Some Results from the Survey on Turkish Statistics Education

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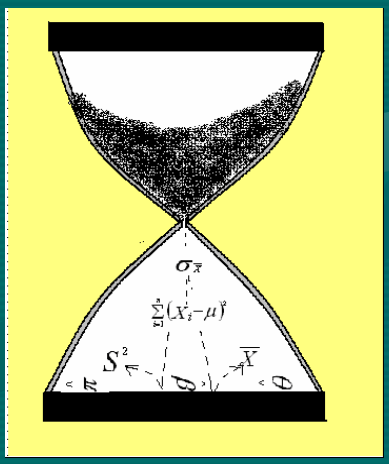
"Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write. "

H.G. Wells



Introduction

The discussions on statistics education were intensified especially at the end of nineties in United States of America. In this respect, some means were taken into consideration to develop statistics education both in undergraduate and graduate levels. Some debates were realized to evaluate the quality of statistics courses both offered in statistics departments and in other departments demanding statistics as service courses. In these debates, the skills that graduates of statistics should acquire were also under investigation

Besides ,

- the relative weights of theoretical courses and applied courses in programs ,
- the content and the quality of mathematics courses offered in statistics curriculum,
- feasibilities of collaboration with some departments including mathematics,
- the affects of technology on statistics education were the other items on the agenda.

Minton (1983) , in his article "The Visibility of Statistics as a Discipline" emphasizes that any systematic way of research is called as a " discipline" if it satisfies the following requirements:

i. the existence of a structure and a literature on its theory,
ii. the existence of a large number of professional people studying for this area ,
iii. the existence of a large number of periodicals publishing the contemporary discussions and innovations in this area ,
iv. the existence of an external demand from the other disciplines towards the outputs of this field.

It is sure that statistics satisfied these requirements totally at the beginning of 20th century. Nevertheless Minton emphasizes that statistics was not then called as a discipline since there were not enough number of statistics departments providing career opportunities for the young candidates of universities. For more than 20 years, ASA (American Statisticians Association) has been organising meetings and symposiums to evaluate the quality of statistics education throughout the world .

In 1999, a meeting held in United States produced a very important document called as "Undergraduate Statistics Education Initiative" . It will be useful to list some of the issues considered during this organization:

a) The titles/ positions in which the statisticians are being currently employed,
b) The relationship between statistics curriculum and career steps offered for prospective statistics graduates,
c) The differences between statistical & mathematical thinking ,
d) Basic subjects that must be covered by statistics curricula,
e) Non-technical skills that statistics students must acquire,
f) Computer skills that statistics students must acquire,

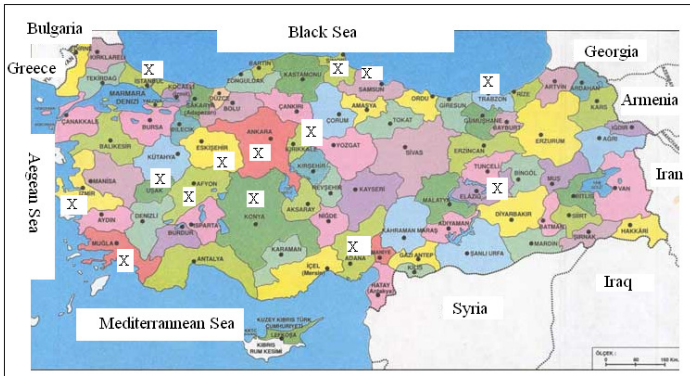
g) Mathematical skills the statistics students must acquire,
h) A basic classification on elective courses,
i) A classification of course offerings for the students with graduate education perspectives,
j) A classification of course offerings for the students without graduate education perspectives,
k) The crucial role of data analysis in statistics education,
l) The importance of mathematical statistics courses in statistics education,
m) Evaluation of introductory statistics /or service courses offered in other departments

2. Some Descriptive Statistics from the Survey on Turkish Statistics Education

Statistics is a young discipline in Turkey as far as the establishment years of statistics departments are taken into account. In Turkey , the oldest statistics departments were established in 1960's . Using the figures of 2006, there were 25 statistics departments in which about 4300 students were being educated.

In addition, an increasing demand for statistical studies from business life is a fact. Of course this high demand motivates academicians to go into further researches. On the other hand; as a by-product of this rapid growth process ; there are some problems that cannot be vanished easily.

Geographical distribution of statistics departments in Turkey



We tried to investigate some aspects of Turkish statistics education at university level by the valuable supports of TUBITAK (The Scientific and Technological Research Council of Turkey) **in 2007. Questionnaire forms of students from different statistics departments of Turkish universities were analysed. We also studied on some questionnaire forms of Turkish academic statisticians.**

General Conclusions about Students' Appreciations on Turkish University Education in Statistics

- The number of participating students in this survey was 1794.
- On the average, there were 94 participating students coming from each university .
- One third of the students in the sample were seniors, whereas one fourth were juniors.
- 52 percent of the students in the sample were female.
- There are two types of education modules or programs offered in Turkey. The first module is carried on days, and the second module is on the evenings. 15.9 % of the students in our sample is from the second module.

Some cross tabulations

	Metropolitan
Female	58,65%
Male	41,35%
Total	100,00%

	Other
Female	44,64%
Male	55,36%
Total	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Squ	35,226	1	,000		
Continuity Correc	34,666	1	,000		
Likelihood Ratio	35,332	1	,000		
Fisher's Exact Te				,000	,000
Linear-by-Linear Association	35,206	1	,000		
N of Valid Cases	1794				

The distribution of the high schools from which students graduated

	Metropolitan	Other
Regular H.S.	19,10%	43,04%
Special H.S.	46,67%	28,18%
Super H. S.	26,07%	24,41%
H.S.S.	2,79%	0,59%
Vocational	0,86%	1,77%
Private	4,29%	1,42%
Other	0,21%	0,59%
Total	100,00%	100,00%

Some statistics based on the preference lists of students while applying university entering examination

Ranks of Programs in Preference List	Metropolitan Universities	Others
1-5	40,89%	24,47%
6-10	35,99%	28,98%
11-15	16,90%	24,70%
16-20	4,47%	14,13%
21+	1,74%	7,72%
Total	100,00%	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Squar	134,495	4	,000
Continuity Correcti			
Likelihood Ratio	138,855	4	,000
Linear-by-Linear Association	129,892	1	,000
N of Valid Cases	1759		

- Some figures on socioeconomic status (SES) scores of students

- The socioeconomic status (SES) scores of the students were calculated and it was observed that 9% of the students came from the group with the highest income and wealth, 30 % of the students came from the second highest group, and 50 % came from the two middling groups. Of course, these are average figures and SES scores change considerably from one unversity to the other. Nevertheless, it can be concluded that university education is still a problem for poorer classes!

