

Math & Science Learning Center Data

Teaching & RPG Seminar

Aug. 26, 2013



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Outline

- Fall 2012 MSLC tutoring numbers
- Analysis of 2010-2011 tutoring client data
- Preliminary analysis of 2011-2012 peer instruction data



MSLC Data Collection

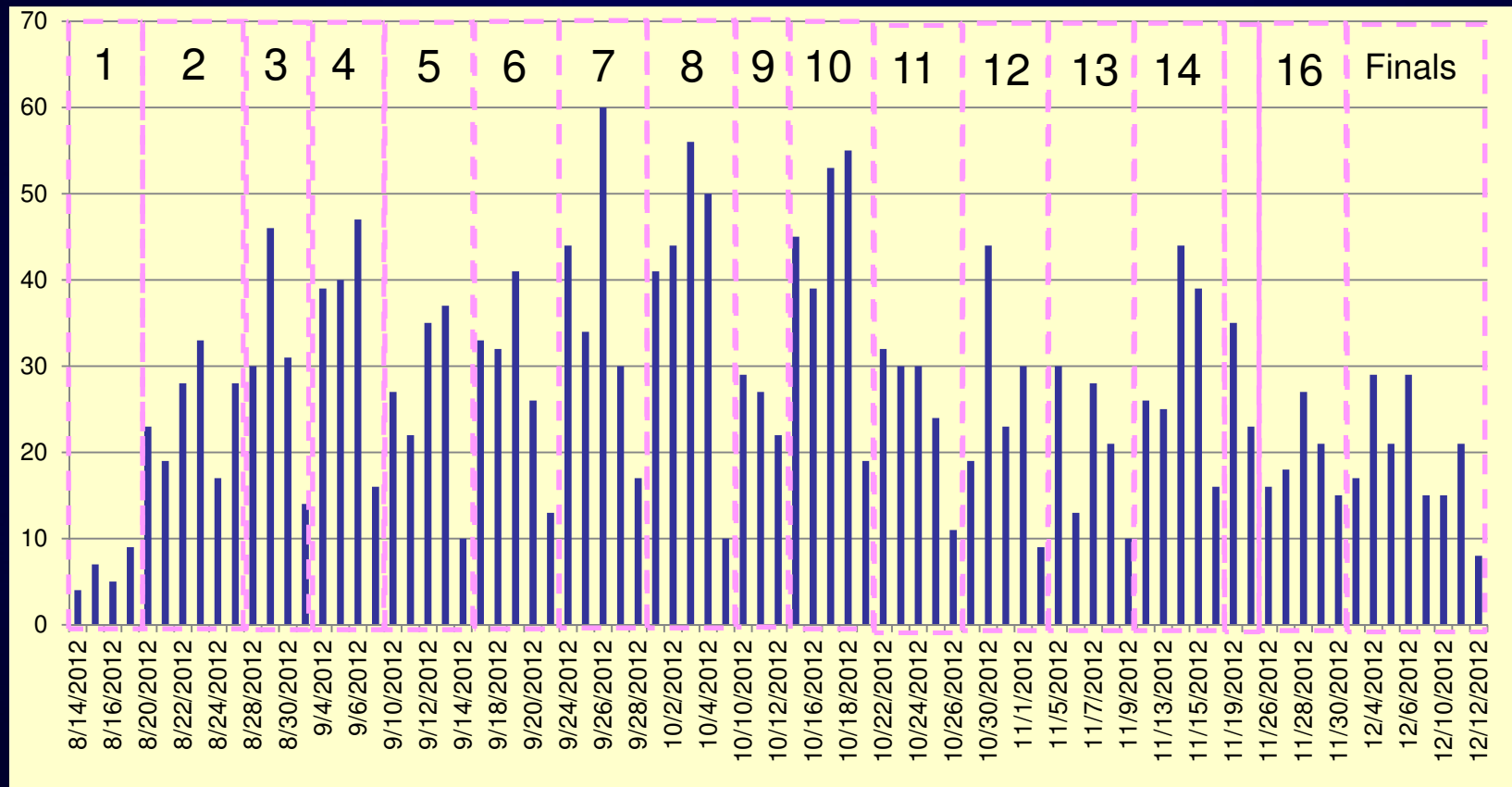
- Visitors sign in with purpose for visit, data pulled from Banner:

