Faculty in technology-rich contexts: Connecting teaching, learning and assessment in the classroom

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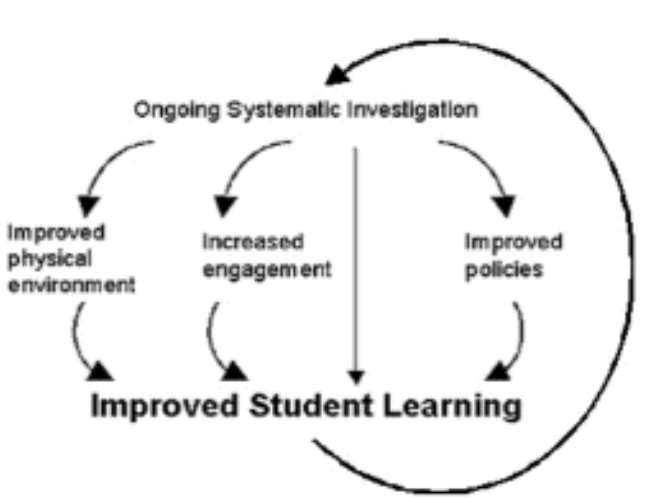
Technology at NCSU

- LITRE is NCSU's quality enhancement plan for SACS accreditation.

LITRE Goals

- LITRE's ultimate purpose is to improve student learning in four dimensions:
  - Problem solving
  - Empirical inquiry
  - Research from sources
  - Performance in the disciplines



- LITRE's primary strategy is to establish an ongoing, systematic investigation into the effectiveness of technology-based innovations to improve learning.

- Results of these investigations will be used to build on our successes, shape future investigations, and inform campus decision-making.

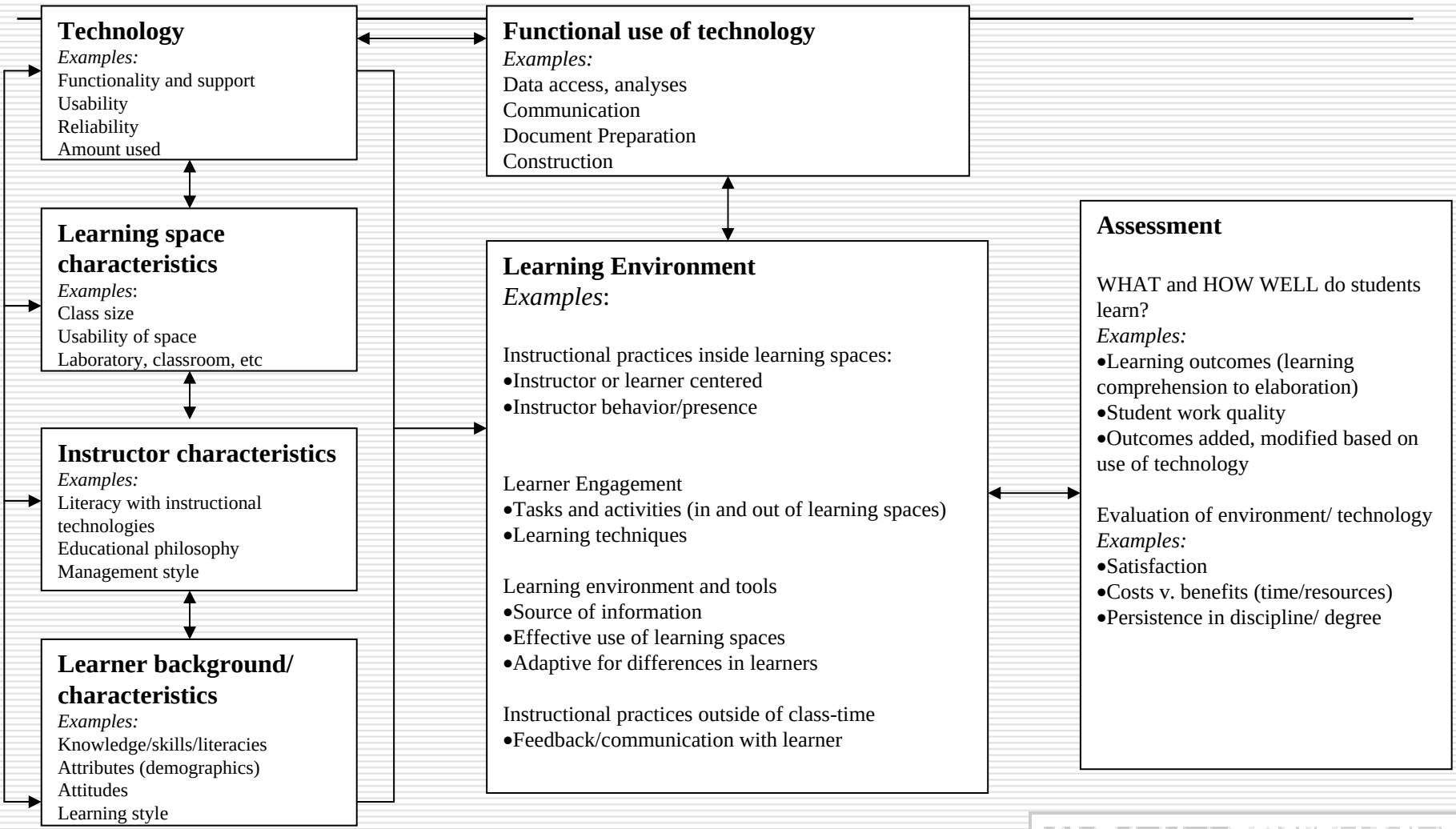
ClassTech

- We spent almost a semester developing a framework around which to do the assessment.
- Recognition that technology is a tool that instructors use in a complex learning environment.