Socio economic Status Groups

- **Group A**: Big capitalists or investors , top managers of private sector, and famous and leading professionals (doctors, lawyers, etc.) are the representatives of this group.
- **Group B**: The new riches of the society, top managers of public sector, big or at least middle-sized entrepreneurs are typical members of this category.
- **Group C1:** This group consists of professionals, managers , etc.
- **Group C2**: White collars and small entrepreneurs are the typical members of this group.
- **Group D**: Blue collars**,** semi-qualified or qualified workers are the natural members of this group.
- **Group E:** This group consists of least qualified portion of society. The members are generally manual workers, agricultural workers etc.

SES scores and groups

SES Groups	Points
A	201 and over
B	between146 and 200
C1	between 105 and 145
C2	between70 and 104
D and E	69 and lower

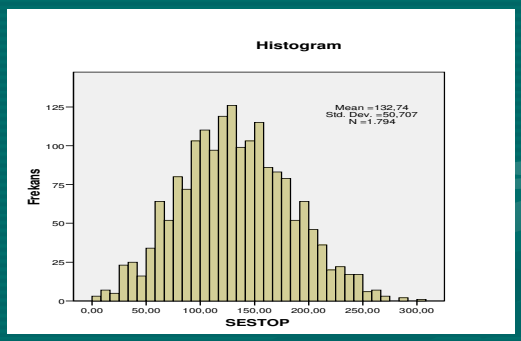


Figure : Frequency distribution of SESTOTAL scores

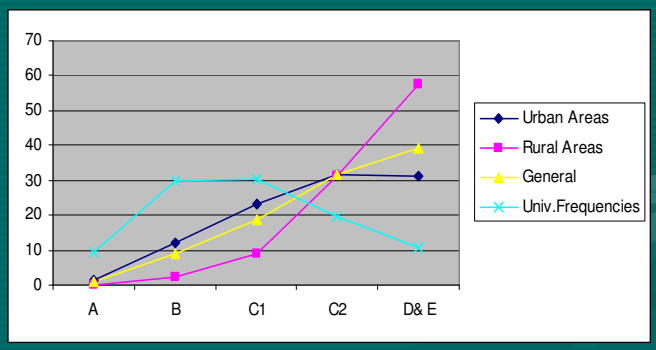
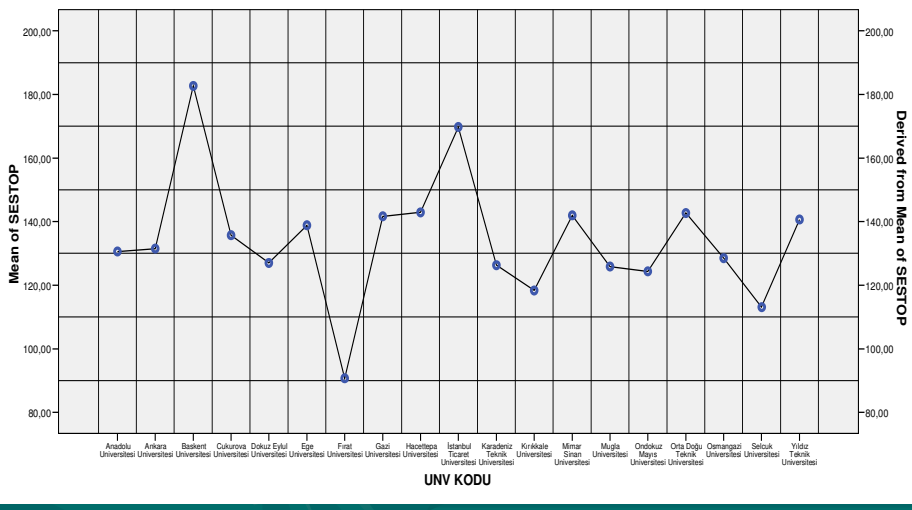


Figure : The percentage distribution of SES scores within Turkish population and within statistics departments



The distribution of SES scores

	Metropolitan	Others	Total
Group A	61,31%	38,69%	100,00%
Group B	61,34%	38,66%	100,00%
Group C1	52,67%	47,33%	100,00%
Group C2	41,36%	58,64%	100,00%
Group D&E	36,98%	63,02%	100,00%

	Group A	Group B	Group C1	Group C2	Group D&E	Total
Metropolitan	11,00%	35,26%	30,56%	15,60%	7,59%	100,00%
Others	7,58%	24,24%	29,95%	24,13%	14,10%	100,00%

Attitude Changes Towards Statistics Departments

- 54.3 percent of the participants stated that they had got some prior information about the opportunities that statistics departments provided its students before they took the university entering examination.

The attitude changes toward the department after registration

	Metropolitan	Other
Extremely negative	3,23%	1,48%
Moderately negative	10,17%	8,37%
Undecided	19,74%	23,15%
Moderately positive	54,07%	55,17%
Extremely positive	12,80%	11,82%
Total	100,00%	100,00%

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9,423	4	,051
Continuity Correction			
Likelihood Ratio	9,578	4	,048
Linear-by-Linear Association	1,018	1	,313
N of Valid Cases	1648		

	Extremely negative	Moderately negative	Undecided	Moderately positive	Extremely positive
Metropolitan	69,23%	55,56%	46,74%	50,22%	52,71%
Other	30,77%	44,44%	53,26%	49,78%	47,29%
Total	100,00%	100,00%	100,00%	100,00%	100,00%

