

Changing Answers in Exams – For the Better or for the Worse?

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Introduction

- Stat 2000: Introduction to Statistical Methods
- Utah State long-distance course
- 3 sessions offered 2004 in Hong Kong
 - Spring (15 weeks, 01/12-04/19): 60 students
 - Summer 1 (12 weeks, 02/23-05/10): 30 students
 - Summer 2 (15 weeks, 04/26-08/02): 89 students

Electronic Exams

- Web-based exams:
 - 3 in Spring
 - 2 in Summer 1 & 2
- Exams taken in Hong Kong classroom
- Multiple-choice (MC) questions and text-based questions to be answered via CyberStats password-protected html Web page
- Question order randomized for each student, but identical questions within each group

Electronic Grading

- Grading via html Web page with forms for points and instructor comments
- ALL answers (including duplicated ones) for a questions for ALL students visible at the same time
- For this analysis, points rescaled from 0 (totally wrong) to 1 (totally right)

Max. Possible Unique Responses

		Multiple Choice		Text	
		# students	# questions	# students	# questions
Spring	Midterm 1	59	15	59	10
	Midterm 2	57	15	57	10
	Final	58	25	58	25
Summer 1	Midterm	27	20	27	15
	Final	27	25	27	25
Summer 2	Midterm	87	20	87	15
	Final	81	25	81	25
Total students * questions		8170		7020	

Responses Received

	Multiple Choice	Text
Total students * questions	8170	7020
1 st response	8030 (98%)	5881 (84%)
2 nd response	453 (cond. 5.6%)	659 (cond. 11.2%)
3 rd response	62 (cond. 0.8%)	74 (cond. 1.3%)
4 th response	6	16
5 th response	-	8
6 th response	-	2
7 th response	-	1
8 th response	-	1

Student with 8 Text Responses

- 6:50:02 AM A1: find the real corelation between Height and weight. No outlter found. (1/11)
- 6:55:33 AM A2: find the real corelation between Height and weight. No outlter found. (1/11)
- 6:57:00 AM A3: find the real corelation between Height and weight. No outlier found. (1/11)
- 7:06:46 AM A4: find the +ve corelation between Height and weight. No outlier found. (1/11)
- 7:06:52 AM A5: find the +ve correlation between Height and weight. No outlier found. (1/11)
- 7:20:58 AM A6: Find the +ve correlation between Height and weight. No outlier found. (1/11)
- 7:24:14 AM A7: No trend can be find inside it and only few outlier found. (8/11)
- 7:32:58 AM A8: No trend can be found inside it and only few outlier found. (8/11)
- Correct: There does not appear to be any trend. There are a few outliers to the right. They are people 25 and over: P74, P93, P96, P105.

Points Awarded

	Multiple Choice		Text	
	Avg.	#	Avg.	#
1 st response	0.602	8030	0.659	5881
2 nd response	0.433	453	0.672	659
3 rd response	0.435	62	0.635	74

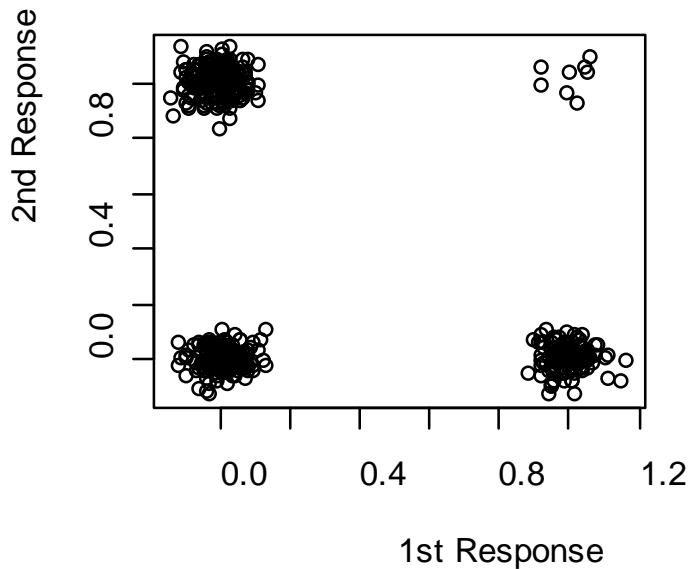
Points Awarded (Conditional on One Change)

	Multiple Choice			Text		
	Avg.	#	P	Avg.	#	P
1 st response	0.278*	453		0.552	659	
2 nd response	0.433	453	< 0.0001	0.672	659	< 0.0001

