

# 2004-05 ClassTech LITRE Report

Summer 2005

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## Introduction

ClassTech is the Information Technology Division's support unit for classroom technologies on the NC State University campus. It is also the name of the project originally conceived by the Classroom Environment Committee and funded by the Provost. The ClassTech project was brought under the LITRE umbrella because of its significant relationship with LITRE's mission to improve teaching and learning through appropriate implementation of technology and the university's desire to better assess the effectiveness of technology being deployed in classrooms.

As a relatively new unit on campus, ClassTech ([www.ncsu.edu/classtech](http://www.ncsu.edu/classtech)) is in a period of rapid expansion as it plans and implements classroom technology and provides support and maintenance in new and existing buildings on the NC State campus. ClassTech's first 11 classrooms came online for Spring 2004 and the unit has been adding rooms each semester. Less than two years later, as a result of the completion of two more bond-funded buildings and a second round of funding from the Provost's Office, there will be 54 classrooms spread across campus in 19 buildings on the ClassTech-supported roster by fall. This does not include the many rooms already in place and supported by individual colleges.

ClassTech rooms provide relatively basic multimedia technology: a ceiling-mounted data projector, a computer in the teaching lectern, connections for an instructor's laptop, a document camera (aka visual presenter), and a combo VCR/DVD player. This equipment is controlled via either a push-button or touch-screen interface.

From its inception ClassTech has been driven by assessment: What tools do faculty need? How much is the equipment being used? Is the training and support provided adequate? Along with being incorporated as a first-wave LITRE initiative came the addition of the questions concerning what impact the technology has had on teaching and learning. Are these classrooms meeting faculty needs and improving student learning? Results from the variety of assessment methods used this past year clearly answer the first part of the question in the affirmative, but can not yet definitively get at the second part.

Karen St. Clair served as the LITRE ClassTech co-investigator since May 2004. She was instrumental in helping to re-phrase the research questions being asked about measuring teaching and learning in ClassTech rooms. She performed an extensive literature review (available at [http://www.ncsu.edu/classtech/workshops/unclt2005/tlt\\_lit\\_review.pdf](http://www.ncsu.edu/classtech/workshops/unclt2005/tlt_lit_review.pdf)) and worked closely first with Ephraim Schechter and later with Joni Spurlin to develop the research instruments to help evaluate what impact ClassTech has had at NC State. Karen has left her position in the FCTL and this summer Brad Mehlenbacher, associate professor in Training and Development (in ACCE) has taken her place as a faculty member with research interests and expertise in this area who will help carry forward the research on classroom technology.

## 2004-05 Assessment Methods

A number of assessment methods were carried out as part of the LITRE ClassTech project over the last year.

### Fall 2004

- Online ClassTech faculty user survey
- Follow-up interviews with five faculty
- Brief, open-ended survey of students in three classrooms
- Equipment usage logs for subset of rooms

### Spring 2005

- Online ClassTech faculty user survey
- In-class survey of students and faculty in 10 classes
- Interviews with faculty in eight classes
- Interviews with technical support staff and review of maintenance logs
- Equipment usage logs for subset of rooms

## Online Faculty User Survey Results

In fall 2004 ClassTech staff conducted its second online user survey. Invitations were sent to 124 instructors for whom we had contact information. We received 35 valid responses for a response rate of 28%. There were 217 course sections taught in the 20 ClassTech rooms online in Fall 2004. Graphical and tabular results for most of the questions are online at:

[http://www.ncsu.edu/classtech/survey\\_results/fa04/](http://www.ncsu.edu/classtech/survey_results/fa04/)

The spring 2005 ClassTech user survey was significantly revised with the help of UPA and ITD staff. Invitations to participate went out under the Interim Provost and Lavon Page's names to 245 instructors teaching in 26 rooms. There were 116 unique surveys received for a response rate of 47%. Graphical and tabular results from many of the questions are online at:

[http://www.ncsu.edu/classtech/survey\\_results/spr05/](http://www.ncsu.edu/classtech/survey_results/spr05/)

The instrument is online at:

[http://www.ncsu.edu/classtech/survey\\_results/spr05/facusersurvey.html](http://www.ncsu.edu/classtech/survey_results/spr05/facusersurvey.html) Results reported below focus on the spring survey but incorporate some data from the fall '04 survey.

