Assessment of the LINK Teaching and Learning Center in Perkins Library

Executive Summary
After an intensive planning, design and construction process, the LINK in Perkins Library opened as scheduled in August 2008. The vision and the design principles of the project (pg. 3) dictated, in brief, that the space should consist of:

- Excellent teaching environments
- Flexibility in furniture, infrastructure and technologies
- Support for diverse disciplines, learning styles, pedagogies
- Experimentation to inform the development of learning environments at Duke

Based on data gathered from multiple sources including student and faculty web surveys, systematic observations, analysis of service records, and staff and faculty discussions, several factors have defined the success of this ambitious project.

Elements of the Link's success

• Architecture and design concept Students and faculty typically singled out these aspects when asked what they liked best about the space. The modern design and aesthetics were almost universally well received.	
• Location The convenient and central West Campus academic quad location as well as proximity to library resources and services were cited as key features by both students and faculty.	
• Co-location of formal and informal learning spaces and flexible classroom features Although not without challenges, the clustering of classrooms, group study and common study space has been viewed as a success by faculty and students. The permeable boundary between the classrooms and study spaces has resulted in tangible benefits to teaching and learning experiences.	
• Convenient access to technology, services and support Classroom support was a significant advantage to faculty teaching in the space. Availability of equipment for checkout at the Service Desk was also praised by both faculty and students.	

Current challenges and future needs

The initial success of the LINK has created a strong foundation for future growth. However, the remainder of this academic year will be a critical time. In Spring 2009, all elements of the space should become fully operational. Use of the space for scheduled classes will also be increased, and demand for other types of use is rising and is expected to be greater than in Fall 2008. Meeting the needs of scheduled classes, accommodating ad hoc use, determining priorities for access, and ensuring continued excellence of the technology and facilities will be an increasing challenge. Specific challenges for the remainder of this academic year and beyond include:

1. Ensure that academic use remains the top priority while also accommodating some important non-academic uses and special events.
2. Provide a technology infrastructure that supports high-end users without compromising support, ease of use and reliability for baseline users.
3. Engage more faculty and courses in experiments with promising pedagogies and classroom technologies, especially those already available in the Link.
4. Develop a seamless, proactive support structure that can scale to support increased use and high levels of Service Desk traffic.
5. Improve communication and outreach about the Link's policies and features.
6. Collaborate with students to identify feasible ways to prioritize group use of group study spaces.
7. Ensure that lessons learned continue to be captured and shared broadly for the benefit of all stakeholders, including the broader higher education community.

Contents of this Report

Assessment Committee

Ed Gomes, *Arts & Sciences* (Chair)

Yvonne Belanger, *Center for Instructional Technology*

Jean Ferguson, *Perkins Library*

Erin Nettifee, *Office of Information Technology*

Pat Hull, *Office of Institutional Research*

Cathy Carter, *Arts & Sciences Facilities*

Caroline Bruzelius, *Art, Art History & Visual Studies*

Rick Hoyle, *Psychology & Neuroscience*

Pravad Khasibalta, *Nicholas School of the Environment*

Deborah Reisinger, *Romance Studies*

I. Evolution of the LINK

For the past four years, Duke University has been intensively engaged in a classroom modernization initiative. The LINK project has been significantly influenced by several recently renovated prototype spaces at Duke as well as larger trends in higher education toward building collaborative flexible learning spaces.

Building upon the work of an Ad Hoc Committee on Classrooms (2004), Provost Lange proposed the creation of a space based on the Teaching and Learning Center concept. The vision included technology-enhanced classrooms, group study spaces, informal learning spaces and on-site support that would promote effective teaching and learning, including collaborative work and project-based learning activities. The evolution of learning space planning at Duke was furthered by a statement of Guiding Principles for Teaching and Learning spaces adopted by the Academic Space Planning Working Group in 2006 as well as lessons learned from renovated and prototype classrooms.

