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Effectiveness

Technology Interventions on Learning Outcomes of Online College Algebra Students

E- Leader, Manila Jan 2-4, 2012

Study Design

2 semesters (4 sections, N= 36)

Spring 2007 & Fall 2007

Agenda

1. Why Technology Interventions?
2. Enhancing Students' Campus Experience
3. Students' Technology Use Behaviors – OIT Survey Data
4. Online Asynchronous Discussions
5. Scoring Rubric Usage - 4 Sections Data,
   2 each in spring 07 and fall 07
6. Online vs. Hybrid Control :Final Exam Comparisons
7. Results and Conclusions

Why Technology and Other Interventions?

Understanding Interventions

•Only 66 percent of full-time four-year college students complete a baccalaureate degree within six years.40 (This reflects the percentage of students who begin full-time in four-year institutions and graduate within six years.).

- Of the nation's nearly 14 million undergraduates:

  More than four in ten attend two-year community colleges.
  Nearly one-third are older than 24 years old.
  40% are enrolled part-time.

- Fewer American students are earning degrees in the STEM fields (science, technology, engineering, mathematics), medicine, and other disciplines critical to global competitiveness, national security, and economic prosperity

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SOURCE: A TEST OF LEADERSHIP: Charting the Future of U.S. Higher Education
A Report of the Commission Appointed by Secretary of Education Margaret Spellings
September 2006
order online at: www.edpubs.org.

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STEM Critical Thinking Skills

Almost **30 percent** of students in their first year of college are forced to take remedial science and math classes because they are not prepared to take college-level courses.7 International benchmarks, such as the Program for International Student Assessment (PISA) test, show that U.S. students are behind students in other industrialized nations in *STEM critical thinking skills…National Action Plan*, National Science Board October 30, 2007; NSB-07-114 www.nsf.gov/nsb/documents/2007/stem_action.pdf

Charting the Future of U.S. Higher Education Strategies

- In this consumer-driven environment, students increasingly care little about the distinctions that sometimes preoccupy the academic establishment, from whether a college has for-profit or nonprofit status to whether its classes are offered online or in brick-and-mortar buildings. Instead, they care—as we do—about results.

- **We want postsecondary institutions to adapt to a world altered by technology, changing demographics and globalization, in which the higher-education landscape includes new providers and new paradigms, from for-profit universities to distance learning.**
- **States can drive improvements in educational learning productivity by encouraging both traditional and electronic delivery of college courses in high school**

Source: Spellings Report www.edpubs.org

Students' Experience
CSU-Wireless Campus

- **Campus Experience**

- **Campus experience**

&

- **Campus Experience**

Enhancing Campus Experience THREE Key Elements

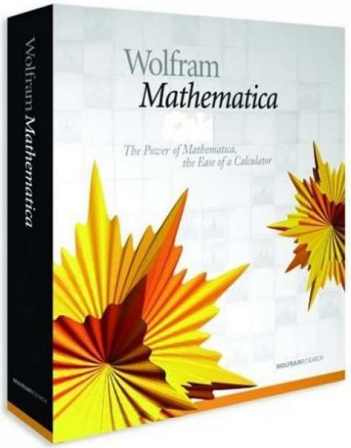
- **Students' Background and Academic Support on Campus**

  And By

- **Enhancing Students' life Experience on Campus**
- **Family Support and Financial Resources**