ClassTech Supported Rooms:

- Increased from 0 rooms in Fall 2003 to 12 in spring 2004 to 20 fall 2004 to 54 in fall 2005 to 67 by spring 2007…to…anticipated UNKNOWN numbers in the future
- Technology:
  - Data projector / control system
  - In-room computer
  - Laptop plug in
  - VCR/DVD
  - Document Camera
  - Overhead transparency projector

Draft Framework (see handout)



Research Questions

- **Question 1:** How does use of technology impact course's pedagogy, faculty workload, faculty attitudes, and amount of material delivered?
- **Question 2:** How does having the technology used in the classroom affect:
  - a) Use of class time?
  - b) How students learn, and
  - c) Student achievement of course and program objectives?

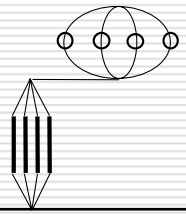
Methodology

- Qualitative – case study design with purposeful sample
  - Faculty interviews using interview protocol
  - Classroom observations using specially developed observation instrument
    - Observers trained for inter-rate reliability
  - Student artifacts gathered as evidence of student learning outcomes (outcomes and artifacts identified by faculty).

Observation Instrument: Technology Use

- Bruce & Levin, 1997 identified 4 main purposes for technology use:
  - Media for inquiry (theory building, data access, data collection, data analysis)
  - Media for communication (document preparation, communication, collaborative media, teaching media)
  - Media for construction
  - Media for expression

Observation Instrument: SOLO

SOLO Taxonomy category	Representation	Type of outcome	
Unanticipated extension		Create Hypothesise Predict Theorise	Synthesise Validate Debate
Logically related answer		Apply Distinguish Classify Summarise	Outline Analyse Contrast Categorise
Multiple points		Explain List Describe	Define Solve Interpret
Single point		State Recall Note	Recognise Quote Name

Sample

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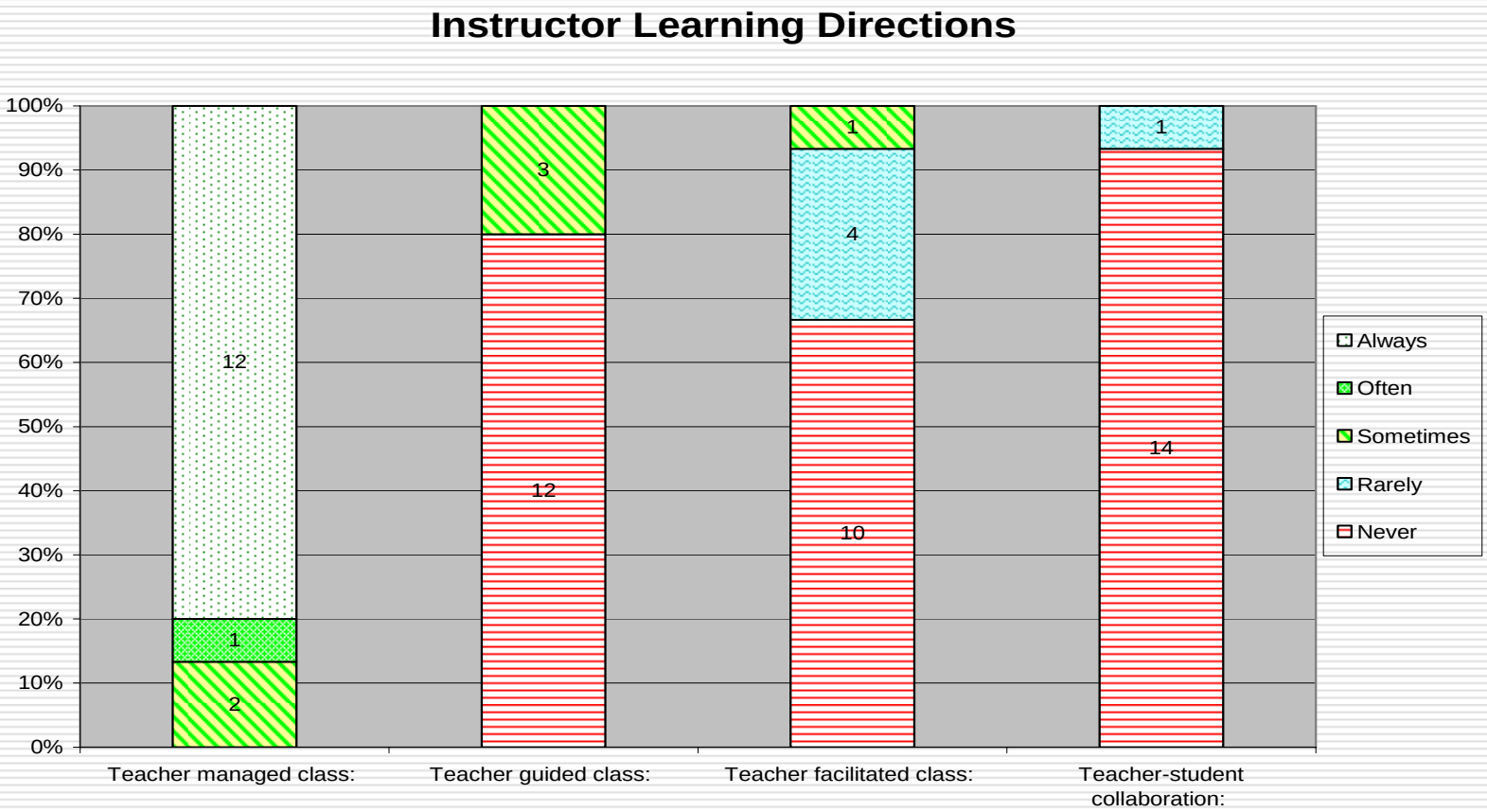
	Number	Percent
Contacted	33	
Interviewed and observed	16 / 15	48%
Did not respond to contact	10	30%
Declined participation	7	21%