Pedagogically, learning is most effective when it is active, problem-based, and collaborative…. We must provide up-to-date conventional classrooms and seminar rooms that facilitate interaction as well as dynamic spaces…that facilitate collaborative discovery and learning processes…

Excerpt from "Guiding Principles for Teaching and Learning Spaces," Academic Space Planning Working Group, December 2006

The LINK was built to create a next generation dynamic academic space to support student and faculty learning, teaching, and collaboration. Three principles guided the design of the space:

1. All learning spaces should be fundamentally excellent teaching environments with: appropriate square footage/seat, good sightlines and acoustics, pleasant aesthetics, transparency, as well as lighting and control systems

2. Spaces should maximize flexibility with respect to furniture systems, teaching walls configuration, infrastructure for power, data, and information technology as well as audio visual systems.

3. Spaces should support a range of learning and teaching styles and pedagogies. The environments should allow for experimentation and the findings should be captured to inform other learning environments on campus.

Within this framework, an intensive planning, design and construction process took place under the leadership of Bob Thompson, Tracy Futhey, Jim Roberts, and Ron Djuren. A large planning committee led by Ed Gomes worked with architects from SBRA and technology consultants from Vantage to combine the expertise of IT staff, instructional technologists, and librarians with lessons learned from prototype spaces as well as pedagogical needs voiced by Duke faculty. Final decisions were guided by reflecting on the needs of a broad range of courses, including specific examples of technologically-intensive courses that could be uniquely supported in the LINK.

The final result consists of:

LINK images are available via Flickr
http://www.flickr.com/photos/31061388@N04

- Six classrooms: 4 with room for 20-30, 1 seating 40, and 1 seating 50

- Four seminar rooms (15-20 seats)
- Eleven group study rooms (6-12 seats)
- Informal spaces for collaboration, individual work and kiosk-style computing
- A Service Desk that provides student, staff and faculty IT support and classroom support, as well as being the circulation point for equipment distributed by the Duke Digital Initiative

LINK is governed by a "Core Services" team led by Ed Gomes which includes representatives from A&SIST, OIT and CIT. This team handles operational issues, processes requests and develops new policies as needed. Requests for semester and ad-hoc use of LINK classrooms are reviewed by this committee prior to scheduling by the registrar or student services office to identify the most appropriate space and ensure that support needs can be met.

II. Assessment of the LINK

This project represents an important opportunity for evaluation and assessment to guide the many decisions that lie ahead in renovating existing space and developing entirely new learning spaces at Duke. The original vision of the Link dictates that it should be not only an excellent teaching space but also a place for experimentation and a source of best practices for overall academic space planning. Therefore, significant attention has been paid to gathering data about the use of the space and the overall implementation of the project's vision.

A LINK assessment committee was convened by Ed Gomes, Dean of A&S IT, to guide the assessment of the project. An initial assessment plan was developed by Yvonne Belanger and reviewed by key stakeholders including the members of the assessment committee and senior leadership (Appendix C). This plan outlined 5 areas to be addressed by the assessment:

1. Confirm that the space planning principles used in designing this space meet the needs and expectations of faculty and students and provide concrete recommendations for future academic space planning
2. Determine whether the service model, staffing, and equipment at the Service Desk meets the needs of formal and informal use of the facility
3. Assess policies developed by the TLC Core Planning Group and Service Team and recommend necessary changes
4. Capture and describe examples of innovative teaching and collaborative, authentic learning experiences
5. Determine the operational costs associate with managing services, technology and facilities in the Link.

Many stakeholder groups were actively engaged in the planning process as well as the implementation of the assessment activities. Efforts to identify a student willing to serve on the committee were unsuccessful; however, students enrolled in courses scheduled in the Link were consulted at several points, including pilot testing of the student survey. Students also participated directly in the assessment, assisting in gathering observational data about LINK use.