E-course Management Systems and Other Technologies

Blackboard & TEGRITY



Students' Technology Usage Behaviors

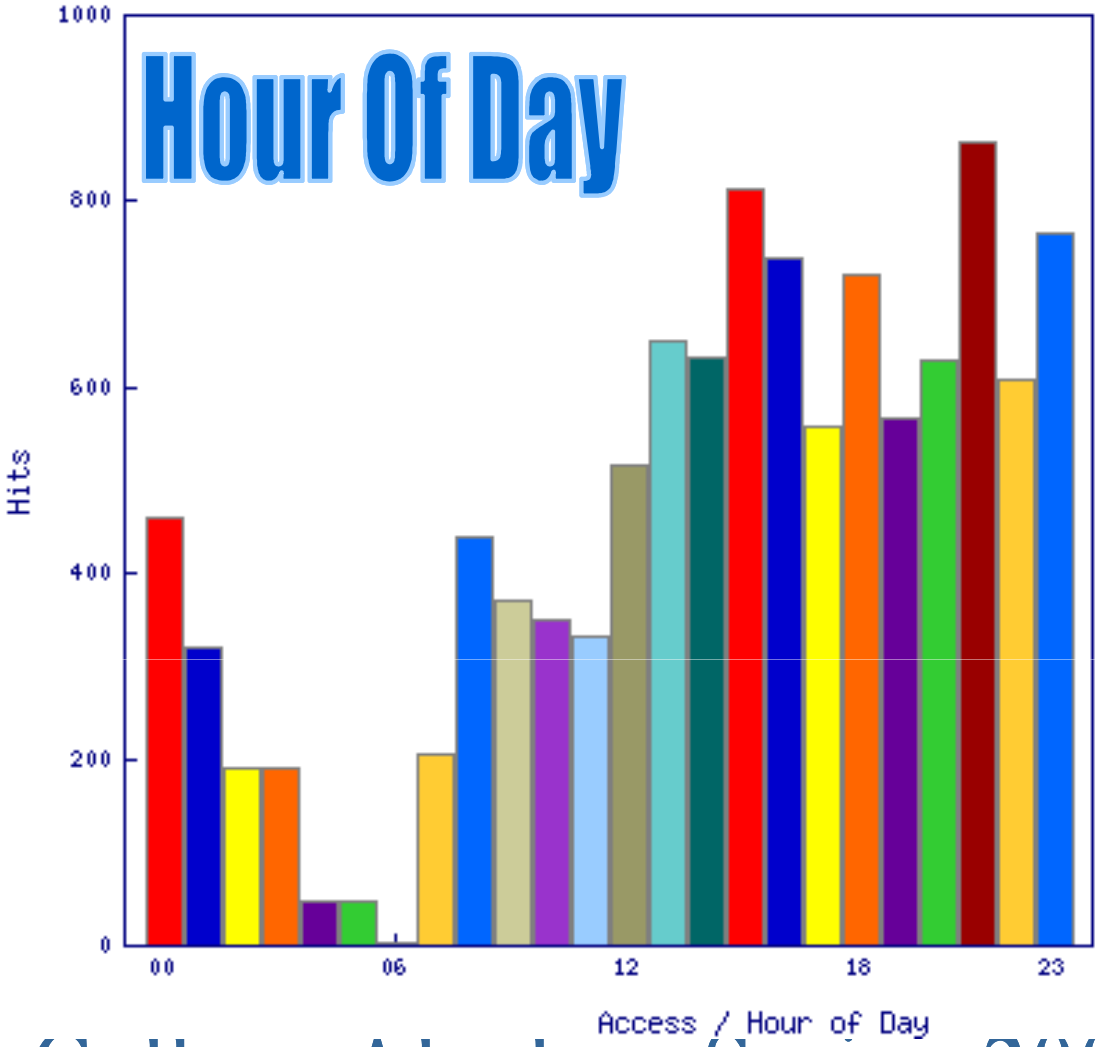
Bb Usage During the Week

Day	Hits	%
SUN	395	7.11
MON	1067	19.2
TUE	1072	19.29
WED	1180	21.24
THU	908	16.34
FRI	588	10.58
SAT	346	6.23
Total	**5556**	**100%**