### \* Experience teaching in technology classrooms

Even if respondents taught more than one course in a ClassTech room in the spring, they were asked to focus on a specific course in their responses. Prior to the spring semester 48, or 41%, of the respondents had not taught this particular course in a room having technology permanently installed. Of those, 14 (12% of all) had never taught the course

before. Conversely, 30% of respondents had taught their course in a classroom with permanent technology at least three times prior to the spring semester.

### **\* Contact with ClassTech staff and preparation to use the equipment**

More than 52% indicated they had some contact with ClassTech staff to receive instruction either before the semester started, at an Open House (11%), in a one-to-one training session (12%) or during “meet-and-greet” sessions during the first several days of classes (29%). See [http://www.ncsu.edu/classtech/survey\\_results/spr05/training.html](http://www.ncsu.edu/classtech/survey_results/spr05/training.html) for graphical and tabular results.

Of those answering the question, 59% were aware more than two weeks in advance that they would be teaching in a room with technology available; 20% became aware two or fewer weeks prior to the first day of classes, and 22% were unaware until the first day of class.

Most faculty felt they were adequately prepared (76%) or somewhat prepared (14%) to use the in-room computer, with the remaining 10% saying they were not prepared to use it. More felt they were not prepared to use the laptop connection to the data projector (29%), the document camera (27%) or the VCR/DVD player (24%); however, a strong majority felt at least somewhat prepared to use this equipment.

### **\* Frequency of use of the equipment**

A strong majority (73%) of respondents said they used the in-room computer sometimes (24%) or most all of the classes (49%). This was the tool used most frequently, followed by the document camera (25% most or all classes, 26% sometimes), the VCR/DVD player (2% most or all classes, 27% sometimes), the laptop connection to the data projector (11% most or all, 14% sometimes) and the overhead transparency projector (5% most or all classes, 20% sometimes). See [http://www.ncsu.edu/classtech/survey\\_results/spr05/frequency.html](http://www.ncsu.edu/classtech/survey_results/spr05/frequency.html) for graphical and tabular results.

### **\* Ease of use of the equipment**

Almost all (98%) of those who used any of the equipment felt the system controls were either very easy (71%) or somewhat easy (27%) to use. Of those who used either the computer or laptop connections, 95% said they were either very easy or somewhat easy to use, though a higher percentage said the in-room computer was very easy to use (72%) compared to those who said the laptop connection was very easy (63%).

The document camera was reported to be very easy to use by 67% of those who used it, with 22% saying it was somewhat easy to use. The VCR/DVD player was reported very easy to use by 61% and somewhat easy by 24%. See [http://www.ncsu.edu/classtech/survey\\_results/spr05/ease-of-use.html](http://www.ncsu.edu/classtech/survey_results/spr05/ease-of-use.html) for graphical and tabular results.

### **\* Importance of these technologies to teaching this course**

In previous ClassTech user surveys a general question was asked about the importance of having the technology available to teaching the course. In the spring edition of the survey, the question was broken down by particular piece of equipment.

Having a networked computer (and the ability to project the video and/or audio output to students) was rated the most important by respondents, with 51% indicating it was essential and an additional 25% saying it was important. The document camera was rated second most important with 27% saying it was essential and 28% saying it was important. See [http://www.ncsu.edu/classtech/survey\\_results/spr05/importance.html](http://www.ncsu.edu/classtech/survey_results/spr05/importance.html) for graphical and tabular results.

Not surprisingly, the importance a respondent gave to particular equipment was strongly correlated to the frequency that faculty members indicated they used the equipment.

As a side note, last fall the College of Management IT staff conducted a classroom technology usage survey via email to those teaching in Nelson Hall. The data they collected on the amount equipment was used closely mirrors the data from the ClassTech faculty user survey. Of the 30 CoM faculty responding, 28 stated that having the technology available was essential for teaching their course.

### **\* How faculty use the technology and what students learn as a result**

In several open-ended questions faculty were asked to provide their best examples of an instructional technology tool they used, what they did with the tool, and what students learned as a result.

The most frequently provided example was displaying lecture notes and static illustrations either via PowerPoint or in another format (e.g. online in HTML). For example, "I project an on-line version of the lecture outline, with links to websites that have relevant information." There was a broad variation in levels of complexity using these tools. Quite a few of those who noted this as their example felt that students were able to concentrate better on content either because the slides were available online or because key points were provided. While some faculty did feel over-reliance on PowerPoint outlines caused students to be more passive or attend class less frequently (if the slides were available online), more said they felt it made it easier to engage students either because students didn't have to write down everything or because it freed them from the board and allowed for increased eye contact.