Findings contained in this report are based on the following sources of data:

- Observations of classes, informal use and special events. One intensive observation period consisted of hourly observations of all areas for one typical week on level and type of use of all spaces.
- Responses to a survey of all faculty teaching in the Link (response rate=62%) and to all students with at least one course scheduled in the Link (response rate=29%)
- In-depth conversations with faculty, including participants in the CIT Faculty Fellows group and Assessment group as well as other faculty teaching in the LINK.
- Debriefings with OIT, CIT & A&SIST staff and librarians on a variety of topics including a review of classroom technology use, problems encountered, support challenges, barriers to faculty use, impact on library operations, and a review of costs incurred by academic and administrative units outside of the project budget to support LINK operations.
- Reviews of operational records including: Service Desk visits; requests to linksupport email account; submissions via the link.duke.edu web form; reservation records in R25 (including ad hoc use); and other records and observations maintained by CIT, OIT and A&SIST staff throughout the semester.

III. Detailed findings

A. Overall reactions to the project

A majority of faculty and student survey respondents responded affirmatively when asked if Duke should consider replicating the LINK concept of clustering classrooms, study space, technology and services elsewhere on campus.

Faculty and student ratings and comments indicated high levels of satisfaction with the design and aesthetic. Faculty and students tended to single out architectural and design characteristics as the best features of LINK, including the colors, lighting (including natural light), glass walls, and comfortable furnishings. Given the location of the LINK in Perkins lower level and resulting ceiling height limitations, it is worth noting that the space was frequently described by faculty and students and "bright", "open", and "airy".

Students and faculty frequently praised the whiteboards and glass walls as conducive to an atmosphere of learning and collaboration. Many student and faculty comments cited the positive impact of the large installed whiteboards and the mobile whiteboards. Students frequently used the glass walls for 'vertical study'. Two types of blinds (solar and opaque) were available for use

> **Sample responses to, "What do you like best about the Link? "**
>
> "...the openness and spaciousness of the classroom, the wonderful big screen at the front of the class, the glass walls, the whiteboard wall, the comfortable chairs." – Faculty
>
> "The classrooms are amazing! As a freshman, I absolutely loved my first day of Duke classes in the Link. The furniture, the architecture, and the technology all make me feel like a real student." – Student
>
> "The whiteboard walls, the technology available in the classrooms, and the location. You can go from class directly into studying." -Student
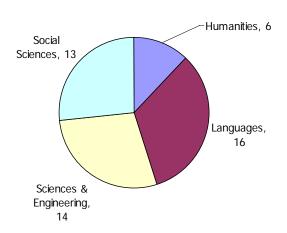
as needed. These blinds were used by faculty on occasion, but in most cases class activity remained visible from the common areas. The whiteboard surfaces initially installed did not withstand the intensity of use and were replaced in December 2008. The new surfaces offer more durability as well as the additional advantage of a matte (rather than glossy) surface, which produces less glare when faculty project and annotate directly on the whiteboard surface. The chart below summarizes and compares the features of the Link (in rank order) most praised by faculty and students, based on the faculty and student surveys.

What do you like best about the Link?

Rank	Students	Instructors
1	ambiance	ambiance
2	technology	help desk
3	furniture	whiteboard walls
4	study space	technology
5	group study rooms	location
6	whiteboard walls	spaciousness

The LINK attracted courses and faculty from a broad range of discipline areas.

In Fall 2008, 49 class sections were scheduled in the LINK. Nearly all of these classes were scheduled in the space by departmental request. These classes represented all discipline areas (see chart, right). In all, 677 students and 39 faculty met in semester-long scheduled courses in the LINK. Twelve additional courses met in the Link for at least one class session during the semester. Finally, over 400 students in groups affiliated with 60 other courses not regularly scheduled in the LINK across a wide range of disciplines reserved space for study sessions and group projects.