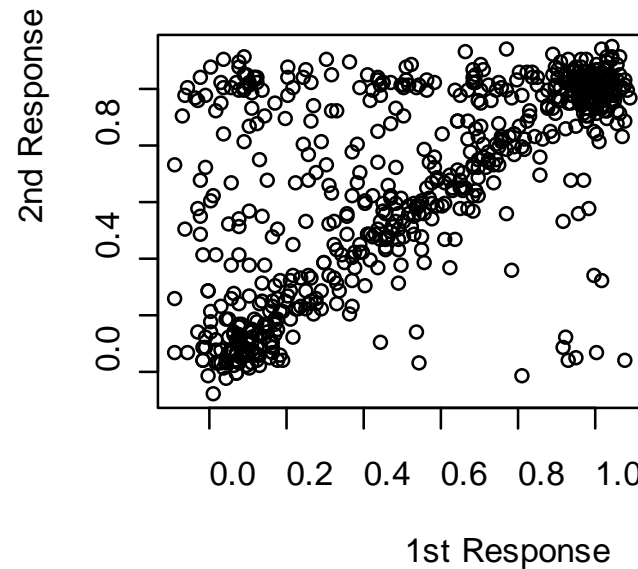
* Not different from 0.25 ($p = 0.1824$)

Change Patterns (Conditional on One Change)

Multiple Choice (i



Text (r= 0.659)



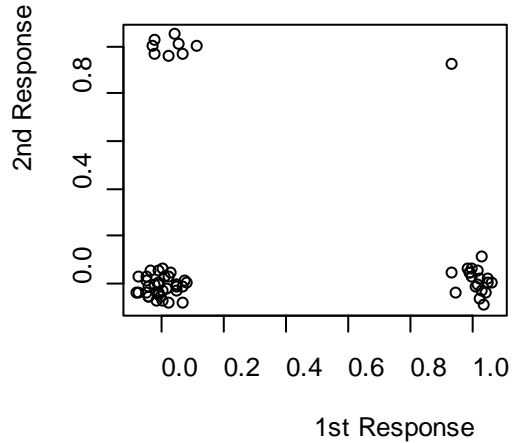
Points Awarded (Conditional on Two Changes)

	Multiple Choice			Text		
	Avg.	#	P	Avg.	#	P
1 st response	0.323*	62		0.439	74	
2 nd response	0.145 ⁺	62	0.0331	0.538	74	0.0016
3 rd response	0.435	62	0.0015	0.635	74	0.0029

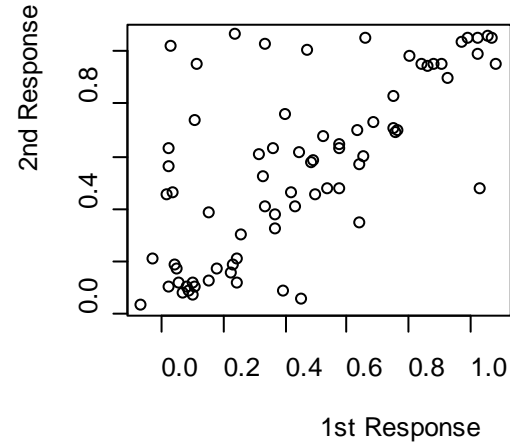
* Not different from 0.25 ($p = 0.2299$) + Different from 0.25 ($p = 0.0235$)

Change Patterns (Conditional on Two Changes)

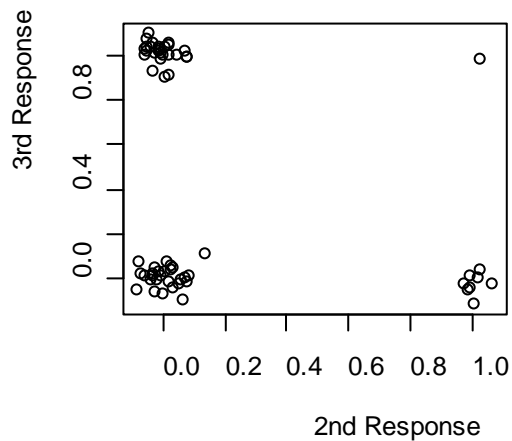
Multiple Choice (i



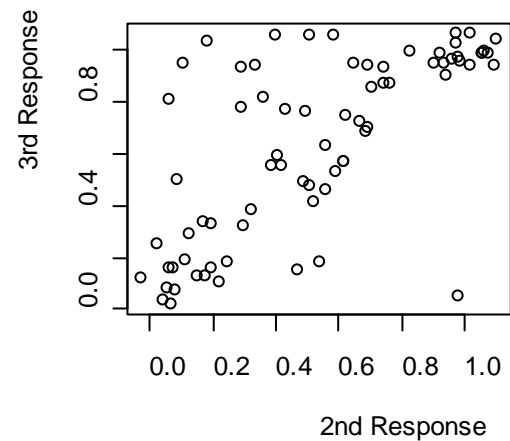
Text (r= 0.688)



Multiple Choice (i



Text (r = 0.685)



Conclusions (1)

- More MC than text questions answered (98% vs 84%)
- More 2nd responses in text than in MC questions (11.2% vs 5.6%)
- More 3rd responses in text than in MC questions (1.3% vs 0.8%)

Conclusions (2)

- 2nd response results in more points than 1st response for text & MC questions (conditional on 1 change)
- 3rd response results in more points than 2nd response and more than 1st response for text questions (conditional on 2 changes)
- 3rd response, 2nd response & 1st response show unclear pattern for MC questions

Future Work

- Do some further data cleaning, i.e., remove some students caught cheating and students with computer problems during the exams as well as “all-correct” MC questions, and rerun analysis

Questions ?