Several pointed out how access to online course resources allowed course content to be much more readily tied into real-world information. "Students were able to see how specific college and state [educational] websites have all of the resources collected instead of having to search for everything individually. Students also got to use interactive educational websites that they would need as educators."

Numerous respondents went well beyond outlines or notes and provided visual and occasionally audible illustrations of specific concepts or processes presented in the course. The use of simulations or animated sequences proved useful according to faculty accounts, such as: “Students received more detailed and accurate visual information than could have been provided via the chalkboard.”

Another key use of the technology was through demonstration. Since students are increasingly expected to use technology outside of class to complete assignments, the methods can be demonstrated in class. “Students saw useful options and graphics for typical analyses they would do on their research data. Equipment gave the flexibility to demo things in answer to questions that arose, as opposed to a static handout.” Several faculty noted the increased speed with which students mastered concepts or were able to analyze data because they had provided a chance to see what was expected in class.

Video clips, shown via the DVD/VCR player, produced or downloaded online were given as an example by a handful as a way to illustrate a point and begin discussion. For example, use of a primary document in a History class such as a clip of Lyndon Johnson agonizing over whether or not to send troops to Vietnam, or an illustration of a speech making concept for a Public Speaking class.

Of the 83 faculty who gave an example of what students learned, most of the faculty really talked about how they used the technology to facilitate learning - 59% of these faculty said that they demonstrated or illustrated course materials by using one or more tools in the room. While not explicitly stated, it can be presumed that faculty using these methods feel they were more effective in teaching than non-electronic means of relating course content. There were 7% who said they were able to cover the material more efficiently. Of these 83 only a few discussed how the student learned - 28% said that students were better able to follow class discussions; 6% said that the student participation in class was facilitated.

#### **\* Differences in teaching the course with and without the technology**

Faculty were asked how the *pace of the course* in a ClassTech room compared to the same or similar course taught without instructional technology. There was an almost even split among those who said the pace was the same (49%) and those who said the pace was faster (48%) with technology. A little less than 3% said the pace was slower. See [http://www.ncsu.edu/classtech/survey\\_results/spr05/multi-answer.html](http://www.ncsu.edu/classtech/survey_results/spr05/multi-answer.html)

Right at half of the respondents said the *variety of topics* covered in their course when teaching with instructional technology was about the same, though the other half said teaching with technology allowed for a wider variety compared to teaching without this technology. Less than 1% said there was less variety of topics covered. See [http://www.ncsu.edu/classtech/survey\\_results/spr05/multi-answer.html#variety](http://www.ncsu.edu/classtech/survey_results/spr05/multi-answer.html#variety)

Most faculty (61%) said the *depth of material covered* during the course was greater when teaching in rooms with classroom technology than those without. Another 36% said it was the same and less than 3% said it was less. See

[http://www.ncsu.edu/classtech/survey\\_results/spr05/multi-answer.html#depth](http://www.ncsu.edu/classtech/survey_results/spr05/multi-answer.html#depth)

A majority of faculty said their students were much more (16%) or somewhat more (43%) *involved in the learning process* when taught using instructional technology. The remaining said student involvement was about the same (33%), somewhat less (7%) or much less (1%). Of the 61 faculty who responded to the an open-ended follow up question related to this, 43% said that the students were more involved in class discussions; 18% said that the students could work along with the instructor on problems and data; 15% said that students showed they were more involved by the types of questions they asked during class; 13% said the students could present their own work during class with use of technology. Of all the faculty respondents, 6% said they felt the technology made the student more passive in class or that the students attend class less. See [http://www.ncsu.edu/classtech/survey\\_results/spr05/multi-answer.html#involvement](http://www.ncsu.edu/classtech/survey_results/spr05/multi-answer.html#involvement)

Those survey respondents who said students were more involved in the learning process when in-class technology was used were also generally more likely to report more frequent use of the in-room computer ( $r=.31$ ,  $p=.001$ ), VCR/DVD player ( $r=.26$ ,  $p=.007$ ) or document camera ( $r=.25$ ,  $p=.009$ ). There was also a significant correlation between those who said they frequently used the computer in the classroom and those who said the pace of the course was faster when teaching in a room with technology ( $r=.29$ ,  $p=.002$ ). Those who said having a computer was important were also more likely to say using technology in class increased the pace of the course ( $r=.26$ ,  $p=.01$ ).