6 Colleges

2 100-level, 2 200-level, 8 300-level, 3 400-level courses

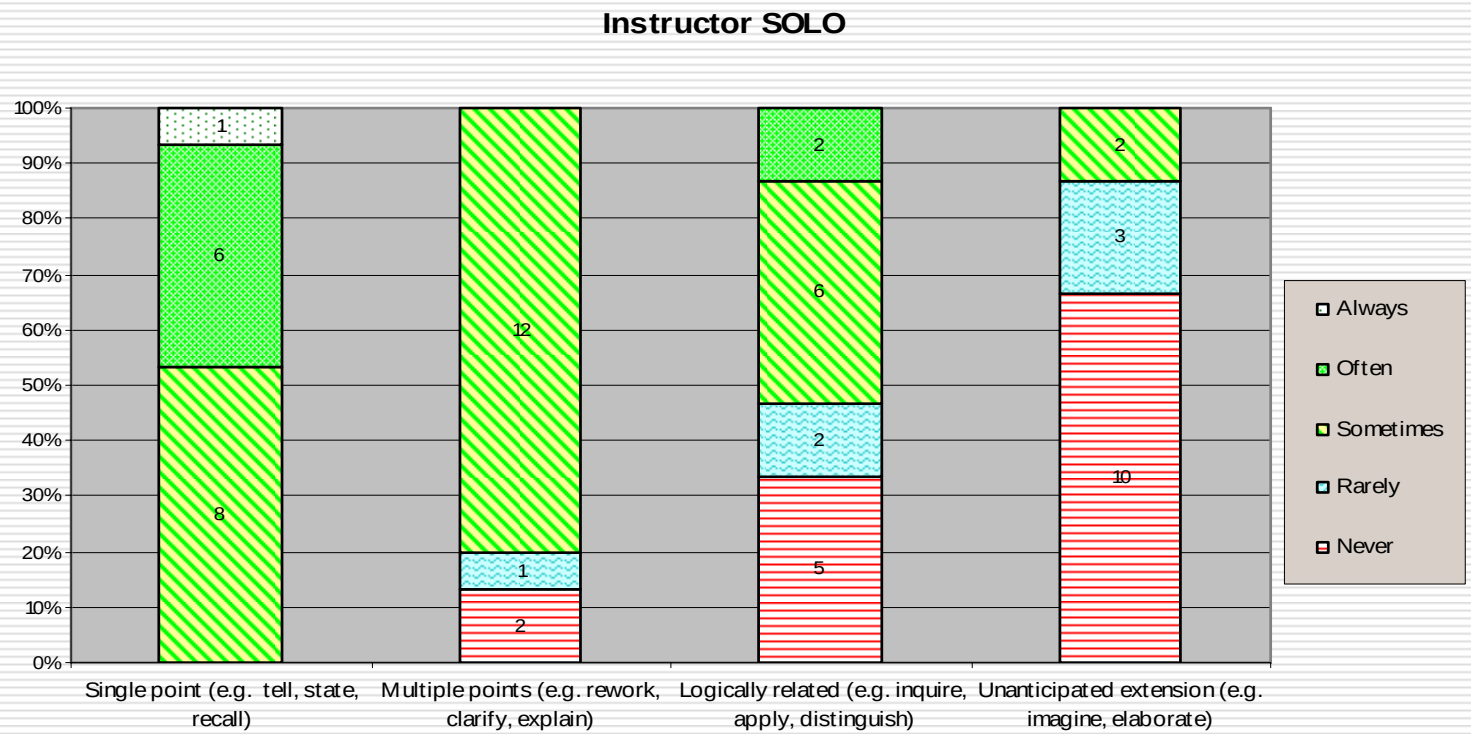
Some findings: Faculty

- Faculty pedagogy is essentially teacher centered.