Class Sections by Discipline Area

Humanities, 6
Social Sciences, 13
Languages, 16
Sciences & Engineering, 14

B. Formal learning spaces

Feedback on the various features of the Link classrooms was generally very positive. Most respondents report that the furniture is comfortable, the acoustics and lighting are good, they like the décor and the use of glass walls, and they find the rooms are clean and orderly when they arrive. Most students and instructors rate their Link classroom as one of the best classrooms at Duke, which is a higher percentage than was found when the same question was asked in recent surveys of other newly renovated classrooms. The most flexible spaces in the LINK (Classrooms 3-5) received the highest ratings from students. Classroom 6 and Seminars 1-3 were rated by a majority of students as above average but not outstanding; faculty tended to be more satisfied with these less flexible spaces than the students were.

One key to higher ratings for Link classrooms than other newly renovated classrooms may be their spaciousness. In a Fall 2007 survey of 15 new and renovated classrooms, one of the frequent comments from students and faculty was that the room was too crowded with furniture and 24% of respondents reported that the room felt cramped. As a result, the classrooms that were renovated in 2008 as prototypes of a new design were decompressed, and in the follow-up survey, the percent of respondents in 2008 who reported that the room felt cramped was reduced to 12%. For the Link classrooms, however, only 7% of respondents feel that the classroom is cramped. Comparison of the square feet per seat in the Link versus other classrooms with 20-25 total seats confirms a significant difference in the actual spaciousness of the Link classrooms ("Average Sq. Ft per Seat", right).

Average Sq. Ft. per seat 20-25 Seat Classrooms		
Link	2008 Prototypes	All other A&S and Pratt rooms
36	27	22

Scheduling for semester-long classes (particularly for Fall 2008) was kept lower than typical classroom utilization to permit ad hoc scheduling and one-time events as well as time to resolve any technical issues ("Room Utilization", right). With chairs-only furnishings and a 50-seat capacity, Classroom 2 was reserved for ad hoc scheduling. Utilization for Spring 2009 is still lower than the average across Arts & Sciences; however, requests for ad hoc use has steadily increased since the opening of the space.

Room Utilization (semester-long courses)	F08	S09
Classroom 1	23%	63%
Classroom 2	0%	0%
Classroom 3	33%	67%
Classroom 4	40%	60%
Classroom 5	37%	47%
Classroom 6	30%	50%
Seminar 1	50%	33%
Seminar 2	3%	27%
Seminar 3	27%	30%
Seminar 4	33%	50%

Evidence indicates that in many cases courses were positively transformed by their location in this facility. The table below summarizes the capabilities of these classrooms along with brief findings based on the experiences of students and faculty. Also, four case studies of courses in the LINK following the table provide further illustration of the early experiences of faculty and students in this facility.

The Link supports…	Early findings in Fall 2008
Groups with breakout sessions Combine presentations or classroom work with small group activities or break-out groups.	Many courses took advantage of group study space as well as the opportunity to send students out into common spaces for collaborative learning activities.
Video capture and real-time playback Combine large and small group work and capture video for immediate review.	The NetStreams video system intended support this capability was not fully ready in Fall 2008; courses which had planned to try it were provided with alternate support or these faculty modified their plans. Work on this system continues, but significant challenges remain in integrating this system with other installed A/V in this room.