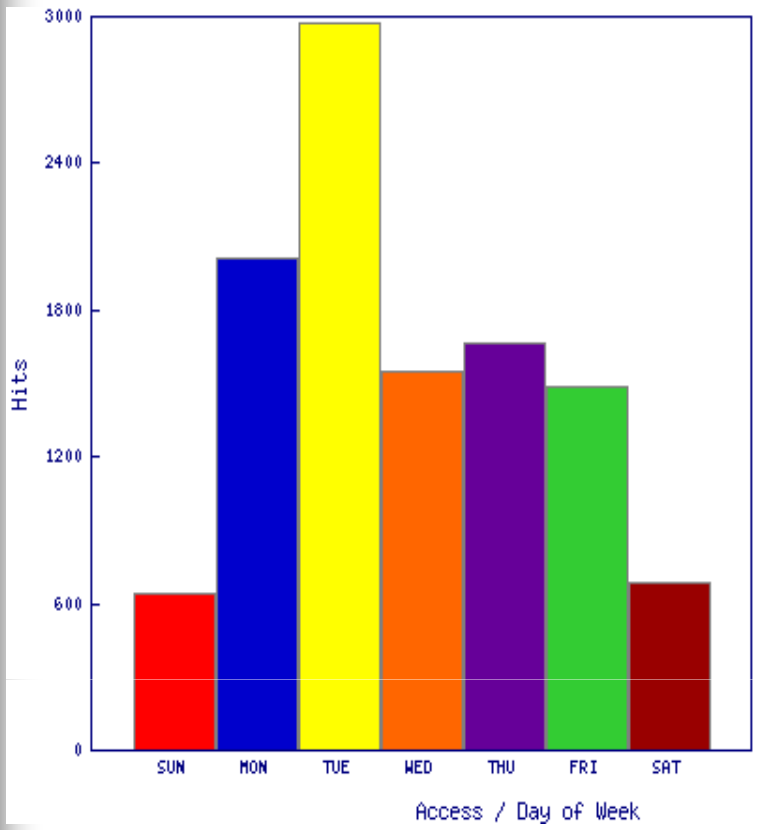
Spring 2006:College Algebra

Day	Hits	%
SUN	345	9.1
MON	872	23
TUE	817	21.55
WED	536	14.14
THU	519	13.69
FRI	468	12.34
SAT	235	6.2
Total	**3792**	**100**