#### **\* Frequency of student PDA/computer use in class**

Few faculty (9%) encourage students to bring their computer or PDA to class some or all of the time. Several (6%) actively discourage students from bringing these tools to class. Of respondents, 54% said that between 1 and 10 percent of their students had ever brought a PDA or computer to use in class, with 37% indicating they never had any students bringing one to use in class.

Other campus surveys have indicated that more than 95% of all students have computers. Of those, around 60% have a laptop. Students generally leave their computers at home unless there is a specific incentive for them to bring their computing devices to the classroom, e.g. to give a presentation or because they are in a class section that specifically incorporates laptops.

#### **\* Frequency of problems with the equipment and getting help**

Of respondents who used any of the equipment, 37% said they had not encountered a time when the equipment didn't work when they wanted to use it. An additional 29% said the equipment had not worked once. A full 21% said equipment did not work three or more times. ClassTech began supporting several of the more troublesome rooms in the

fall. Reported equipment uptime did improve slightly in the spring compared to the fall semester.

| Number of times found equipment was <b>not</b> working | Fall 2004 | Spring 2005 |
|--|-----------|-------------|
| Worked every time                                      | 31%       | 37%         |
| Didn't work once or twice                              | 46%       | 41%         |
| Didn't work three or more times                        | 23%       | 21%         |

Faculty generally sought help through ClassTech staff rather than from a student in the class, a colleague or other staff member, or someone else. Of the 61 respondents who requested help from ClassTech, 87% said they were satisfied (36%) or very satisfied (51%). There were 10% who were unsatisfied and 2, or 3.3% who were very unsatisfied with ClassTech's help.

Occasionally faculty did ask students for help, with 21% indicating they had at least once. Of those who did, 62% were very satisfied and 29% were satisfied with the help they received.

#### **\* Likelihood of attending training on effective practices**

When asked whether they would attend training sessions on effective practices in the use of these classroom technologies, 53% said they would be either highly likely (17%) or somewhat likely (36%) to attend.

### Findings from student survey data

In the fall Karen St. Clair conducted a brief open-ended survey of students in three classes. In the spring a more extensive survey was conducted in 10 classes with a total of 470 responses received. While the classes represented a reasonable variety of disciplines, the class sizes varied significantly and the number of respondents per class ranged from 12 to 183. As a result, responses are weighted toward the larger classes.

That said, 81% of students felt that their instructor's use of technology positively affected their learning. Only 1 student (0.2%) felt it negatively affected their learning and the remaining 19% felt the use of technology had no affect on their learning.

Most students completing the survey prefer classes with moderate (71%) or extensive (21%) use of instructional technology. The remainder prefer classes with limited (8%) or no (0.4%) instructional technology use.

According to respondents, 88% felt the pace of the course in which they were surveyed was about right. More than 9% said it was too fast and more 2% said it was too slow.

A five-point Likert scale was used in the student survey to ascertain students' agreement with a series of statements.

| <b>Extent to which respondents agreed with statements<br/>(1=Strongly Disagree, 5=Strongly Agree) Ordered highest to lowest</b> | Mean | Standard<br>Deviation |
|---|------|-----------------------|
| The instructor is comfortable with the use of technology in class.  | 4.11 | 0.84                  |
| The instructor uses the technology to help me visualize the concepts.   | 4.09 | 0.70                  |
| The instructional technology accommodates my needs and learning styles.   | 3.83 | 0.73                  |
| The instructor uses the technology to give real-world examples.   | 3.79 | 0.79                  |
| The benefits of using technology in class outweigh any hassles or difficulties that might arise.                                | 3.79 | 0.83                  |
| The instructor uses the technology to help me better comprehend complex or abstract concepts.                                   | 3.78 | 0.83                  |
| Compared to classes where the instructors don't use the same technology, my learning is enhanced.                               | 3.49 | 0.92                  |
| Use of technology facilitates teamwork within the classroom.  | 3.22 | 0.89                  |
| Class time is spent dealing with technical problems.  | 2.61 | 1.11                  |
| The technology in class makes me feel detached from the instructor.   | 2.21 | 0.81                  |

The in-class survey asked students to look at that specific course. University Planning & Analysis added several general questions to the sophomore and graduating senior survey that asked more broadly about classroom technology. Those results are online at: <http://www2.acs.ncsu.edu/UPA/survey/litre/> In these surveys, students were more likely to feel they learn better when instructors present course concepts electronically via animation, multimedia, simulation, etc. than when other electronic methods listed were used. However, not even half who have had instructors use non-static electronic presentations such as these said they learn better this way. Students were less likely to say the use of other methods listed helped them learn better. The use of Computerized exams/quizzes in a class or lab had the greatest percentages of students indicating they did not learn as well this way.