The Link supports…	Early findings in Fall 2008
Classroom videoconferencing Connect with an individual in a remote location via video conferencing. Presentations incorporating multiple projections	PolyCom systems were used in 2 courses, including one which used videoconferencing in every class session and another which held only one videoconference. Use also included student job interviews, dissertation defenses, and some administrative use. Adobe Connect was also used; the web-based nature of this system was more suitable for some types of remote connections.
Presentations involving multiple projections Compare and contrast two to three different visual sources during your presentation.	The level of interest and demand for this functionality was greater than anticipated. Only one space (Classroom 5) currently supports this; several classes found this feature highly beneficial. Mobile projectors and laptops could be used to expand this capability to other rooms in the short term.
Projections from multiple classroom computers Project work from many computers on multiple surfaces.	This feature has not been fully implemented. Currently students must connect their computer to the A/V system via a wired connection, and some faculty who tried this reported that students were not always able to project from their machines. Installed equipment supports wireless projection and faculty have expressed an interest in trying this, but the capability has yet to be tested in classes.
Interaction with large data files and data sets Use specialized software to manipulate, analyze, and visualize large data sets	Several courses downloaded large data files or used applications requiring high-bandwidth connections. Faculty and students used wireless connections when using mobile equipment; wired connections were only provided for installed desktop computers. Wireless connections were adequate for the majority of class activities, but some students and faculty encountered network issues that occasionally impaired class activities. OIT and A&S continue to investigate the best way to provide reliable high-bandwidth connections in the LINK.
Fixed-lab computers for instruction Use high-performance desktop computers in a fixed lab setting, or get individual access to GIS, Matlab, multimedia or other computing-intensive instructional activities.	With the 25 high-powered desktop computing stations in C6, students in a range of disciplines used specialized software for coursework, both during as well as outside of class time.

The Link supports…	Early findings in Fall 2008
Flexible classroom configuration Alternate between lectures and small group work in the same classroom by rearranging the lightweight furniture during class.	Courses frequently made use of the flexible furnishings to accommodate diverse teaching and learning styles, particularly in C3 and C4. In addition, the large whiteboards were frequently credited with improving the teaching and learning possibilities of the space. In general, the lightweight furnishings used in the classroom was preferred by most faculty to the heavier tables in Seminar rooms. Several faculty confirmed that a complete reconfiguration of a classroom could be accomplished in a few minutes. Furnishings were not reset into any one standard configuration; rather than a source of complaint, in at least one case a faculty member reported experimenting with a successful new room configuration because of how the previous class arranged the tables.
Simultaneous meetings of multiple sections Reserve multiple Link classrooms at once to enable different course sections to meet both together and separately during the same time block.	Semester-long classes as well as one-time special academic events took advantage of the close proximity of multiple learning spaces. Bruzelius' Gothic Cathedrals course (p. 10) benefited from the use of multiple rooms, as did several special events in Fall 2008 including: - The Virtual Peace Project simulation exercise - Led by Rochelle Schwartz-Bloom, CHEM 23 students conducted an experiment simultaneously testing visualization software tools in the DiVE and the LINK - Students in Brad Fox's Project Management course (EGRMGT 260) roller coaster construction activity

C. Case Studies of Fall 2008 LINK courses

Below are four case studies of Fall 2008 LINK courses which provide illustration of the capabilities of the LINK as described above.

Case 1: Enhancing group collaboration with flexible spaces and video
Teaching foreign languages (Liliana Paredes)

The LINK provided opportunities for students to enhance teamwork, materials production and evaluation within the classroom. Using portable digital Flip cameras, students captured discussions on topics such as oral feedback in the classroom. Using the flexible space features such as breakout groups and whiteboards provided opportunities for students to brainstorm and share work, such as their developing portfolios and teaching philosophies.
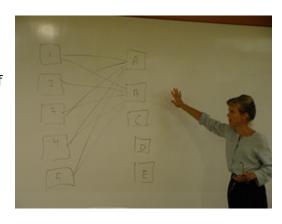
"What I really found useful at the Link were the breakout rooms…. I've used them in almost every single class and have been able to enhance group work." – Liliana Paredes

Case 2: Promoting student engagement in a non-major science course
Biology of Aging (Alison Hill)

