-0.1**), Cis= -0.164, -0.025	-0.026 ^{N.S}
Differences in impact of Academic Programs on Belief in Omniscient Authority		
Behavioural Sciences → Omniscient Authority (-0.27***), Cis= -0.396, -0.141	English → Omniscient Authority , (-0.185**), Cis= -0.302, -0.056	-0.085 ^{N.S}
	Computing → Omniscient Authority , (-0.18*), Cis= -0.312, -0.047	-0.09 ^{N.S}
	Arts & Humanities → Omniscient Authority, (-0.131**), Cis= -0.224, -0.054	-0.139 ^{N.S}
English → Omniscient Authority (-0.185**), Cis= -0.302, -0.056	Computing → Omniscient Authority , (-0.18*), Cis= -0.312, -0.047	-0.005 ^{N.S}
	Arts & Humanities → Omniscient Authority, (-0.131**), Cis= -0.224, -0.054	-0.054 ^{N.S}
Computing → Omniscient Authority (-0.18*), Cis= -0.312, -0.047	Arts & Humanities → Omniscient Authority, (-0.131**), Cis= -0.224, -0.054	-0.049 ^{N.S}
*= $p < 0.05$, if Overlapping of Intervals is more than 50%, the difference is insignificant at an alpha level of 0.05		

Table No. 8 shows the effect sizes of different predictor variables on dependent variables. The strength of effect sizes is determined based on suggestions by Hair *et al.* (2014). The effect size of behavioral sciences academic program on students' belief in structure of knowledge is medium. In comparison, the effect sizes of Computing, English, Arts, and Humanities academic programs on students' belief in knowledge structure are small. Likewise, there are small effect sizes of English, Behavioral Sciences, and Computing academic programs on students' belief in omniscient authority. The effect sizes of the remaining predictors for dependent variables are very small.

Table No. 8						
Effect Sizes						
	Quick Learning	Innate Ability	Grades	Structure Knowledge	Omniscient Authority	Certain Knowledge
Behavioural Sciences	0.002	0.003		0.153	0.079	0.002
Arts & Humanities		0.003		0.049	0.018	0.005
English		0.004		0.095	0.035	0.007
Mathematical and Physical Sciences	0.009	0.003		0.017	0.009	0.008
Computing	0.006			0.072	0.034	0.001
Quick Learning			0.008			
Business Sciences		0.001		0.01	0.001	0.001
Biological Sciences	0.004	0.001		0.016	0.008	0.008
Innate Ability			0.002			
Grades						
Structure Knowledge			0.003			
Omniscient Authority			0.002			
Certain Knowledge						

The R^2 values of the model (Table No. 9) show that this model explains 2.5 percent variance of belief in quick learning, 0.3 percent variance of belief in innate ability, 4.1 percent variance of belief in structure of knowledge, 2.1 percent of the variance in belief in omniscient authority, 0.9 percent variance of belief in certain knowledge, and 1.7 percent variance in academic grades. The academic programs have an obvious role in developing structure knowledge and omniscient authority beliefs because beliefs entrench in the academic environments of university academic programs. The belief in quick learning is the negative predictor of students' better academic performance.

Table No. 9					
R squared values of components in the structural model					
Quick Learning	Innate Ability	Structure Knowledge	Omniscient Authority	Certain Knowledge	Grades
0.025	0.003	0.041	0.021	0.009	0.017

6. Discussion

This study supports earlier findings concerning the general influence of academic programs on students' epistemological beliefs (Aditomo, 2018; Hofer, 2006). The differences in students' beliefs in structure knowledge are coherent with findings of previous studies (Paulsen & Wells, 1998; Tümkaya, 2012). The academic programs counted in the soft field of studies such as Behavioural Sciences and English Literature look like to incite sophisticated epistemological beliefs in structure knowledge compared to academic programs included in the hard field of studies such Mathematical-Physical Biological Sciences. However, Business Sciences students have naive beliefs compared to other academic programs such as Behavioural Sciences, and English Literature included in soft-field of study. This finding is congruent to literature because Business Science is an applied field of study, and Behavioural Sciences, English Literature, and Computing can be considered a pure field of study. The students of the applied field of studies have strong naive beliefs compared to students of the pure field of studies (Paulsen & Wells, 1998). The differences in students' epistemological beliefs result from different teaching practices and content presented to students (Buehl & Alexander, 2001; Buehl *et al.*, 2002). The academic programs of Behavioural Sciences, English, Computing, Arts, and humanities have a strong negative impact on students' belief in omniscient authority. This finding adds to existing evidence that students of Behavioural Sciences, English, Computing, Arts, and humanities academic programs have less strong beliefs in omniscient authority.