Age	Gender	Ethnicity	Race
Major	Total visits	Visit date	Class
GPA	CSU Hrs	HS gpa	ACT
ACTM	SAT	SATM	Math placement

- **Purposes:** Quiet place to study, use computer, study group, tutoring



Fall 2012 Daily Tutoring Visits



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Fall 2012 Visits

- 2,813 visits logged
- 2,214 visits for tutoring
- Tutoring visits by math course:
 - 600 College Algebra (104 unique students) 5.8 vps
 - 294 Pre-calculus (51 students) 5.8 vps
 - 141 Math Modeling (36 students) 3.9 vps
 - 131 Introductory Statistics (28 students) 4.7 vps
 - 118 Calculus 1 (23 students) 5.1 vps
 - 82 Applied Calculus (18 students) 4.6 vps
 - 41 Calculus 2 (9 students) 4.6 vps



Analysis of 2010-2011 Data

Joint work with Kimberly Shaw &
Cindy Ticknor



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Grade Distributions

	A	B	C	D	F/WF
Non-visitor	425 (416)	563 (547)	608 (615)	294 (318)	461 (454)
Mean test score	23.2	21.7	21.0	19.7	21.2
Visitor	55 (64)	68 (84)	102 (95)	73* (49)	63 (70)
Mean test score	21.4	19.6	19.0	18.9	18.1

Finding: significantly different grade distributions

$$\chi^2 (4, N=2712) = 20.15, p \leq 0.001$$

$$\text{Cramer's } V = 0.089$$

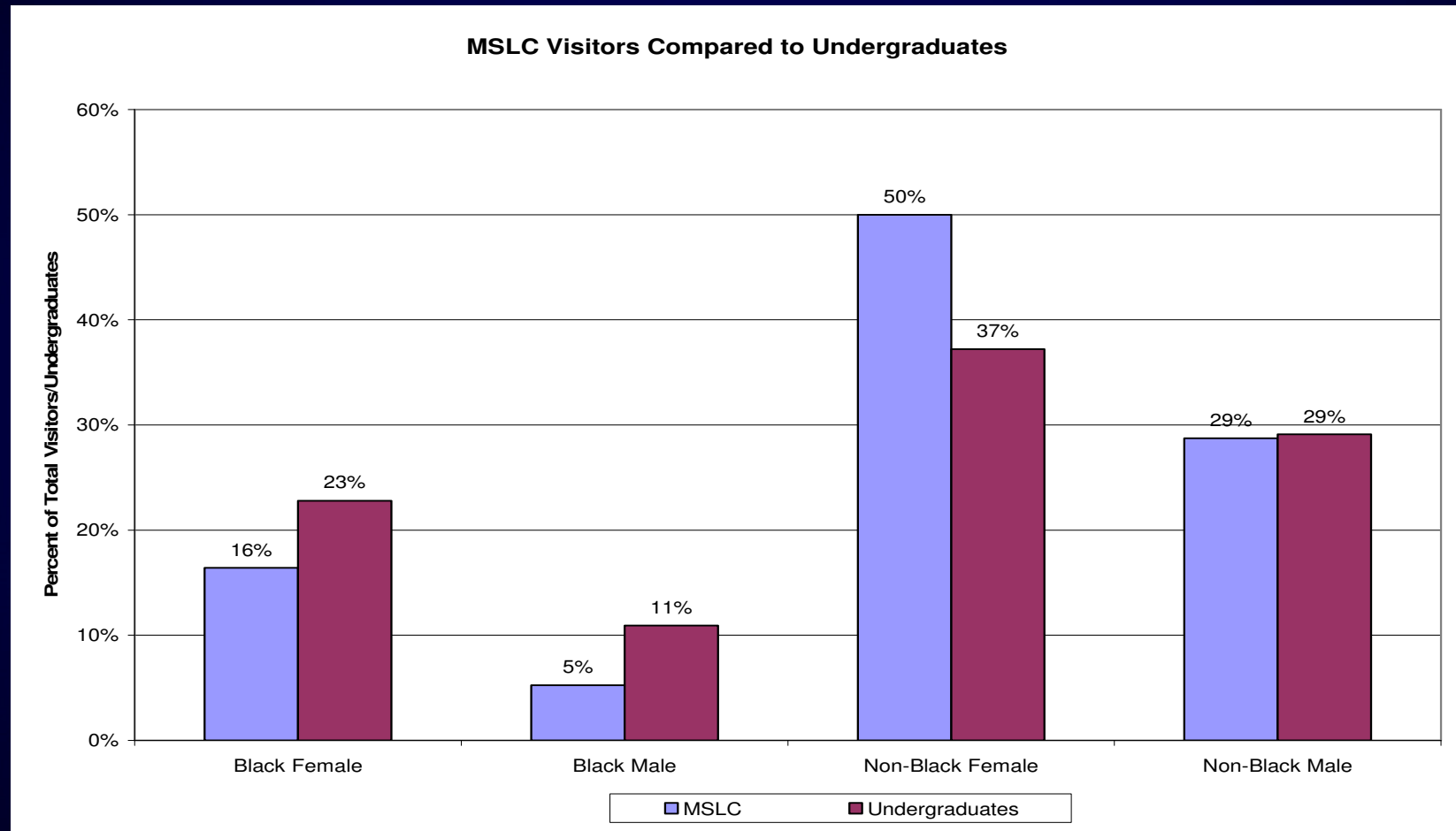
* = largest contributor to χ^2 statistic