The association between gender and future perspectives after graduation

	Female	Male
I plan to work	44,16%	51,59%
I want to take a statistics graduate program	15,42%	9,99%
I want to register a graduate program other than statistics	22,14%	18,80%
I want to go abroad to improve my foreign language abilities	8,70%	7,99%
I want to go abroad to take a graduate program	8,15%	6,70%
Other	1,43%	4,94%
Total	100,00%	100,00%

	I plan to work	I want to take a statistics graduate program	I want to register a graduate program other than statistics	I want to go abroad to improve my foreign language	I want to go abroad to take a graduate program	Other
Female	47,74%	62,22%	55,68%	53,74%	56,49%	23,64%
Male	52,26%	37,78%	44,32%	46,26%	43,51%	76,36%
Total	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36,331	5	,000
Continuity Correction			
Likelihood Ratio	37,249	5	,000
Linear-by-Linear Association	,131	1	,718
N of Valid Cases	1759		

The class identifications and the degree of satisfaction with statistics department

	No satisfaction	Inferior satisfaction	Mediocre satisfaction	Superior satisfaction	Perfect satisfaction
Freshman	7,56%	11,11%	14,68%	20,83%	24,80%
Sophomore	19,33%	19,66%	25,69%	24,32%	19,29%
Junior	34,45%	30,34%	24,95%	22,89%	28,35%
Senior	38,66%	38,89%	34,68%	31,96%	27,56%
Total	100,00%	100,00%	100,00%	100,00%	100,00%

	Freshman	Sophomore	Junior	Senior
No satisfaction	2,91%	5,60%	8,84%	7,71%
Inferior satisfaction	8,41%	11,19%	15,30%	15,24%
Mediocre satsifaction	25,89%	34,06%	29,31%	31,66%
Superior satisfaction	42,39%	37,23%	31,03%	33,67%
Perfect satisfaction	20,39%	11,92%	15,52%	11,73%
Total	100,00%	100,00%	100,00%	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	46,467	12	,000
Continuity Correction			
Likelihood Ratio	47,794	12	,000
Linear-by-Linear Association	27,883	1	,000
N of Valid Cases	1781		

Distributions of degrees of satisfaction with the department

	Metropolitan	Other
Extremely dissatisfied	2,78%	8,28%
Dissatisfied	6,94%	22,26%
Undecided	30,02%	36,83%
Satisfied	49,57%	26,92%
Extremely satisfied	10,68%	5,71%
Total	100,00%	100,00%

	Extremely dissatisfied	Dissatisfied	Undecided	Satisfied	Extremely satisfied
Metropolitan	26,80%	25,39%	47,07%	66,76%	67,11%
Other	73,20%	74,61%	52,93%	33,24%	32,89%
Total	100,00%	100,00%	100,00%	100,00%	100,00%

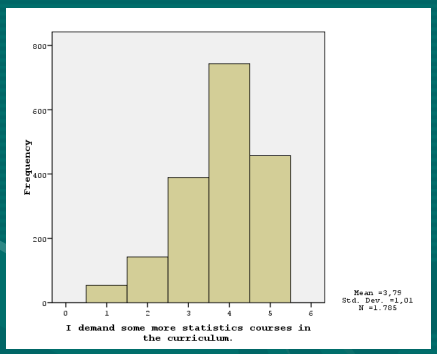
Chi-Square Tests

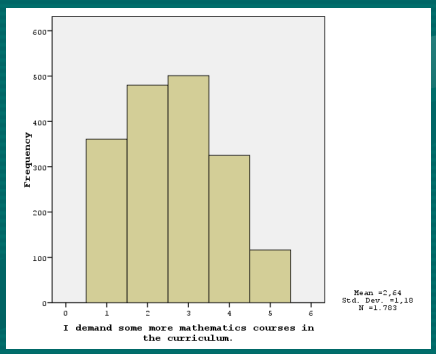
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	177,458	4	,000
Continuity Correction			
Likelihood Ratio	182,619	4	,000
Linear-by-Linear Association	157,294	1	,000
N of Valid Cases	1794		

Students' Evaluations on the Performances of Statistics Departments

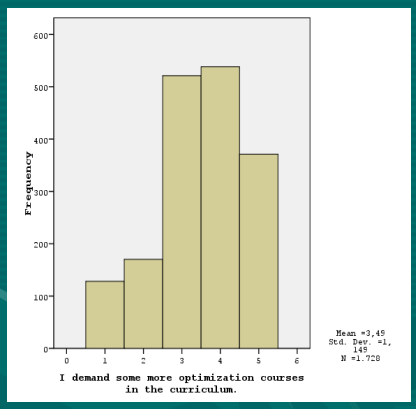
- The majority of the students (65.3 %) of statistics departments thought that the education program was very difficult indeed .
- 71.5 % of the students needed more rigorous mathematics background to keep up with the courses they were taking. In contradiction with this fact , most of the students did not demand more mathematics courses in their statistics curriculum.

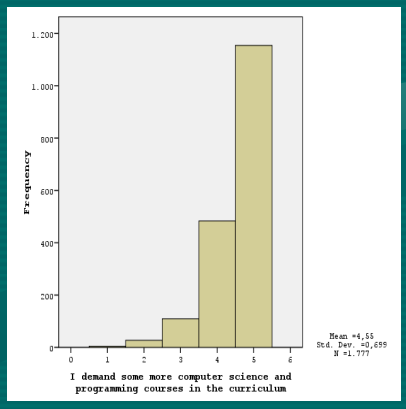
1-Strongly disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly agree





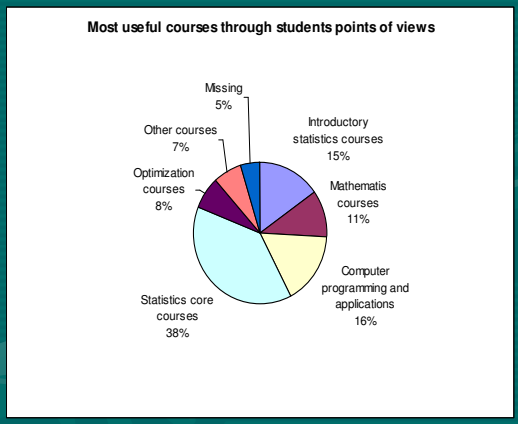
1-Strongly disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly agree