For the past two years ResNet has included a couple of very general questions about students' perceptions of classroom technology use on its annual survey. (The survey is given only to students living in campus residence halls and on Greek Court, so results can not be generalized.) The questions changed slightly this past spring to better match questions being asked on other surveys. Results are available at: [http://www.ncsu.edu/resnet/survey\\_data/2004/results\\_04.html#25](http://www.ncsu.edu/resnet/survey_data/2004/results_04.html#25) [http://www.ncsu.edu/resnet/survey\\_data/2005/results\\_05.html#q26](http://www.ncsu.edu/resnet/survey_data/2005/results_05.html#q26) In the 2004 survey, 38% of those who said technology had been used in their classes felt its use enhanced their ability to learn the material a lot, while 51% said it somewhat enhanced their ability to learn. In the 2005 survey, 56% felt they learned better when instructional technology was used in their courses than when it wasn't. Another 33% said

it made no difference, while 4% felt they did not learn as well. The remaining ~8% were either not sure or had not been in courses that used technology in the classroom.

## Usage statistics based on real-time data

All ClassTech rooms have control systems installed that allow staff to remotely manage the status of the equipment via the Internet. One type of system, SP Controls' SmartPanel, provides real-time equipment usage data that were able to be collected in a database and later analyzed. Will Brockelsby, ITD applications analyst programmer, was able to merge this data with Registration & Records course schedule data to, among other things, calculate the actual equipment usage for any class in a room with one of these control systems working. In fall 2004, there were 7 ClassTech rooms where comprehensive data were collected over the course of the semester. In spring 2005, there were 11 rooms for which data were available.

| Average percentage of time used in class during a semester   | Fall 2004 | Spring 2005             |           |
|--|-----------|-------------------------|-----------|
|  | 7 rooms*  | same 7 rooms as in fall | 11 rooms# |
| Any ClassTech Equipment                                      | 40.3%     | 50.0%                   | 42.8%     |
| In-room Computer   | 19.2%     | 29.2%                   | 24.9%     |
| Laptop Connection  | 1.6%      | 1.8%                    | 2.5%      |
| Document Camera  | 18.0%     | 14.5%                   | 12.5%     |
| VCR/DVD Player   | 1.6%      | 4.5%                    | 3.0%      |
| <b>Individual equipment usage as percentage of all usage</b> |           |                         |           |
| In-room Computer   | 47.6%     | 58.4%                   | 58.1%     |
| Laptop Connection  | 3.9%      | 3.6%                    | 5.7%      |
| Document Camera  | 44.7%     | 28.9%                   | 29.2%     |
| VCR/DVD Player   | 3.9%      | 9.1%                    | 7.0%      |

\* Caldwell G109, Dabney 220, Harrelson 100, 107, 210, 233, Winston 20

# Same as above, plus Fox 104, 106, 304, 306

On average, ClassTech equipment was used during 40% percent of all scheduled class periods in the 7 rooms during the fall and 43% of the time in 11 rooms during the spring. The usage rate goes up to 50% of the time a course was in session in the spring when looking only at the same 7 rooms that were included in the fall figures, though when adding the rooms in Fox, the increase is not quite as dramatic.

Confirming the user surveys, the in-room computer was used most frequently of all equipment. In fall it was used an average 48% of the time when equipment was used and 58% of the time in the spring. The document camera was used second most frequently, though its usage fell during the spring semester with the computer and DVD/VCR player picking up its share of usage. The laptop connection was used less frequently. Reviewing

individual courses, with the exception of one course, even in classes where laptop usage was higher, the in-room computer was also used extensively.

Registration & Records scheduling staff have worked diligently to try to assign courses to ClassTech rooms where faculty have specifically requested access to multimedia technology. As more faculty use technology in the classroom, there is increased demand for these spaces. At the same time, usage can be expected to increase among those regularly teaching with technology as they implement creative new uses for the tools. As we continue to gather data and with faculty members' permission, we should be able to compare individual's usage of classroom technology tools over a number of semesters.