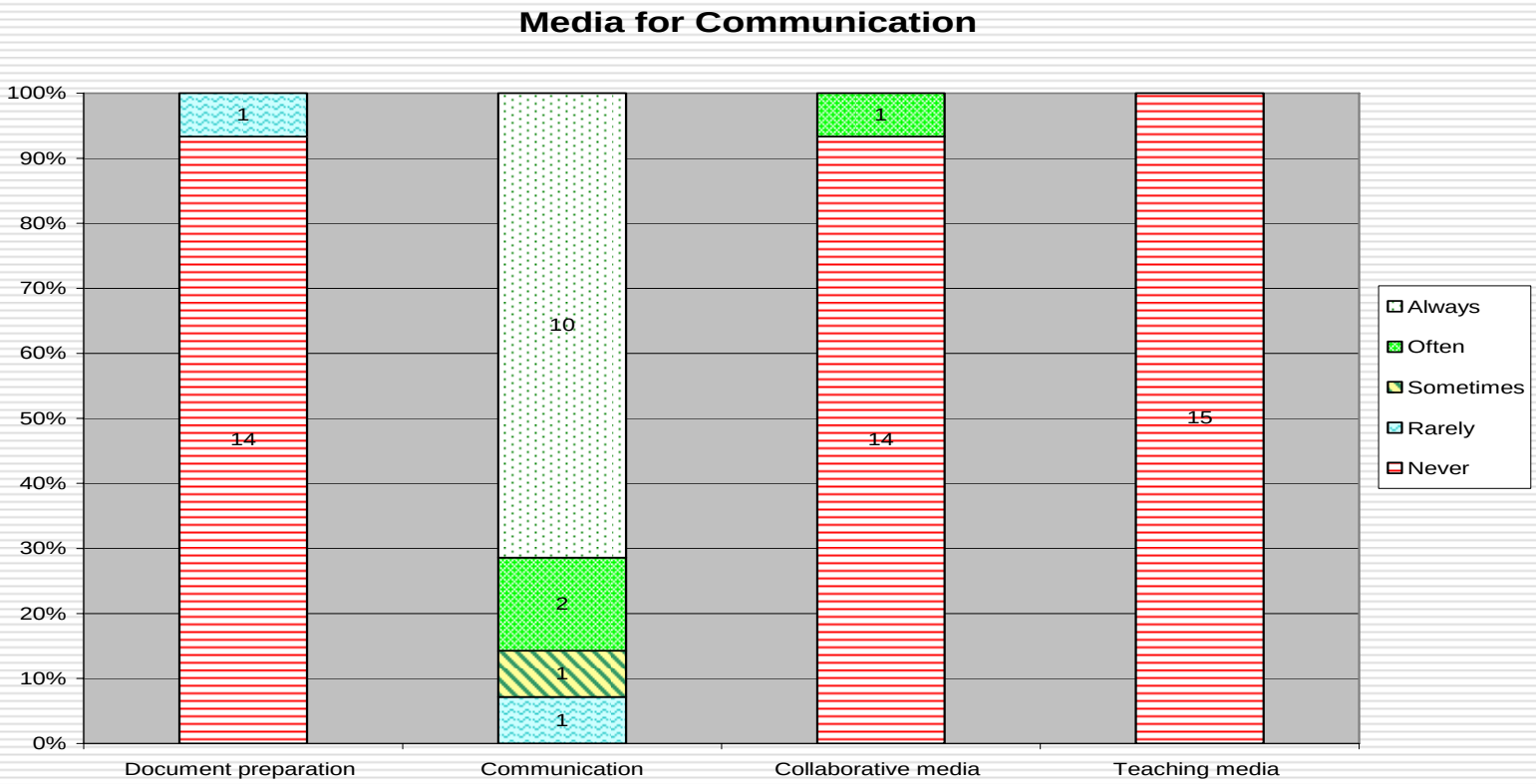
Some findings: Faculty

- All instructors were classified as using the single point SOLO taxonomy level.