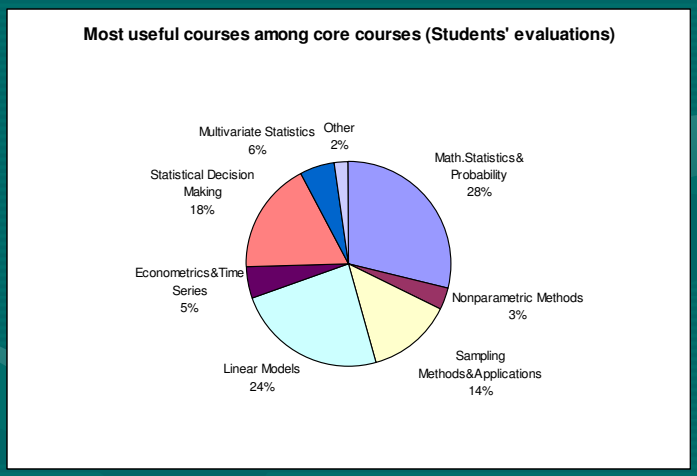




- 34 % of the students agreed with the proposition that the textbooks and similar reference books were sufficient both in quantity and in content whereas some other 33 % disagreed.
- Most of the students in our survey thought that some of the theoretical courses offered in their departments were superfluous.

Some evaluations on courses



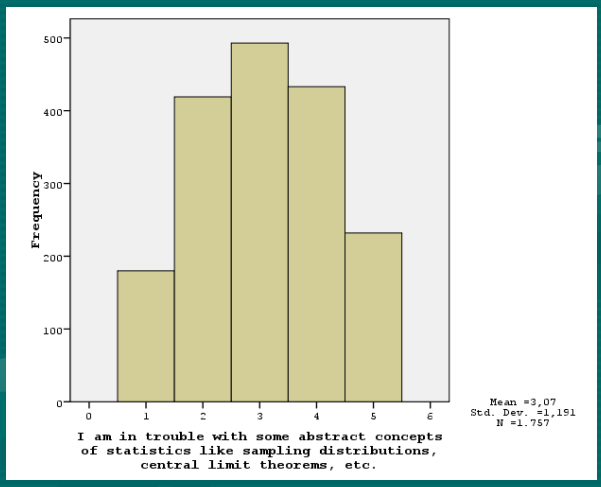


- 94.9 percent of the students demanded more attention on case studies in some applied courses.
- 79.7 percent of the students demanded more specialized statistics courses in the program.

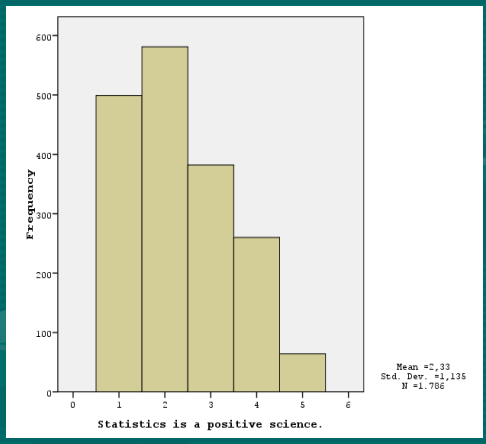
Some of the concepts the students stated that they had experienced difficulty in perception

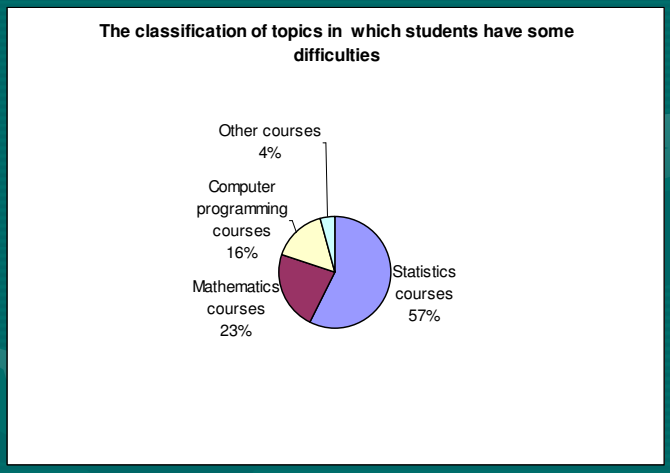
- Some introductory concepts : Variance, covariance, standard deviation, correlation, type-I and type-II errors, degree of freedom, hypothesis tests, point and interval estimation
- Some probabilistic concepts and theorems : The Central Limit Theorems, moment generating functions, sigma algebra, some distributions including Chi-Square and Snedecor's F distribution
- Some concepts on sampling: Sampling distributions, standard deviation and standard errors.

1-Strongly disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly agree

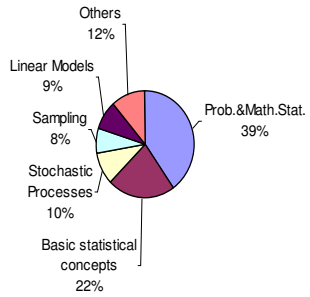


1-Strongly disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly agree

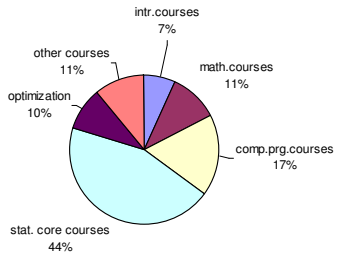


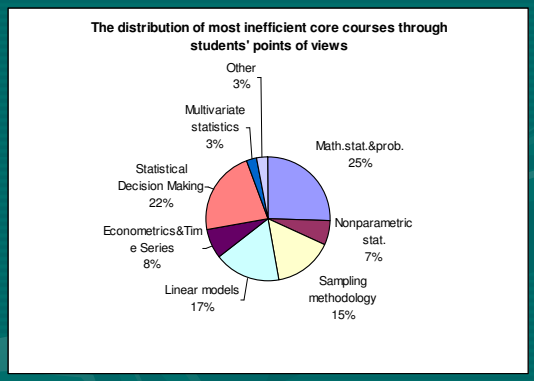


The distribution of statistical concepts students have some difficulty



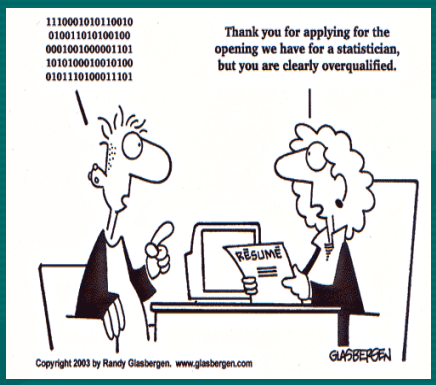
The distribution of most inefficient courses through students' points of views



