

# **Difference of Attitudes Toward Statistics between Cadets and College Students**

W. M. Luh, National Cheng Kung University, Taiwan, J. H. Guo, Air Force Academy, Taiwan, and J. M. Wisenbaker, University of Georgia, USA

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## 1. Introduction

Teaching introductory statistics in the ordinary college is somewhat different from in the Air Force Academy in Taiwan. The cadets in the Air Force Academy often have different interests and show low academic expectation and negative learning attitude than the ordinary college students (Luh, 1995). Teachers at the Air Force Academy find that teaching, especially statistics, is challenging. An introductory statistics is one of the required courses for most majors in the Air Force Academy. Although the first course in statistics rarely requires sophisticated mathematics, the teachers have experiences the difficulty of teaching because of the fear of mathematics and negative attitudes toward statistics. Many studies showed that students' attitudes might influence their learning of statistical concepts as much as the cognitive abilities (Fetta, 1992). Bishop (2002) also showed that 64% of the unsuccessful students were correctly classified by the mathematics anxiety. Schutz, Drogosz, White and Distefano (1998) showed that motivational variables including attitudes influenced performance in the introductory statistics courses. Moreover, Galagedera, Woodward and Degamboda (2000) found that perceived mathematics ability together with aptitude could affect elementary statistics performance. The literature also shows that students usually generalize from their experience with mathematics or from their perception of their own general cognitive abilities (Scott & Wisenbaker, 1994). Therefore, the present study is to investigate and compare the difference of mathematical attitude, attitude toward statistics (SATS), and the perceived mathematical ability (PMA) for the cadets and college students. The results can provide insights of the role of math and statistics attitudes. In essence, such evaluation can assist instructors in identifying remedial need or putting much effort on intervention or teaching strategy.

## 2. Procedure and Instruments

There are 38 male cadets and 43 full-time college students participating in the present study. The college students are from a large university in the southern Taiwan. Two instruments were administered on the first day of a statistics class for both schools. The Mathematics Attitude Scale has 10 items, from 1 (strongly disagree) to 7 (strongly agree). The higher the score is, the more positive attitude toward mathematics. The Cronbach alpha for the instrument is .93 in this

study. Moreover, the Survey of Attitudes Toward Statistics (SATS) (Schau, Dauphinee, Edl Vecchio, & Stevens, 1992) has 30 items, with 7-point Likert scale. There are four subscales in the survey: Affect, Cognitive Competence (CogComp), Value and Difficulty. The higher the score is, the more positive attitude toward statistics. The two leading instruments were translated to Chinese and translated back to English to make sure the equivalence of item meaning. The psychometric properties of the C-SATS were investigated in Luh, Takahashi and Wisenbaker (2004). In the present study, the Cronbach alpha of the Affect subscales is .78, with 6 items. The Cronbach alpha of the Cogcomp subscale is .77 with 6 items. The Cronbach alpha of the Value and Difficulty subscale is .83 and .63 with 10 and 8 items respectively. Finally, there is one question about the math ability the subjects perceive: How good at mathematics are you? The subject can choose from 1 (very poor) to 7 (very good) to express their perception of their math ability (PMA). The data was keyed in and analyzed by using Spss software.

### 3. Results

The descriptive statistics of subscales for the two groups are presented in the Table 1. The Value subscale has the highest mean score among these variables indicating that subjects have very positive evaluation toward the value of statistics. It is noted that the means of variables for college students are larger than cadets except for the CogComp score. Moreover, the standard deviation of CogComp in cadets is as twice as the college students. Table 2 and 3 show the correlation of subscales for cadets and college students respectively. It is found that the CogComp score for college students is negative correlated to other variable. Figure 1 shows the scatter plot of CogComp and math attitude for the cadets. It reveals a positive relationship, which is expected. However, the scatter plot of Cogcomp and math attitude for the college students (See Figure 2) reveals a negative relationship. Finally, a null hypothesis of no difference of scores for cadets and college students is tested at a .05 level. The result shows that there are statistical differences between cadets and college students on PMA, math attitude, and CogComp.