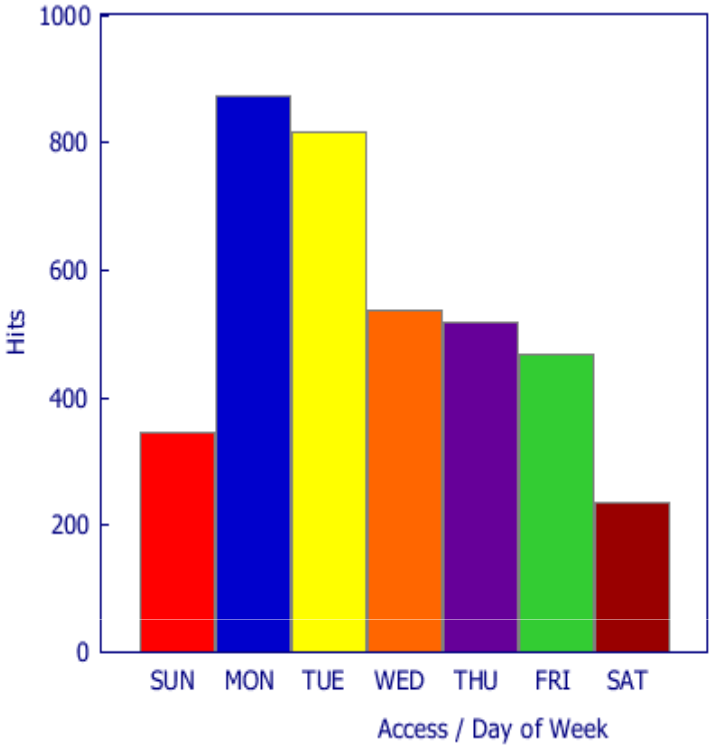
Fall 2008:College Algebra



College Algebra: Spring 2007

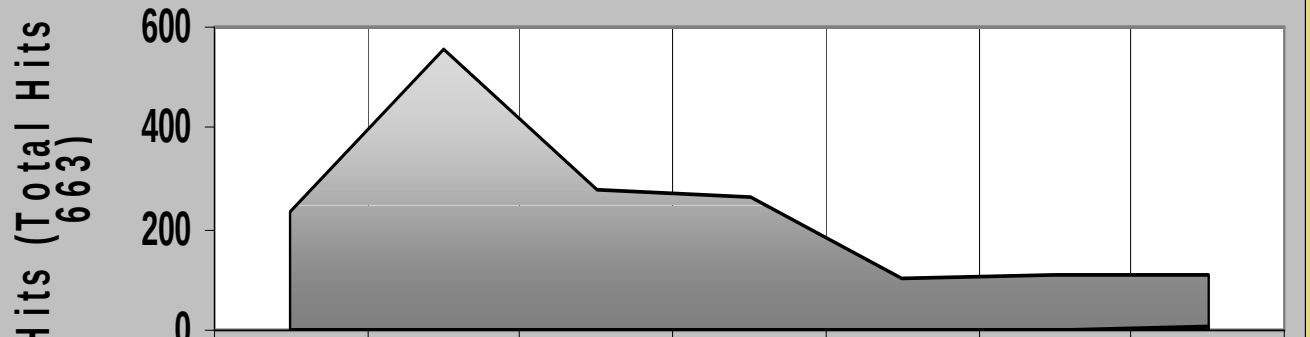


Day of the Week
Spring 2007 Online



Day of the Week
Fall 2008 Online

Usage Day of Week
(Linear Algebra n=16 students)



	SUN	MON	TUE	WED	THU	FRI	SAT
Hits	235	557	281	264	100	113	113
Percent	14.13%	33.49%	16.90%	15.87%	6.01%	6.79%	6.79

Table: Technology is easy to Use
- Campus Survey by OIT
(N = 469 Respondents)

% of Student Respondents	Ease of Technology Use Indicator
85%	Tegrity would enhance some, most, or all courses
81%	Tegrity is acceptable, easy or very easy to use
34%	Tegrity is easy or very easy to use

Source: Coppin State University OIT
Fall 2005 Student and Faculty Survey

Table: Effects on Content Learning and Study Process

% of Student Respondents	Learning and Study Process Indicator
67%	A positive impact on learning
48%	Improvement in study effectiveness

(N = 469 Respondents)

Source: Coppin State University OIT
Fall 2005 Student and Faculty Survey

Content Comprehension and Success in the Course
(N = 16 Faculty Respondents)

78%	Tegrity increased student's ability to focus on the most important learning objectives
62%	A positive impact of Tegrity on comprehension
50%	A positive impact of Tegrity on grades

Source: Coppin State University OIT
Fall 2005 Student and Faculty Survey

Ease of Use and Teaching Effectiveness

(N=16 Faculty Respondents)

64%	Tegrity is easy or very easy to use
82%	Tegrity is acceptable, easy or very easy to use
55%	adjusted their pedagogy for use with Tegrity
100%	Tegrity contributed to their teaching effectiveness
94%	A desire to use Tegrity in the future

Student Retention

50% Faculty (N=16) estimated a positive impact of Tegrity on retention

Source: Coppin State University OIT

Fall 2005 Student and Faculty Survey

When students asked ---Overall, what was the impact of Tegrity on your learning in this course? Their response-data on mathematics courses is tabulated in the following table on five-point scale:

- **A distraction to my learning**
- **Did not contribute to my learning**
- **Contributed somewhat to my learning**
- **A significant contribution to my learning**
- **A very substantial contribution to my learning**

MATH Course Sections with Impact on Learning Above 3.0 (on 5 points scale)