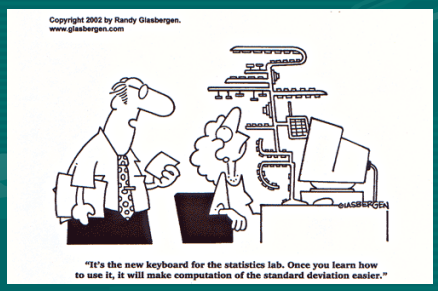


Computer Skills , Physical Availabilities for Computer Practices

- 92.1 percent of the students stated that they had needed advanced computer skills.



- **Students seemed interested in SPSS applications much more than in any other statistical softwares.**
- **Most of the students (85.28 %) declared that they had no skills in SAS programming.**



The frequency distribution of students with respect to computer skills in general

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I have no ability	284	15,8	15,8	15,8
	I have little ability	551	30,7	30,7	46,5
	I have mediocre ability	430	24,0	24,0	70,5
	I have superior ability	291	16,2	16,2	86,7
	I have perfect ability	238	13,3	13,3	100,0
	Total	1794	100,0	100,0	

The association between the type of the university and computer skills in general

	Metropolitan	Other
No ability	10,79%	21,33%
Inferior ability	27,78%	33,92%
Mediocre ability	25,85%	21,91%
Superior ability	20,30%	11,77%
Perfect ability	15,28%	11,07%
Total	100,00%	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	65,835	4	,000
Continuity Correction			
Likelihood Ratio	66,577	4	,000
Linear-by-Linear Association	54,693	1	,000
N of Valid Cases	1794		

The association between the type of the university enrolled and PC ownership

	Metropolitan	Other
I own PC	86,59%	72,33%
I don't own PC	13,41%	27,67%
Total	100,00%	100,00%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	56,095	1	,000		
Continuity Correction	55,215	1	,000		
Likelihood Ratio	56,619	1	,000		
Fisher's Exact Test				,000	,000
Linear-by-Linear Association	56,063	1	,000		
N of Valid Cases	1785				

• Some Points to be Highlighted in Some Judgements of Academicians

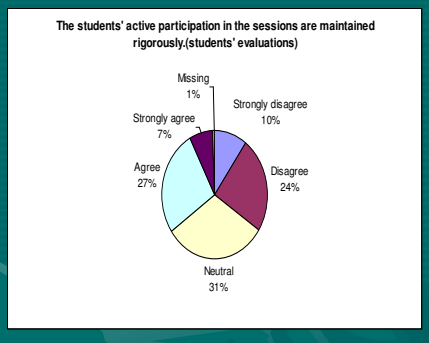
General Statistics from Lecturers' Survey

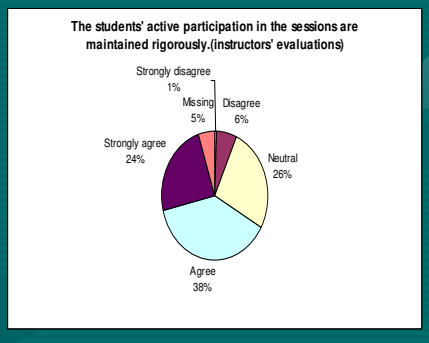
- This survey is based on the questionnaire forms of 182 academicians on statistics education.
- Questionnaire forms from 19 universities were investigated. On the average there were 10 academicians from each university.

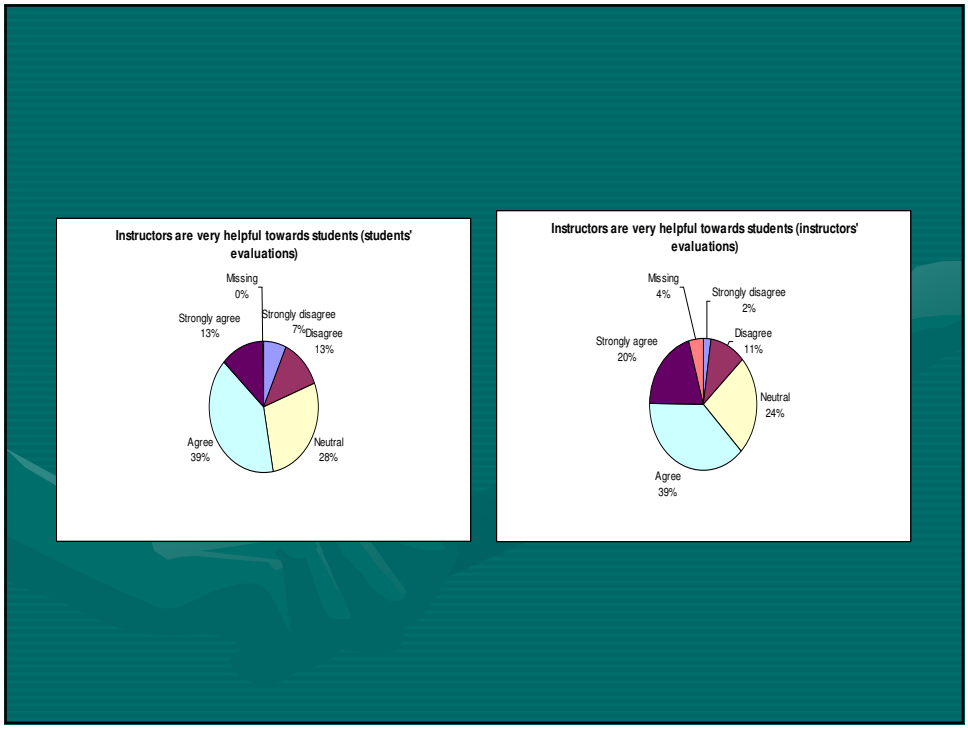
- The majority of the academicians thought that students were in trouble with some basic concepts of statistical reasoning like population, parameters, sampling distributions and central limit theorems .