The conclusive findings affirming sophisticated epistemological beliefs in students of Social Sciences (Ismail *et al.*, 2013) are because the knowledge delivered to social sciences students is subjective, and students of social sciences are provided opportunities to reflect and interpret the subjective knowledge (Ismail *et al.*, 2013). Likewise, students of Mathematics and Physical Sciences likely fail to understand relationships between different concepts, and they believe that experts create and deliver subject knowledge to them (Muis, 2004). In this way, the students' epistemological beliefs reveal their learning experience and perceptions of instruction practices in these academic programs. The strong belief in omniscient authority discloses that some books are preferred to teach, and students have no opportunities for knowledge construction (Hofer, 2004).

Although the epistemological beliefs differ in strength, these are almost in the same direction in different disciplines included in this study. It adds evidence to the already suggested limitation by Muis *et al.* (2006) in the notion of domain-specific epistemological beliefs.

Furthermore, it is noticeable that the sample in this study was university students. Although there are commonly teacher-centred teaching methods in practice to teach this sample, this sample shows less strong naive beliefs. Therefore, the role of age in developing sophisticated beliefs can be recognized because there is a decrease in reliance on authority with an increase in age (Nacaroglu & Kızkapan, 2021).

This study's finding of the negative impact of students' naive epistemological beliefs on their academic performance is consistent with the literature (Cano, 2005; Chen & Pajares, 2010). Among five dimensions of epistemological beliefs, only the belief in quick learning negatively impacts students' academic grades. Different dimensions of epistemological beliefs relate to students' academic performance. Ongowo (2021) found certainty of knowledge and justification of knowledge related to students' science performance, Aditomo (2018) found subjectivity of knowledge and certainty beliefs related to academic performance in soft subjects and did not see any impact of omniscient authority belief on academic performance in hard or soft fields. Therefore, the effects of dimensions of epistemological beliefs on academic performance vary with the context of learning and learning

content.

7. Conclusion

Although the strength and effect of belief in quick learning on students' academic performance are very low in this study, the confidence intervals show this may have severe implications for students' academic performance. The students' belief in quick learning can motivate them to draw quick, oversimplified conclusions and fixed answers to questions (Schommer & Dunnell, 1997). This belief disheartens students, and they abandon understanding text if they feel it is difficult to understand (Schommer-Aikins, 2004). As a result, such students memorize content instead of acquiring an understanding of content (Schommer-Aikins *et al.*, 2005). In this way, these students are likely to have a surface learning approach, high anxiety, and low motivation for learning (Schommer-Aikins & Easter, 2008). Consequently, they fail to regulate their learning (Metallidou, 2013).

8. Policy Implications

The academic environments of different academic programs, and the content presented to students vary in nature, objectives, and organization. These differences have the potential to impart differences in students' epistemological beliefs. Although there are implicit objectives in each program to develop sophisticated and mature epistemological beliefs in students essential for the intellectual development of students, therefore teachers do not opt for any explicit strategy for the development and evaluation of sophisticated epistemological beliefs in students. It seems that the curriculums of different academic programs focus only on teaching informative content rather than a development of sophisticated epistemological beliefs. Therefore, the links between students' epistemological beliefs and their academic performance are not very obvious across different academic programs in this study. However, the beliefs of quick learning provide the foundation for the development of other epistemological beliefs such as omniscient authority, innate ability, structure knowledge, and certain knowledge. Therefore, explicit interventions and strategies should be formulated to develop sophisticated epistemological beliefs in step by step and gradual learning.

9. Recommendations

This study highlighted the need to pay attention to students' epistemological beliefs because they play a critical role in their academic performance. The teaching practices in science classrooms should be revisited to identify the reasons for naive epistemological beliefs in science students. It is needed to suggest frameworks for the development and instigation of sophisticated epistemological beliefs in science students. Curriculum experts can include detailed notes and points explaining sophisticated epistemological beliefs for science students in textbooks. The teachers' teaching practices reflect their epistemological beliefs. Therefore, researchers should also scrutinize teachers' epistemological beliefs. The teachers should introduce student-centred teaching methods in place of teacher-centred methods in classrooms.

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