Course Section	Score	# of respondents
College Algebra	3.33	9
Linear Equations	3.2	5
Calculus II	3.17	6
College Alg. (MAT&SC)	3.15	13
Pre-Calculus	3.1	10
Calculus I	3	10
Algebraic Structure	3	2

Online College Algebra Students

Asynchronous

Discussion Sessions Participation

Method

- **Participants were from two sections each in Spring 2007 (N=10 Control Subjects, N=8 Online) and Fall 2007(N=8 Control Subjects, N=10 Online) College Algebra classes--- a total of FOUR sections. Students had freedom of adding into the various instructors sections, and thus the subjects in this study were not self-selected by the investigator.**
- **All face-to-face Hybrid classes, as well as online classes, were administered same departmental cumulative final exam, and were proctored by the instructor .**

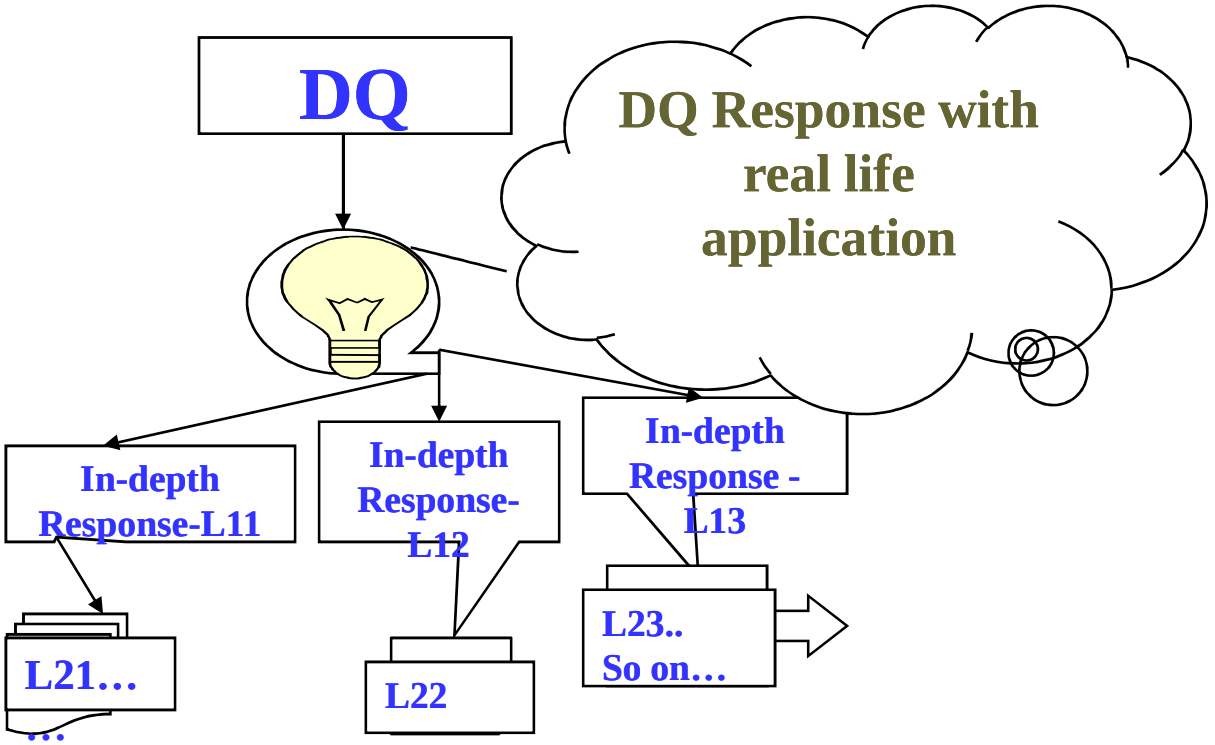
Discussion Questions (DQs) and Class Participation

- **Students were required to give their initial answers to discussion questions (three sets) for grades.**
- **Students were required to contribute at least two substantive discussion messages three days for two weeks as part of their participation grades.**