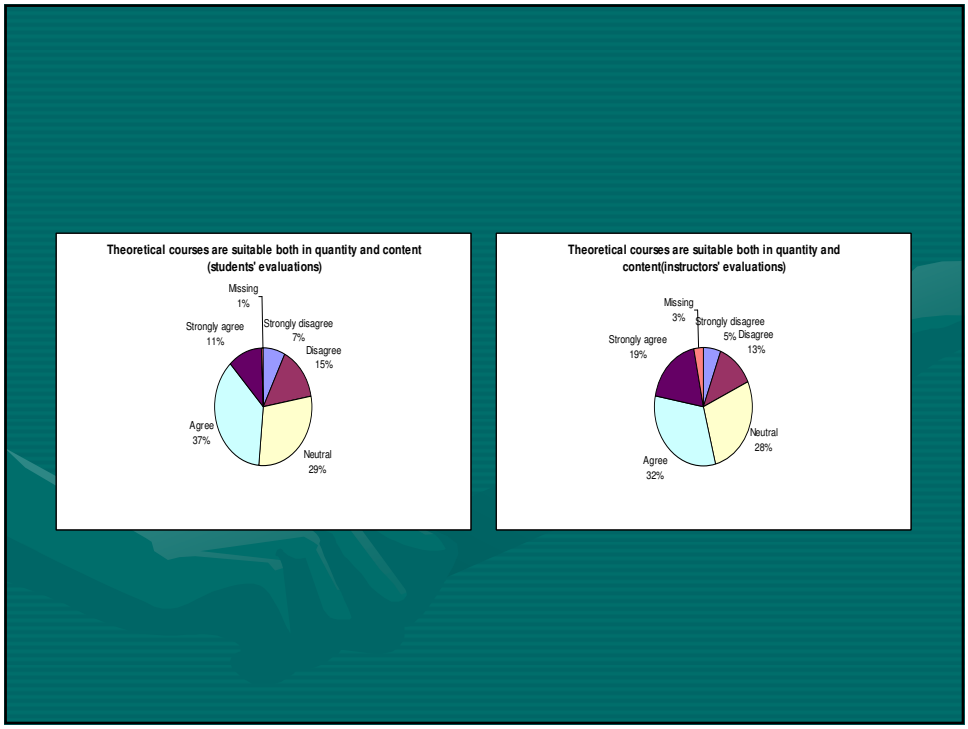
- The majority of the academicians strongly emphasized that there should have been more mathematics courses in the curriculum.

Some comparisons between the comments of students and those of instructors on some selected issues

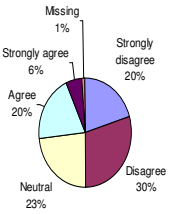




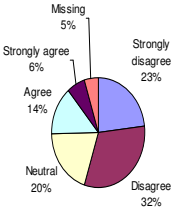

Instructors are very helpful towards students (students' evaluations)
Missing 0%
Strongly disagree 7%
Disagree 13%
Neutral 28%
Agree 39%
Strongly agree 13%
Instructors are very helpful towards students (instructors' evaluations)
Missing 4%
Strongly disagree 2%
Disagree 11%
Neutral 24%
Agree 39%
Strongly agree 20%


Theoretical courses are suitable both in quantity and content (students' evaluations)
Missing 1%
Strongly disagree 7%
Disagree 15%
Neutral 29%
Agree 37%
Strongly agree 11%
Theoretical courses are suitable both in quantity and content(instructors' evaluations)
Missing 3%
Strongly disagree 5%
Disagree 13%
Neutral 28%
Agree 32%
Strongly agree 19%

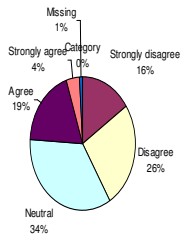
Applied courses are suitable both in quality and content (students' evaluations)



Applied courses are suitable both in quality and content (instructors' evaluations)



Teaching methods of our instructors are vivid and pedagogical(students' evaluations)



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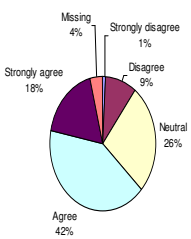


A Factor Analysis Model

In this part, we intended to form a statistical model on the satisfaction scores of both the students and instructors with the departments by some factor-regression models. First of all among 30 questions, we picked 13 questions (variables) related to students' satisfaction levels, and 10 questions related to instructors' satisfaction levels.

Then we observed that, for students' evaluations, these 13 variables can be reduced to 2 factors, namely, pedagogical factor, and professional perspective factor.

Question code (Instructors)	Question code (Students)	Variables (Propositions on Questionnaire forms)
K121	K67	There are sufficiently large number of consultative services for students within the department.
K122	K68	The personal communications betwen the students and instructors, in general, are satisfactory
K123	K69	The active participations of students in the sessions are maintained strongly
K124	K70	The personal communications among the students themselves are satisfactory in general
K126	K72	Behaviours of instructors towards students are friendly and helpful.
K127	K74	There are plenty number of theoretical courses in curriculum.
K128	K75	There are plenty number of applied courses in curriculum
K129	K76	The teaching methods of our instructors are both vivid and pedagogic.
K130	K77	The instructors are objective and fair enough in assesing our performance and our responsibilites.
K131	K78	The students are motivated to carry further scientific studies by the instructors.
K133	K80	There are a lot of meetings organized in the department to interact with statistics specialists.
K134	K81	In the department a lot of meetings or discussions are organized frequently on some other social and cultural issues.
	K82	The textbooks and other materials offered in the lectures are quite useful.