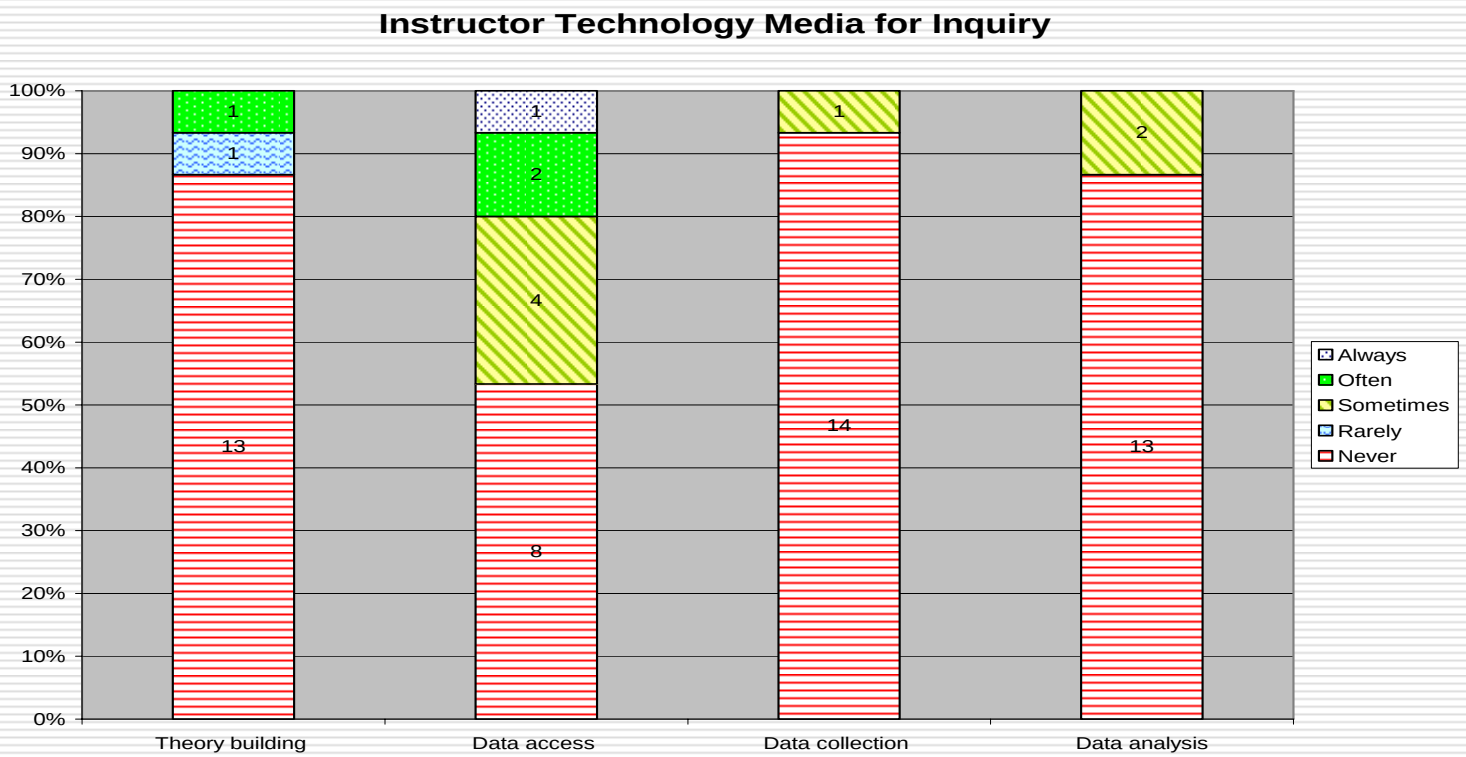
Some findings: Faculty

- Faculty primarily used technology to communicate information.



Some findings: Faculty

- A few used technology as a medium for inquiry (especially data access).



Some findings: Faculty

- Faculty articulated that the value of using technology in relationship to student learning in class were as follows:
  - demonstration & visualization,
  - see applications of theory,
  - accommodate different learning styles,
  - students process information because not taking notes,
  - students have notes and materials before, in and after class, i.e. access to information is enhanced and faculty show them how to get to the material,
  - students don't have to carry textbooks,
  - students learn processes that can be applied in other contexts because it has been modeled by the instructor (e.g. writing excel macros).

Some findings: Faculty

- Technology is viewed as a way to organize teaching and make it easier for students.
- Many faculty spoke of the value of having materials online outside the class, so that students could access it 'anywhere, anytime, 24/7' (9 of the cases).
- Other roles for technology included
  - Increased student independence,
  - Students have more time to study/do homework,
  - Keeping students on task,
  - Providing immediate feedback on assignments (Webassign), and
  - Providing access to examples and model answers

Cross-Case Analysis

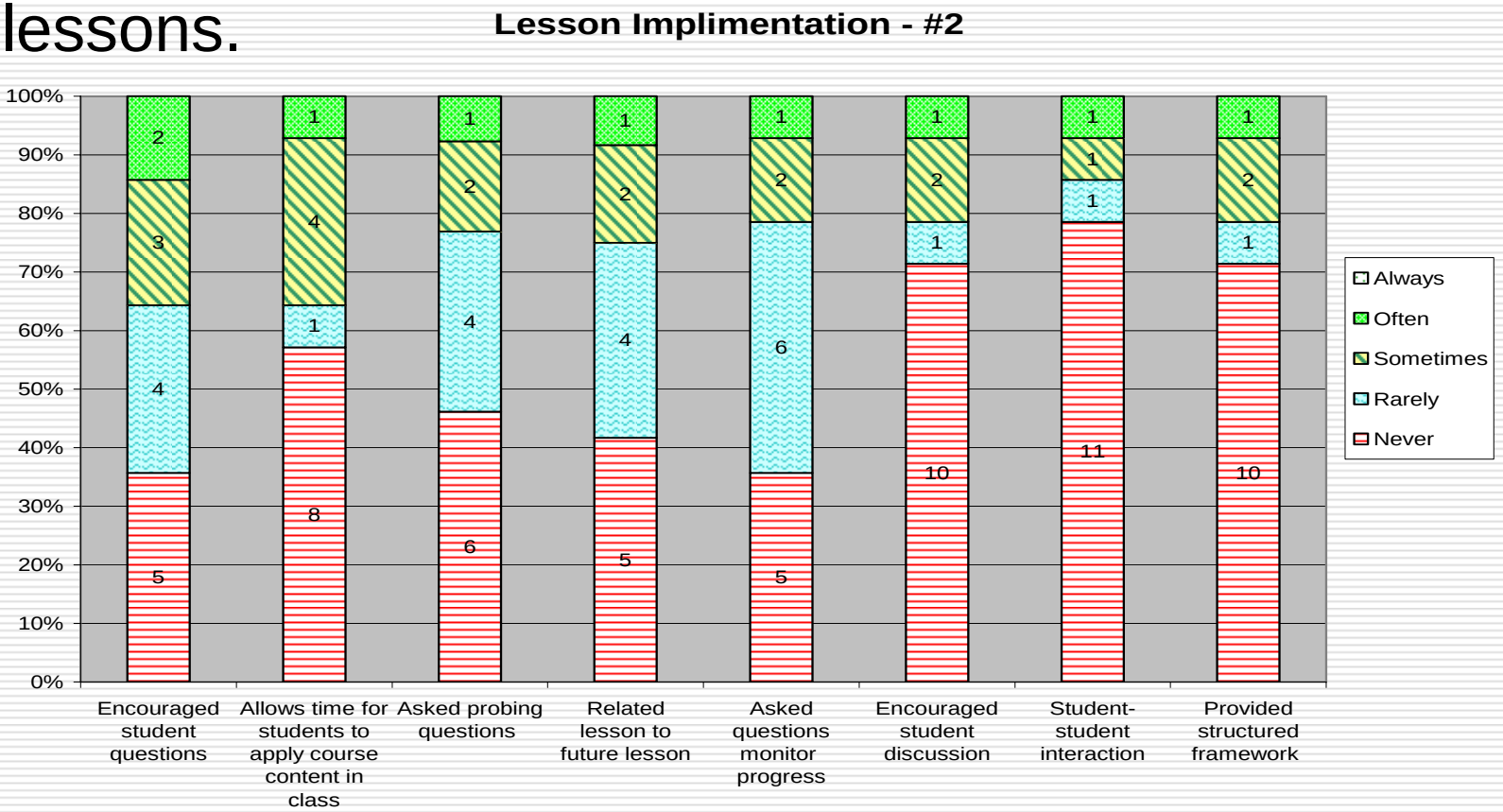
- Overall, faculty felt that the purpose of teaching was to:
  - To provide students with materials & information (2 courses),
  - To motivate students to learn (3 courses),
  - For students to learn the content and/or structure of the discipline (10 courses),
  - For students to learn particular processes & skills important to the discipline (5 courses), and
  - For students to apply course content (3 courses).