Looking at courses serving at least 5 students



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Looking at gender and race



Grades Among Black Males

	A	B	C	D	F/WF
Non-visitor	28 (26)	47 (41)	69 (75)	30 (36)	56 (52)
Mean test score	21.6	20.3	20.4	19.1	19.6
Visitor	5 (7)	6 (12)	27 (21)	16* (10)	10 (14)
Mean test score	21.0	19.2	18.7	17.4	18.8

$$\chi^2 (4, N=294) = 12.79, p < 0.012$$

$$\text{Cramer's } V = .21$$

* = largest contributor to χ^2 statistic



Contemplating Selection Bias

One-way ANOVA tests between subjects → significant difference in course performance. $p < 0.001$ level, $F(2,5779) = 16.29$, $p=0.000$.

Tukey-Honest post-hoc comparisons indicate the following:

- Significantly lower gpa for group A than group B ($p = 0.000$)
- Significantly higher gpa for group A than group C ($p = 0.009$)

Groups	N	Mean	Std. Dev.	95% CI
A. Non-visitors	4700	2.21	1.38	[2.17, 2.25]
B. Visitors, not tutored	630	2.47	1.27	[2.38, 2.57]
C. Visitors tutored	456	2.01	1.31	[1.89, 2.13]



Peer Instruction Leader Data

Fall 2011 – Fall 2012 Preliminary Analysis

Also work with Kimberly Shaw & Cindy
Ticknor



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Models in the literature

1. Colorado Learning Assistant Program, UC Boulder
2. Structured Learning Assistance, Ferris State University
3. Structured Learning Assistance, Austin Peay State University
4. Supplemental Instruction, University of Missouri-Kansas City



What others have found

- Colorado Learning Assistant Program
 - Increased # in physics teaching by factor of 3
 - Increased student learning gains & knowledge retention in biology and physics
- UMKC SI Model
 - Increased number of A's and B's
 - Improved retention rates
 - Better long-term knowledge retention
 - Better problem-solving



What others have found, p.2

- Structured Learning Assistance
 - Increased ABC rates
 - Improved retention rates
 - Cost effectiveness



PIL Session Attendance

Fall 2011				Spring 2012				Fall 2012			
Course	Att.	Enr.	Pct.	Course	Att.	Enr.	Pct.	Course	Att.	Enr.	Pct.
BIOL 1215	71	166	43%	MATH 1111	14	116	12%	BIOL 1215	58	93	62%
PHYS 2211	11	45	24%	CHEM 1212	13	38	34%	GEOL 1110	37	162	23%
STAT 1127	11	65	17%	BIOL 1215 (A)	40	125	32%	CHEM 1211	58	115	50%
				BIOL 1215 (B)	34	75	45%				
TOTAL	93	276	34%	TOTAL	101	354	29%	TOTAL	153	370	41%