Correlation Matrix

		K67	K68	K69	K70	K72	K74	K75	K76	K77	K78	K80	K81	K82
Correlation	K67	1,000	,578	,523	,327	,438	,258	,411	,486	,366	,441	,444	,404	,345
	K68	,578	1,000	,598	,358	,682	,296	,393	,493	,461	,438	,360	,313	,342
	K69	,523	,598	1,000	,405	,504	,289	,426	,532	,430	,525	,402	,387	,373
	K70	,327	,358	,405	1,000	,313	,202	,269	,292	,266	,306	,245	,264	,294
	K72	,438	,682	,504	,313	1,000	,351	,372	,502	,537	,417	,346	,298	,344
	K74	,258	,296	,289	,202	,351	1,000	,399	,333	,295	,308	,214	,220	,270
	K75	,411	,393	,426	,269	,372	,399	1,000	,503	,347	,451	,434	,394	,317
	K76	,486	,493	,532	,292	,502	,333	,503	1,000	,486	,537	,478	,444	,439
	K77	,366	,461	,430	,266	,537	,295	,347	,486	1,000	,428	,340	,303	,348
	K78	,441	,438	,525	,306	,417	,308	,451	,537	,428	1,000	,449	,414	,384
	K80	,444	,360	,402	,245	,346	,214	,434	,478	,340	,449	1,000	,671	,399
	K81	,404	,313	,387	,264	,298	,220	,394	,444	,303	,414	,671	1,000	,462
	K82	,345	,342	,373	,294	,344	,270	,317	,439	,348	,384	,399	,462	1,000

Correlation Matrix

		K121	K122	K123	K124	K125	K126	K129	K131	K133	K134
Correlation	K121	1,000	,796	,625	,404	,413	,528	,548	,542	,451	,423
	K122	,796	1,000	,672	,500	,403	,613	,571	,585	,495	,436
	K123	,625	,672	1,000	,491	,406	,485	,652	,587	,496	,489
	K124	,404	,500	,491	1,000	,452	,412	,416	,478	,392	,278
	K125	,413	,403	,406	,452	1,000	,403	,339	,321	,322	,277
	K126	,528	,613	,485	,412	,403	1,000	,552	,533	,464	,357
	K129	,548	,571	,652	,416	,339	,552	1,000	,647	,490	,452
	K131	,542	,585	,587	,478	,321	,533	,647	1,000	,511	,451
	K133	,451	,495	,496	,392	,322	,464	,490	,511	1,000	,798
	K134	,423	,436	,489	,278	,277	,357	,452	,451	,798	1,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,803	44,642	44,642	5,803	44,642	44,642	3,979	30,604	30,604
2	1,152	8,860	53,502	1,152	8,860	53,502	2,977	22,898	53,502
3	,900	6,920	60,422						
4	,799	6,149	66,571						
5	,728	5,600	72,171						
6	,628	4,829	77,000						
7	,583	4,486	81,486						
8	,512	3,942	85,428						
9	,473	3,642	89,070						
10	,423	3,256	92,325						
11	,414	3,182	95,507						
12	,315	2,419	97,927						
13	,270	2,073	100,000						

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,491	54,907	54,907	5,491	54,907	54,907	4,088	40,877	40,877
2	1,089	10,891	65,797	1,089	10,891	65,797	2,492	24,921	65,797
3	,794	7,941	73,738						
4	,570	5,698	79,436						
5	,560	5,602	85,038						
6	,456	4,561	89,599						
7	,387	3,869	93,468						
8	,284	2,839	96,306						
9	,192	1,916	98,222						
10	,178	1,778	100,000						

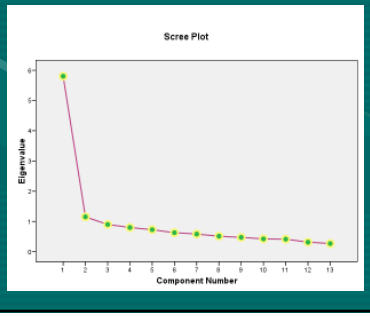
Extraction Method: Principal Component Analysis.

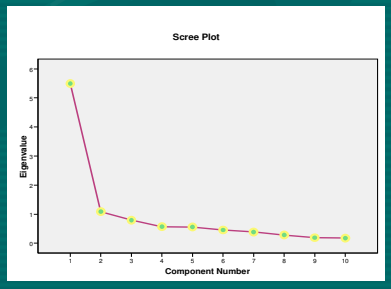
KMO and Bartlett's Test

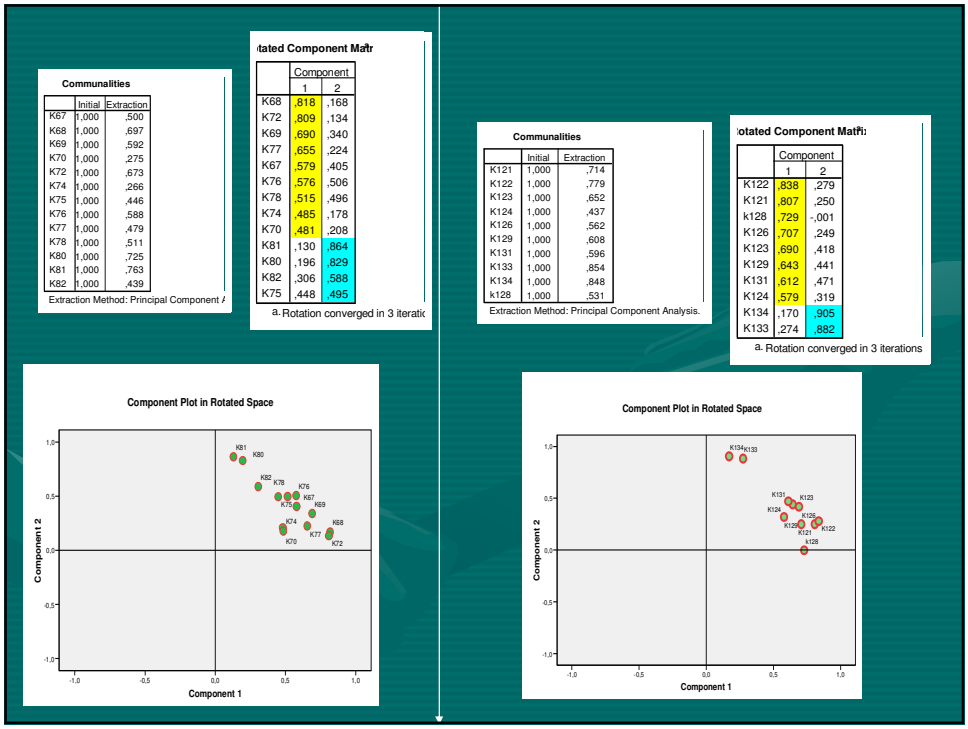
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,919
Bartlett's Test of Sphericity	Approx. Chi-Square	9218,466
	df	78
	Sig.	,000