Cross-Case Analysis

- Faculty attitudes to the use of technology were very positive overall. Reasons given were that:
  - It makes it easier to teach the course the next time around,
  - It assists student efficiency because they can access materials,
  - Presentations are more accurate because of visual aids,
  - Helps to organize teaching,
  - Makes teaching more enjoyable,
  - Enthusiasm for teaching had been increased or renewed,
  - Enhances comfort level in the class,
  - Makes interaction in class more student focused,
  - Pedagogy should drive the use of technology, and not technology for its own sake.

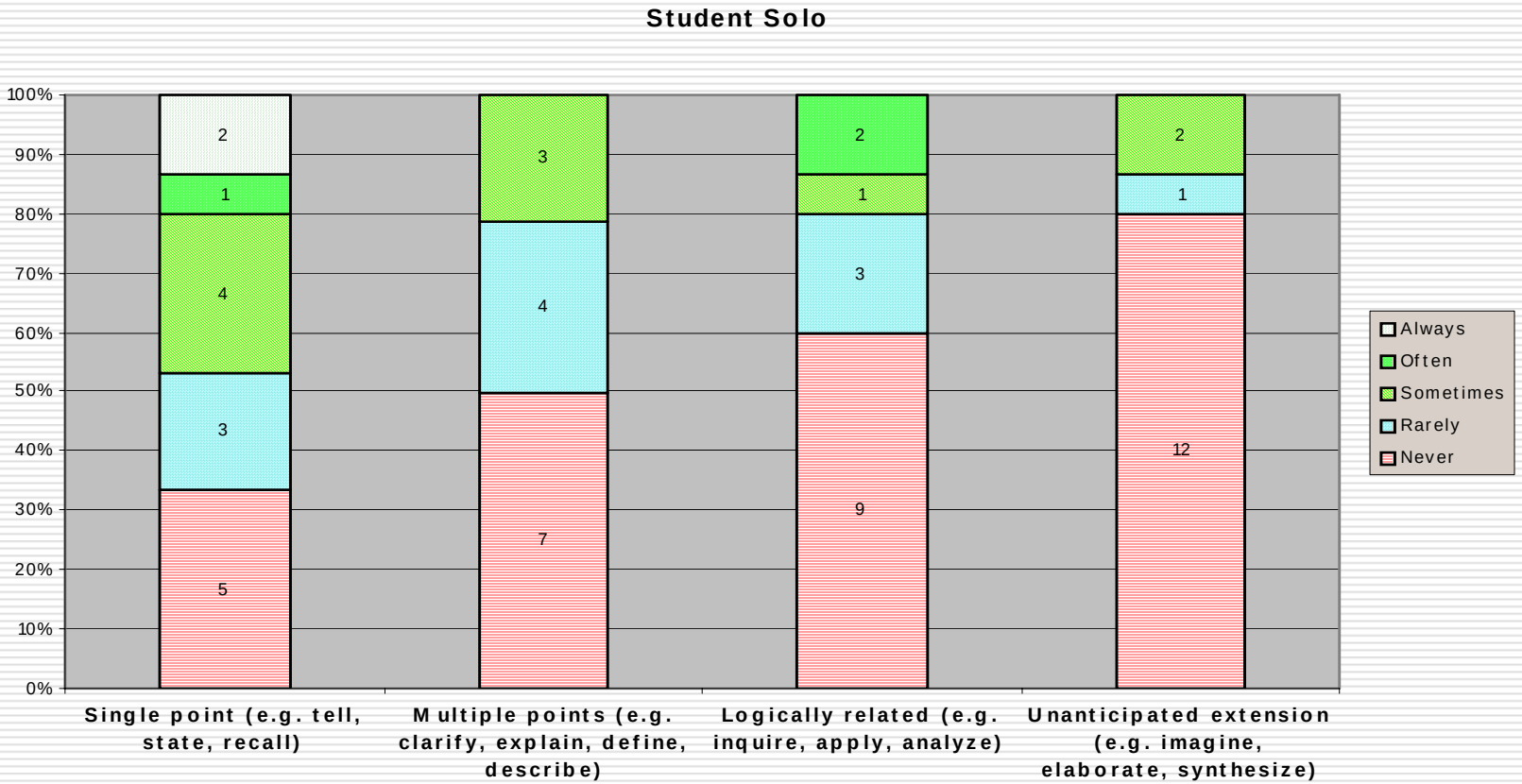
Some findings: Students

- Generally, students are not actively engaged during lessons.