Table 1. Means and standard deviations of two groups

	Perceived	Math	SATS			
	Math Ability	Attitude	Affect	CogComp	Value	Difficulty
Cadets (N=38)	3.51 (1.21)	3.78 (1.10)	4.41 (.92)	4.61 (1.03)	5.35 (.91)	3.3 (.69)
College Students (N=43)	4.44 (1.35)	4.79 (1.31)	4.73 (.81)	3.67 (.51)	5.61 (.86)	3.36 (.69)

Table 2. The correlation of variables for the cadets

	PMA	Math Attitude	Affect	CogComp	Value
Math Attitude	.64				
Affect	.18	.26			
CogComp	.41	.42	.88		
Value	.20	.34	.64	.71	
Difficulty	-.16	-.21	.17	.025	-.28

Table 3. The correlation of variables for the college students

	PMA	Math Attitude	Affect	CogComp	Value
Math Attitude	.71				
Affect	.41	.58			
CogComp	-.31	-.37	-.43		
Value	.26	.29	.39	-.10	
Difficulty	-.04	.17	.21	-.38	-.29

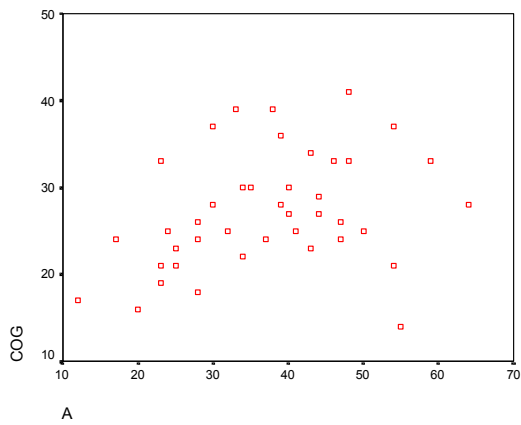
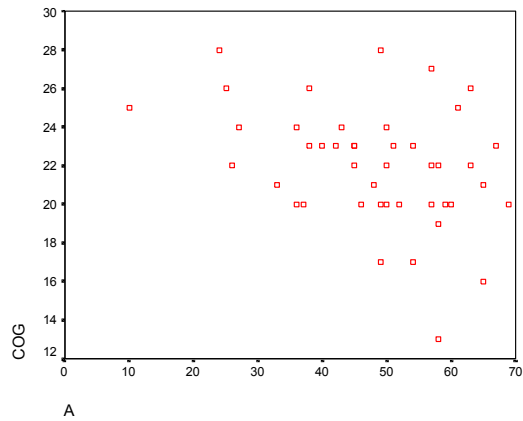


Figure 1. The scatter plot of CogComp and math attitude for the cadets



**Figure 2. The scatter plot of CogComp and math attitude for college students**

Table 4. The results of hypothesis testing (two-sided)  $\alpha = .05$

Variable	t	p	Mean Difference	95%CI Difference
PMA	3.37	.001	.93	[.38, 1.48]
Math Attitude	3.78	.000	1.01	[.48, 1.54]
Affect	1.65	.103	.32	[.06, .79]
CogComp	-5.11※	.000	-.94	[-1.3, -.57]
Value	1.34	.186	.26	[-.13, .65]
Difficulty	.38	.704	.06	[-.24, .36]

※ Equal variances are not assumed.

#### 4. Conclusion

The results show that both groups think statistics has its own value and have positive attitude toward statistics. In addition to that, the college students have higher perceived math ability and math attitude but lower CogComp score than the cadets. The distinguished difference between two groups is the CogComp subscale. There is a negative relation between CogComp and math attitude for the college students, and positive relation for the cadets.

Despite the fact that statistics is probably the least favored area of study for most students, the present investigation is useful and constructive to both students and instructors. These results help to expand our understanding of what is involved in the process of learning statistics. The implication of the results is that we must enhance the perception of the cognitive competence for college students while teaching. Furthermore, future studies investigating the relationship between the variables considered here needs to be replicated using other samples.

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