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,878
Bartlett's Test of Sphericity	Approx. Chi-Square	636,453
	df	45
	Sig.	,000







FACTOR MODELS

MODEL1 Students

1st FACTOR (Pedagogy) ⟺ K68,K72,K96,K77,K67 K76,K78,K74,K70

2nd FACTOR (Professional perspective) ⟺ K81,K80,K82,K75

MODEL 2 Instructors

1st FACTOR (Pedagogy) ⟺ K122,K121,K128,K126 K123,K129,K131,K124

2nd FACTOR (Professional perspective) ⟺ K134,K138

Here Y_l and Y_s represent the satisfaction levels of instructors and students observed in ten different possibilities. X1 and X2 represent pedagogical and professional perspective factors respectively.

$$y_l = 7,252 + 0,678x_1 + 0,375x_2$$

$$y_s = 6,245 + 1,004x_1 + 0,420x_2$$

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2023,026	2	1011,513	274,860	,000[a]
	Residual	6278,264	1706	3,680		
	Total	8301,290	1708			

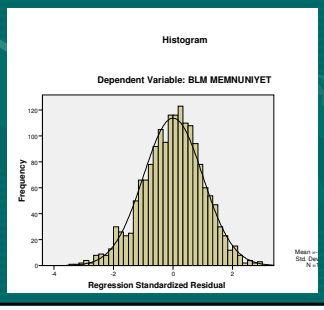
a. Predictors: (Constant), FAC2_2, FAC1_2
b. Dependent Variable: K109

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	6,245	,046		134,579	,000
	FAC1_2	1,004	,046	,455	21,624	,000
	FAC2_2	,420	,046	,191	9,058	,000

a. Dependent Variable: K109

$y_s = 6,245 + 1,004x_1 + 0,420x_2$



ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	68,049	2	34,024	9,686	,000[a]
	Residual	379,375	108	3,513		
	Total	447,423	110			

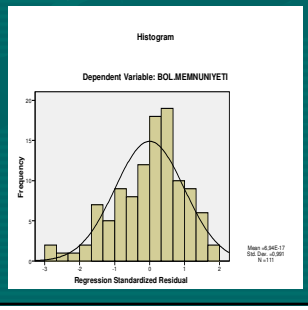
a. Predictors: (Constant), FAC2_1, FAC1_1
b. Dependent Variable: K160

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7,252	,178		40,762	,000
	FAC1_1	,678	,176	,340	3,842	,000
	FAC2_1	,375	,176	,188	2,125	,036

a. Dependent Variable: K160

$y_l = 7,252 + 0,678x_1 + 0,375x_2$



PROPOSALS

- There should be more statistics courses in the curricula in order to increase the level of specialization in statistics undergraduate education.
- It will be wiser to support curricula with more qualified computer science lectures.

- Mathematics and statistics need each other . Collaborative studies with mathematics departments should be on the agenda. As a starting point of this collaboration; some meetings must be organized to discuss the common problems of both mathematics and statistics education.

- Statistics is an applied science although it has a very abstract and theoretical base. Free time practices , regular industry or business practices are the natural allies of this education process. These practices are especially vital for the students to "recognize data", and to encounter with some aspects of statistical studies and some basic problems of the processes of collecting , summarizing, analyzing statistical data as well.

- The statistical studies depend totally on collaborative team work since the levels of specialization are very high. Thus the collective abilities of students in team works should be increased.

- Statistical data analyses and their conclusions should be open for everybody from the other fields of scientific study. This point is especially important to develop some common research activities with different branches. A sophisticated communication ability with other scientific areas is crucial.

- The students of statistics should have some abilities in data collecting methodologies and related technologies. Statistics curricula should serve this purpose.
- The graphical presentations are very important in business life's communications. Students should develop ways of thinking by the help of histograms, charts, graphics and develop some abilities to make explanations on the data for the people who don't have any sufficient background in statistical reasoning.

- There should be some surveys on the pedagogical values of the textbooks offered during statistics education.
- Specifically, the performances of math courses offered in statistics departments should be reviewed.

- "Teachers should consider computing as a tool for learning statistics, not simply for doing statistics. Because graphics and manipulations aid learning, we should encourage students to use software to explore , visualize, and interact with data and simulations, not simply to automate calculations." (Moore, 1997, p. 131)

- "Time spent on teaching is often viewed as time taken away from research, and research is what leads promotion and tenure. Faculty should also be encouraged to collaborate in educational research related to their teaching, adressing issues such as those raised relating to the use of technology. Publication of this "educational " research should be counted the same as published statistical research."(Garfield, (1997, pp. 140-141)

- There is currently little tangible incentive, and in fact significant disincentive , for statisticians in academia to spend time on improving introductory courses. Could we honestly encourage young professors, seeking tenure, to spend the time required to fundamentally improve their introductory courses at the expense of publications? This is a problem with the system, and cannot be resolved easily by individuals working in isolation.(Hoerl, et al., 1997, p. 152)

- Before observing the maturity of currently existing statistics programs it will be useless to open some more departments. The extensive growth of statistics departments will inevitably result in an inflationary process of having departments lacking quality. Both the students and the graduates are very sensitive on this issue.

- At least an introductory statistics course should be offered for the final classes of high schools to make statistics popular and well-known among prospective university students. This proposal will serve the purpose of maintaining the position of statistics "culturally healthy" in society.

- Some surveys on the working conditions of the graduates of statistics departments should be realized.
- The " data specialist" or "data analyst" titles should be given to young graduates. At least a discussion on this legal issue should be realized in the public.
- Because of the interdisciplinary characteristic of statistics, the applicability opportunities of statistical methods in other areas such as engineering or social sciences should be increased.

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- Danke schön für alles!