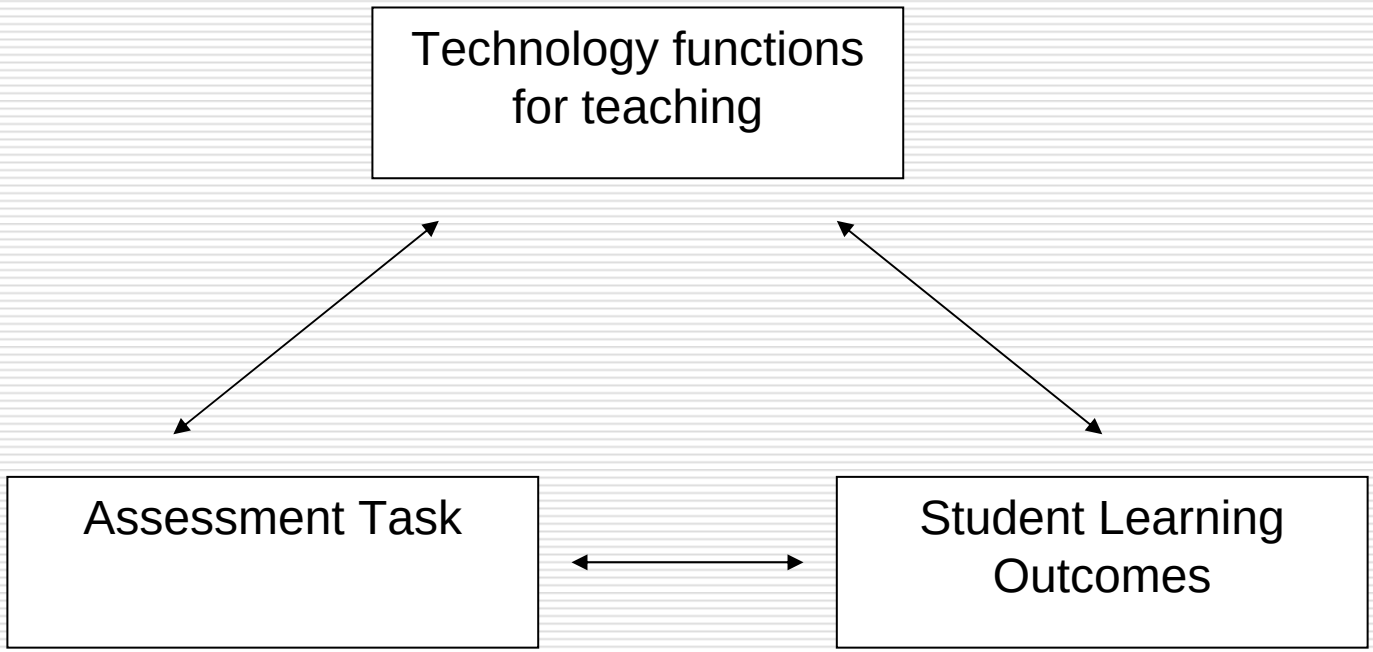
Some findings: Students

- The SOLO level of student engagement in classes was primarily at the lower levels.



Some findings: Assessment

- Technology, learning outcomes and assessment were not seen in relationship to each other by faculty.



Some findings: Assessment

- As a group, faculty tend to assess at a lower SOLO level, even if they have a higher level outcome for the lesson.
- The higher the outcome level planned, the more diverse the use of the technology.

	Lesson outcome level - N	Assessment task level - N
Single point	3	7
Multiple point	2	3
Logically related	8	2
Unanticipated Extension	0	1

Some findings: Assessment

- In general, the lower cognitive level of the task, the better the performance.
- The student performance reflects the SOLO level of the task more than being related to how technology was used.

SOLO categories of student work	Number of courses	How well student's performed
Single	8	80.1%
Multiple point	6	71.8%
Logically related	2	57.5%
Unantici-pated extension	1	92.5%

Implications for Technology

- In general, the technology works, though support infrastructure must be in place to assist when it doesn't.
- 75% of faculty asked for support of some kind.
- Classrooms in the study were "traditional": designed for presentation-style format

Implications for Technology

- Classroom design & technology standards should be driven by expected learning outcomes

- Designing buildings from the inside out
  - Need-based rather than formula-based
  - Functionality needs assessment at the programming phase if possible

Technology infrastructure

- Define functionality first, then determine what infrastructure needed to allow for the functionality needs
- Balancing needs for flexibility due to changes in technology and pedagogy
- With increase in blended/hybrid learning environments, scheduling needs and systems change

Balancing Equipment Needs/Costs

- Convenience matters: In-room computer is primary tool used in the classroom, even though most have access to laptop
- Phasing out equipment
  - migrating from transparency projector to document camera
  - Moving from VCRs to digital content
- Standards vs. special needs

Technology Applications

- If PowerPoint is primary application used, what are key factors that allow it to be used to enhance cognition, rather than dull it?

Comments or Questions about Technology?