## Technical challenges encountered

### **\* Training and support**

ClassTech attempts to make users assigned to the rooms aware of the tools available to them by putting resources online and sending out email before the beginning of the semester. The email explains what technology is available, points them to the ClassTech web site where tutorials are available for using the equipment, and invites them to any of several open house/training events that take place immediately prior to the start of the semester. They are also notified that one-to-one instruction is also available.

One of the challenges has been to get complete instructor data with valid email addresses for all of those assigned to the spaces. Registration and Records relies on the scheduling officers to document who will be teaching the course. In previous semesters this information was often incomplete, making it more difficult to notify the instructor that they would have access to the classroom technology and--equally important--access to training and support.

ClassTech tries to address usability on two fronts. One is to make the tools as easy to use as possible so someone could come in with little or no knowledge about the particular room and be able to use the equipment. The group has strived to provide a consistent interface for users so that faculty will find a very similar environment in every ClassTech room.

The second front has been in providing training and documentation for users. ClassTech staff has prided themselves in providing multiple options for getting training and support. Several open houses are provided before each semester begins. For those faculty teaching in a ClassTech room for the first time who don't attend an open house, staff attempt to meet them either before or after their first class to introduce them to the unit, explain that the equipment is available for their use and that help is available via a variety of methods, including the in-room phones. They also receive an invitation for one-to-one training if they are interested. Even with in-room signage inviting users to call or email for help or training, and with copies of the documentation in the room, several survey respondents complained that they had not been trained on how to use the equipment. Admittedly,

ClassTech has occasionally missed opportunities to train faculty when help was requested. As more classrooms are supported, the ClassTech unit must further refine how appointments for faculty training and support are made and carried out.

### **\* Equipment maintenance**

Providing the level of support and reliability ClassTech strives to maintain has occasionally been a challenge, due in large part to the newness of the project and rapid growth of ClassTech.

According to survey data, two rooms where equipment appeared to fail the most frequently were Poe 216 and Broughton 3216. ClassTech staff is aware of specific issues related to these rooms and this would seem to correlate with service calls logged during the spring semester.

In the case of Poe216, ClassTech inherited responsibility for supporting this room in the fall and some of the equipment, including the projector, was relatively old. The wireless microphone--which is almost imperative to use in this stadium-style auditorium which seats over 200--had frequent issues with not being adjusted properly, dead batteries, and additional hum caused by equipment interference. Staff believe these issues were resolved by the end of the spring semester, but some of the equipment in Poe 216 such as the document camera still is not as functional as what is deployed in the other classrooms.

ClassTech staff have also been working on a series of computer failures that took place in the spring and into the summer. The majority of the problems were reported in classrooms in Fox Hall and some suspect it may be related to overheating due to lack of adequate ventilation in the lecterns. This problem is continuing to be worked on.

There has also been an abnormally high failure rate of document cameras in ClassTech rooms. At least five of the original model (Samsung SDP-900DX) document cameras deployed in the first round of rooms have needed warranty repair service. Last summer a switch to Wolfvision VZ-9 document cameras in rooms being newly outfitted provided faculty with easier-to-use controls and higher quality images, along with the hope of increased reliability. However, four of these units have required warranty service this year. This equipment has a three-year warranty so can be fixed at little cost the university, however, ways to avoid the failures are still being explored.

Staff keep a schedule of routine maintenance in an effort to minimize downtime. Each week equipment is tested in the rooms to make sure it is fully functional. Filters on the data projectors are also cleaned on a regular basis. A pattern of lamp overheating appeared in several rooms this year that indicated greater than normal levels of dust were clogging the filters. As a result, filters are cleaned every-other week during the semester in these classrooms.

ClassTech has added staff to help maintain and support the ClassTech rooms. Staff are working this summer to put into place processes that improve the uptime of the classroom

technology so faculty can rely on it. Other processes, such as automatic mailing lists based on who is teaching in a specific room, are being developed to notify faculty when there is a problem with a piece of equipment in a room.