- Attendance improving but still a challenge
- Implications for future arrangements
 - Targeting classes w/high DFW rates, large enrollments
 - PIL scheduling



Compare Scores & Session Attendance

Mean Percent of End of Course Points Versus Session Attendance				
	Fall 2011	Spring 2012	Fall 2012	Overall
Never	70.1	70.3	70.2	70.2
Once	70.4	68.3	75.5	72.0
More than once	73.1	77.9	76.9	75.9

Two-tailed t-test for independent samples results:
 $t(722) = 2.84, p < 0.005$

End-of-course score info available for 722 cases.



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Grade Distribution Versus Attendance

	A	B	C	D	F
Attended	14%	25%	37%	17%	8%
Never attended	10%	21%	25%	23%	21%

One-tailed t-test results: $t(998) = 5.68, p < 0.001$

- ABC rate of 75% among those who attended
- ABC rate of 56% among those who never attended



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Looking at Attendance Versus GPA

	PIL Attendance	N	Mean GPA	Std. Dev.
High School GPA	Attended	227	3.06	0.49
	Never Attended	414	3.07	0.52
CSU GPA	Attended	275	2.54	1.21
	Never Attended	487	2.43	1.19

Differences not statistically significant ($p=0.05$).



Partial PIL Bibliography

Colorado program:

1. Otero, V., Pollock, S., & Finkelstein, N. (2010). A physics department's role in preparing physics teachers: The Colorado learning assistant model. *American Journal of Physics*, 78, 1218.
2. Wood, W. B. (2009). Innovations in teaching undergraduate biology and why we need them. *Annual Review of Cell and Developmental*, 25, 93-112.
3. Gray, K. E., & Otero, V. K. (2009, November). Analysis of Former Learning Assistants' Views on Cooperative Learning. In *AIP Conference Proceedings*(Vol. 1179, p. 149).
4. Turpen, C., Finkelstein, N. D., & Pollock, S. J. (2009, November). Towards understanding classroom culture: Students' perceptions of tutorials. In *AIP Conference Proceedings* (Vol. 1179, p. 285).
5. Knight, M. T., Garik, P., Moser, A., Hammond, N., Jariwala, E. M., Spilios, K., Seliga, A., Duffy, A., Dill, D., & Goldberg, B. Investigating the effect of peer teachers on learning environments in large STEM courses.



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Partial PIL Bibliography

UMKC model:

1. Arendale, D. (1997). Supplemental Instruction (SI): Review of Research Concerning the Effectiveness of SI from the University of Missouri-Kansas City and Other Institutions from across the United States.
2. Gattis, K. W. (2000). Long-term knowledge gains due to supplemental instruction in college chemistry courses. *Journal of research and development in education*, 33(2), 118-126.
3. Hensen, K. A., & Shelley, M. C. (2003). The impact of supplemental instruction: Results from a large, public, Midwestern university. *Journal of college Student development*, 44(2), 250-259.



Partial PIL Bibliography

Structured Learning Assistance:

1. *Tennessee Board of Regents: Developmental Studies Redesign Initiative*. National Center for Academic Transformation. Retrieved from http://www.thencat.org/States/TN/Abstracts/APSU_Algebra_Abstract.htm
2. *Transform Remediation: The Co-Requisite Course Model*. Complete College America. Retrieved from [http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final\(1\).pdf](http://www.completecollege.org/docs/CCA%20Co-Req%20Model%20-%20Transform%20Remediation%20for%20Chicago%20final(1).pdf).
3. Ferris State University reports at <http://www.ferris.edu/HTMLS/academics/sla/reports/homepage.htm>.



Partial PIL Bibliography

CSU program:

- Hughes, K. S. (2011). *Peer-assisted learning strategies in human anatomy & physiology*. **The American Biology Teacher**, 73(3), 144-147.
- Shaw, K. A., Ticknor, C., & Howard, T. (2013). *The Effect of Peer Leader Instruction on Introductory University Science and Mathematics Course Performance: Preliminary Results*. **Perspectives in Learning**, 20.



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