Implications for ClassTech students

- Faculty believe that students want access to ‘anywhere, anytime, 24/7’ (9 of the cases).
- Request blended environments and opportunities, but unprepared for them.
- Students expect edutainment (infodelivery, McKnowledge)
- Students meet faculty expectations (for better or worse)
  - If cognitive demand required to use hardcopy materials was the same as dynamic materials, student performance remained the same
  - If faculty expectations were aimed at lower SOLO cognitive performance, faculty presentation level does not matter
  - If faculty take total responsibility for producing and distributing class materials and notes, students do not produce their own
  - If faculty promise access to materials 24/7, students expect it
  - If faculty replace talk and chalk with state the point and click, students passively listen (or not).

Student expectations in general

- Children currently spend more time watching TV than they do in school (Bransford, et al., 2000).
- 91% of American children (3-17 years old) use computers; 65% use the Internet (Burkhardt, et al., 2003; DeBell & Chapman, 2006).
- Work organized around teamwork, interruptions, deliverables, and accelerated communication and deadlines (Perlow, 1999).
- Technology users report diminished attention, inter-ruptability, multitasking, dual processing, polychronicity, information overload, and pseudo-attention deficit disorder (Hafner, 2005; Turner & Reinsch, 2007).
- Students expect
  - Forty-year degrees, content mobility, tailored programs, just-in-time instruction (Berge, 2003)
  - Education while working full-time, faculty that are relevant to the workplace, time-efficient and cost-effective education
  - High level of customer service and convenience (Biggs, 2003; De Alva, 2000).

Implications for ClassTech faculty

- Technology supports traditional presentation and communication of instructional materials.
- Technology allows greater coverage and instructional pace (~50%).
- Hesitation to invest time and energy in preparation of materials related to classroom access.
- Technology is easy to use but not easy to use to improve teaching or instructional materials (Austin, 2003; Baker & Saltmarch, 2000).
- Faculty use technology in ways that are familiar to them, based on their own experiences as students (Johnson, 1996).
- Faculty who use technology creatively to encourage higher-level thinking, frequently assess student performance at lower-levels.

Faculty expectations in general

- Instruction generally viewed as mere presentation of known facts, knowledge, and the true state of the world (Petraglia, 1998).
- Perspectives on the role of technology in education on a continuum from negative (Dumont, 1996; Noble, 1998; Oppenheimer, 1997) to neutral (Clark, 1983; Russell, 1999) to positive (Kozma, 1991; Singh, et al., 2005).
- Communication channels are one to many.
- "Will many teachers be tempted to use expensive and extraordinarily versatile technological tools in a one-dimensional manner, to imitate and perpetuate and aggravate traditional teaching and learning down to the very last detail?" (Peters, 2003).

Comments or Questions about Teaching and Learning?

Implications for assessment

- The qualitative design of this study yielded very rich, in-depth data about specific classrooms. But, this is time consuming and needs personnel.
- This was complimented by university wide surveys of faculty using ClassTech rooms yielded additional data about challenges and technical issues with using technology, patterns of use, views about student learning, and the impact on course delivery (data not presented in this session).
- Mixed method approaches to assessment enable a fuller understanding of context.
- Can we replicate this approach in assessing teaching and learning in the online environment, in blended courses or in other physical spaces.

Implications for assessment

- The study results showed that:
  - Gathering data on student learning outcomes in relationship to course or lesson goals was difficult because many faculty did not understand the nature of this relationship.
  - Learning outcomes were not related to technology use.
  - Most faculty used traditional forms of assessment (tests/exams, online quizzing) and assessed at the lower cognitive levels.
- In order to improve assessment processes generally, we need to foster faculty understanding about the nature of assessment, and its relationship to teaching and learning.

Implications for assessment

- Assessment inevitably leads to new questions, e.g.
  - Do faculty who have used technology for longer use it in more sophisticated ways?
  - What types of technology use and pedagogy best support student learning?
  - How do students say they learn through the use of technology? Are these personal theories valid?
  - What results would we find if the study were replicated in classroom where students have access to technology (computer labs, laptops, virtual computing)?
  - How would different classroom arrangements/infrastructure impact teaching and learning?

Implications for assessment

- Utilization-focused evaluation (Patton, 1996) stresses that evaluation processes should generate data that will be used to bring about change and improvement. The same is true of assessment data.
  - Identify key stakeholders and include them in ongoing assessment processes.
  - Report findings with implications and recommendations to key decision makers, special interest groups and other stakeholders.
  - Showcase exemplars of good practice and assessment data, as the basis for further development.

Comments or Questions about Assessment?

General Comments or Questions ?

Resources

- These slides: http://www.ncsu.edu/classtech/workshops/unctlt2007/
- Classroom Observation Study Report (full report)

  http://www.ncsu.edu/classtech/survey_results/2005_06/ClassTech_Observation_Study_Report.pdf
- Classroom Technology @ NC State: http://www.ncsu.edu/classtech/

  http://www.ncsu.edu/classtech/survey_results/2005-06/

  http://www.ncsu.edu/classtech/survey_results/
- Other Session Documents: http://www.ncsu.edu/classtech/workshops/unctlt2006/
- Resources on assessment of technology related to student learning: http://www2.acs.ncsu.edu/UPA/assmt/litre/
- Quality Enhancement Plan for Learning in a Technology-Rich Environment at NC State: http://litre.ncsu.edu/pdf/litre_qep.pdf
- LITRE Goals and Assessment Plan: http://litre.ncsu.edu/dfiles/goals_short.html
- 2003 LITRE Faculty Survey Report: http://litre.ncsu.edu/fac_sur.pdf

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