One comment that has been consistently received in each of the ClassTech surveys has been the difficulty of playing back videotapes and DVDs. The original rooms had VCR players and computers with DVD-ROM drives. While not the most frequently used piece of equipment, DVD/VCR units have been installed with easier-to-use VCR controls as a result of user feedback. However, this still did not provide adequate DVD menu navigation in rooms with SmartPanel push-button control systems. In response, this summer all new and existing ClassTech rooms with SmartPanel controls received a module that provides easy desktop access to control DVD and VCR functions. ClassTech staff will monitor use of this control interface to see if it better meets users' needs.

Basic analysis of the ease of use survey question has found little or no difference in preference for the push-button versus touch-panel control systems. Because of decreasing variation in cost and the increased functionality of the touch-panel type controls, ClassTech will likely be encouraging adoption of the touch panels as a university standard.

In each of the surveys faculty have also asked for wireless mice and laser pointers to make it easier to move around the classroom and highlight objects on the screen. Since this spring, most new room installations now include wireless keyboards and mice. Time will determine whether they will be practical to support and how long the untethered devices will remain in the classrooms. Thus far, none have been stolen. Laser pointers will not likely be provided as part of the classroom package, but faculty can certainly bring in their own devices.

ClassTech has strived to capitalize on existing campus resources. This is seen most clearly within the Information Technology Division where ClassTech relies on the NC State Help Desk to provide frontline support and has utilized and grown staffing resources used by Computing Services' Unity lab support and ResNet units. A tremendous amount of consulting and conferring with existing departmental and college support units has proven mutually beneficial. Departmental support staff have been instrumental in helping evaluate and modify classroom technology standards and will assist in creating support guidelines. ClassTech staff have provided design, purchasing and support guidance for at least 20 different units on campus in the past year. ClassTech staff also work extensively with Facilities in the planning, implementation and support of new and existing classrooms.

## Number of students and faculty members engaged in the project

In the spring there were a total of 425 sections assigned to ClassTech rooms (including cross-listed sections). These were taught by more than 245 different faculty members. Last fall there were 217 course sections taught by at least 125 instructors. We don't have

a count of how many students were in each section. ClassTech rooms range in size from 25 to 509 seats. This spring 470 students completed surveys in 10 different classes. Karen St. Clair interviewed faculty from seven of those classes and Stan North Martin interviewed one additional faculty member.

## Publications and presentations about the project

Karen St. Clair and Stan North Martin led workshops at the 2005 UNC Teaching and Learning with Technology Conference and the 3rd Annual NC State Undergraduate Assessment Symposium. The sessions were both titled “Student Learning when Teaching with Technology: Aligning Objectives, Methods, and Assessments”. See <http://www.ncsu.edu/classtech/workshops/unclt2005/> and <http://www.ncsu.edu/classtech/workshops/ugassess2005/> for more information.

Karen St. Clair conducted a literature review as part of the research for the ClassTech assessment. While it is not meant for citation, the paper was made available to the workshop participants. It is also available online at: [http://www.ncsu.edu/classtech/workshops/tlt\\_lit\\_review.pdf](http://www.ncsu.edu/classtech/workshops/tlt_lit_review.pdf)

## Conclusions

Faculty and students alike appreciate having classroom technology available. While it is currently--and likely will continue to be--difficult to definitively say that the basic technology in ClassTech rooms directly improves teaching and learning, it is safe to say that having it there does improve *opportunities for* more effective teaching and learning.

There is no evidence from the surveys or interviews that course or program outcomes changed as a result of the availability of these basic technology tools. In the experience of the researchers, most faculty do not think about their courses in terms of learning outcomes. Even in cases where they do, it is not the tools that drive the learning outcomes, but more often the methods used to achieve those outcomes. Most of these methods can be achieved without the availability of electronic technology but some are easier to achieve or may be enhanced through the use of technology.

A factor for many faculty who use classroom technology is the efficiency that it can bring, particularly in larger sections. While it may take time initially to prepare class materials in electronic format, they can more easily be shared and re-used in subsequent semesters. A number of faculty reported making their notes available online before class. Students can print them out if they choose and annotate them as opposed to having to write everything down during the class.

Another example of efficiency the technology provided was the ease with which relevant material could be brought to bear on the topic at hand. Several faculty commented about being able to readily bring up pertinent examples online or demonstrate a principle to

illustrate a point or more thoroughly answer a question. For example, "...[I]n this graduate second language acquisition class we were discussing student use of their second language in chat rooms. I was able to open a chat that was occurring in one of my undergraduate classes and we discussed things that were happening in the chat in real time."