Discussion Questions Scoring Rubric

Adopted with minor modifications from Young (2008)

Scores	Required Elements
10-9	i) Answer the DQ correctly on or by the due date ii) Give sustentative responses by citing research and content readings, relating to new ideas with real application examples. iii) Ask meaningful follow-up questions. iv) Respond *two or more postings* on three distinct days per week for *three weeks*.
8	For this score, elements one, three and four must be there
7	For this score, elements one and four must be there
6	For this score, elements one must be there, and respond to classmates in four or more lines at satisfactory level



Asynchronous Discussion Sessions Participation flow chart

DATA COLLECTION AND DATA ANALYSIS

- **Both formative and summative assessment data collection strategies were employed.**
  a) Formal/Formative Data collection tools (mid-term, quizzes),
  b) Informal Online Participation Observation (Bb Discussion Questions, Class Participation, Math-Tech Assignments, Quizzes, Mid term),
  c) Summative Evaluation Data tools that included Survey and f2f Cumulative Departmental Final Exam.

- **Two online sections Spring 2007 (N=8) and Fall 2007 (N= 10).**
- **2 semesters –Total of 4 sections-Two Online plus Two Hybrid Control (N= 36)**

Means of Discussion Scores in Spring 07 (N=8), Fall 07 (N=10) Online College Algebra Classes

Students participated three weeks each for three discussion questions sets.

Discussion Question Sets	Spring 2007	Fall 2007
Discussion Section Set I	7.34	8.14
Discussion Section Set II	8.45	8.63
Discussion Section Set III	8.95	7.82

Within Semester Comparison: Two-Sample t- Test Analysis Tables

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- ***ONLS07 vs. CTLS07: ONL a bit better than CTL, not significant at α=0.05***
- **ONLS07 (8, 114.5) > CTLS07 (10, 105.6); *df* = 15,t=1.01, p=0.328.**

***Table 1 Spring 07*: CTLS07 (N=10, Mean), ONLS07 (N=8, Mean)**

- ***ONLF07 vs. CTLF07: CTL a bit better than ONL, not significant at α=0.05***
- **ONLF07 (10, 97.8) < CTLF07 (8, 102.5); *df* = 11, t=-0.58, p=0.572.**

***Table 2 Fall 07*: CTLF07 (N=8, Mean), ONLF07(N=10,Mean)**

CONCLUSIONS

- **The *student achievements* enhanced when online students participate collaboratively in doing discussion questions**
- **The students used applications examples more and more to demonstrate understanding of algebra concepts and use of their algebraic reasoning.**
- **The students' self-esteem, use of algebraic reasoning skills and problem-solving skills were improved in an online College Algebra classroom environment**
- **The distinction made in the study between fully online and face-to-face hybrid classes is a most important enhancement on previous studies relating to online instructional models, and particularly in College Algebra subject area (Katz, 2007)**
- **The discussion questions session analysis-rubric used in this study, was an excellent strategy which added validity and consistency in scoring students' participation and discussion questions responses for determining grades.**

Quality and Innovation through Course Redesign

- **From 1999 to 2004, Carol Twigg and the National Center for Academic Transformation at the Rensselaer Polytechnic Institute worked with 30 colleges and universities to enhance quality of instruction, improve student learning, and reduce costs through the use of technology and innovative pedagogy.**
- **Scores in a redesigned biology course at the University of Massachusetts *increased by 20%,* while the cost to the university per student dropped by nearly 40 %.**

SOURCE ttp://www.collegecosts.info/pdfs/solution_papers/Collegecosts_Oct2005.pdf;

Source: Spellings Report www.edpubs.org.

The National Forum on College-Level Learning Report

"The first attempt to measure what the college educated know and can do"; visit http://www.collegelevellearning.org.

Margaret A. Miller, Peter T. Ewell, Oct.2005

National Center for Public Policy and Higher Education

Report #05-8

Acknowledgements

Thank You