It is clear that most faculty prefer to use the computer provided in the classroom rather than bring in their own laptop. The data do not indicate how many have access to a laptop but choose to use the in-room computer. The comments would indicate that many appreciate the convenience of being able to call up their notes and other material over the network without having to bring in their own equipment.

For some faculty who have used multimedia equipment in non-equipped classrooms, a significant convenience for them relates simply to having the technology installed in the room. "[It] made class run very smoothly and allowed me to cover things I was unable to in the past because it was too inconvenient to access necessary equipment or it wasn't available."

Demand among faculty is strong for classrooms with basic instructional technology installed such as those provided by ClassTech. Registration and Records staff continue to be challenged to find rooms with technology for faculty requesting them. According to Catherine Freeman, university scheduling officer, as more faculty discover ClassTech rooms, more are requesting to be assigned to these spaces.

Use of computers has become ubiquitous outside of the classroom. It should come as no surprise then that more and more faculty will choose to use them in class and more students expect their instructors to make use of the technology. However, because demand continues to grow and resources are limited, the university needs to make sure those assigned to rooms with technology plan to make use of it. That is one of the many aspects being explored by the Classroom Improvement Task Force.

While there is not much evidence the in-room technology significantly changes assignments students are given, there were several cases provided where it did. In some instances this had to do with students making use of the technology to do in-class presentations or demonstrate their knowledge of the concept by demonstrating or hypothesizing how a simulation might turn out. In other cases, it related to the ability of faculty to illustrate expectations concerning assignments carried on outside of the classroom either by demonstrating the methodology for carrying out experiments or completing assignments online, or by showing how to use course-specific software. In at least one case it was through illustrating the type and quality of resources students were expected to use for their research. As a result, the expectations for the quality of the student assignment may have increased.

While not specifically asked on the survey, based on written comments and through the interviews where the question was asked, we can conclude the availability of the basic in-room technology did not significantly change how students were assessed. Faculty may

have been able to demonstrate what was expected of students in their use of technology for assignments outside of class, but only in a couple of cases did it directly impact the way assessment exercises were carried out. While not a standard part of ClassTech rooms, there is growing interest in some areas to use classroom response systems, aka “clickers”. PAMS has adopted these in both Physics and Chemistry. ClassTech has helped to evaluate these devices; however, to date there does not appear to be interest in a unified campus solution. (See <http://www.ncsu.edu/classtech/clickers/> .)

Students generally felt technology-enabled instruction enhanced their ability to learn. However, when asked about more specific teaching tools such as in the UPA student surveys, students were less likely to say they learned better using these tools.

While very difficult to test empirically, faculty and student *perceptions* indicate that the use of the technology in the classroom positively impacted student learning through:

- increased involvement of students,
- the ability to cover material in greater depth,
- the opportunity to better accommodate students’ learning styles, and
- increased ability to visualize the concepts being taught.

With the increasing ubiquity of and demand for multimedia technology, in many ways asking whether classroom technology improves teaching and learning (presumably compared to more traditional technology such as chalkboards, wall maps and record players) is a little like asking whether teaching and learning are improved more through the use of electric light fixtures or gas lamps. Both are a means to an end. The technology is merely the tool. Depending on the situation, some tools are easier to use, more effective in accomplishing the desired result, or allow the ends to be reached more efficiently.

Ideally, the technology becomes invisible to the process of teaching and learning. Effective pedagogy must drive the implementation of technology tools, not vice versa.

### **\* Future of the project**

The existing data can be mined more thoroughly than has been reported here. ClassTech will continue to survey users of ClassTech rooms at least once a year to make sure the rooms are meeting faculty needs. Real-time usage statistics will be gathered from a greater percentage of classrooms to capture these details as back-end technology is enhanced in the classrooms with touch-panel interfaces. Standards for support and maintenance will be put into place and continually refined in consultation with other units on campus. ClassTech will also be working with Registration and Records to develop ways to track the demand for and availability of rooms with built-in instructional technology. The continuing work of the Classroom Improvement Task Force will have an impact on the future of ClassTech projects.

The LITRE ClassTech research team has been reshaped with Brad Mehlenbacher coming on board. Joni Spurlin’s involvement with the research projects has and will continue to

be instrumental in the ongoing studies. One of the plans is to work specifically with several faculty members who are interested in doing more in-depth research into how using technology in the classroom has altered their teaching and their students' learning. These and further plans are being developed this summer with the reconstituted group.