In addition to traditional lecturing and projection of PowerPoint presentations, Alison Hill took advantage of the flexibility offered in the LINK to create a more interactive mid-size course. The common spaces and larger classroom format enabled small breakout groups of students to work collaboratively on problems and data analysis and to discuss the ethical/social implications of aging research. The projection capability enabled groups to display findings for classroom presentations. Finally, the equipment also enabled students to engage in simulation activities, filming/recording of role-playing in town-hall forums and/ or congressional hearings. "I was very pleased with how my Biology of Aging class went

this semester in the Link. One of my goals was to be able to offer the "intimacy" of a seminar-style class to a larger group…. The combination of both holding my class in the Link and participating in CIT's Flexible Learning Spaces Fellowship program encouraged me to break-out of the traditional lecturing mode of teaching by incorporating small-group work and "jig-saw" activities into my classes. There were multiple times this semester that I was delighted (and amazed) by the level of engagement and enthusiasm that I observed in my students as they pieced together complex concepts during jig-saw activities or discussed ethical/ policy issues in small group work." As a result of her efforts, Hill observed greater student engagement. "When we reconvened for a wrap-up and summary at the end of the class time, the students appeared to be far more invested in the topic than I typically see at the end of a standard lecture."

Case 3: Promoting interaction in the student-centered language classroom
French 100S: Cultural and Literary Perspectives (Deb Reisinger)

The combination of flexible learning space, on-site equipment check-out, and support for technology integration promoted a more student-centered and collaborative learning experience in French 100S. Using wikis, students worked collaboratively over the course of the semester during class breakout sessions. On-site check-out of portable technology such as laptops, Flip video

cameras and headsets promoted more technology use; technology training for course assignments was provided in their regular classroom, avoiding the need to relocate the class to a training lab. Reisinger used installed A/V equipment to show video and project images in addition to writing on the whiteboards. Student presentations were enhanced by easier student access to technology including video and use of the installed classroom computer. Using installed projectors, students could also share the results of group collaborations from laptops. Multiple whiteboards made classroom learning more student-centered. Groups were better able to better demonstrate their analysis by mapping out and displaying their work on the whiteboards.

"More or less a typical day"

"…we began class by identifying projected images on one of the room's white boards (paintings, literary titles, photos). Students then broke into small groups to generate lists of well-known French intellectuals on the board; follow up discussion included the collective creation of a definition of an intellectual.
We then returned to our seminar table (shaped like a pentagon today, which they seemed to like) and we related how their definition matched that put forth by the author of the article they had prepared, called "The Death of French Culture."
Students then worked in pairs to briefly summarize the article's arguments, accessing the article on their laptops. In a follow-up discussion, a student secretary listed pair findings on the board, and we closed with a whole group debate about the article's conclusions. It was more or less a typical day, but shows how the classroom facilitates this type of classroom dynamic: it's easy to get students writing as groups on multiple boards, to move from groups to seminar-type and back again, and to blend technology into traditional forms of classroom discussions."
- *Deb Reisinger, Romance Studies*

Case 4: A collaborative approach to bringing art history to life
Gothic Cathedrals (Caroline Bruzelius)

In this popular and innovative course, three-member teams design, decorate and write a fictional narrative for a medieval cathedral. Previously, AutoCAD software used by the class was only available in a computer lab in a separate building from the rest of the class. The opening of the Link and the close proximity of its computer classroom to other nearby classroom spaces removed this barrier to collaboration. The co-location of different types of learning spaces made it possible for some students receive AutoCAD software training while others meet simultaneously in a separate room to work on other aspects of the project. According to Bruzelius, "Getting the different members of the group close together and working like a team has been a long-term dream for this course." One particular challenge in delivering this course is the amount of TA time required to provide training and support on AutoCAD software. Bruzelius is experimenting with Camtasia screen video capture program to record the software training. The hope is that these recordings might be used as a resource for future classes.

Taking advantage of breakout rooms and projection

"I can be talking to one group in one room, while other groups can be working in the other rooms…Suppose one group has a problem that I know others are struggling with. If I want to talk to the whole group, I can put myself on camera, broadcast it into the other rooms and say, 'Let's all think about this particular problem.' "

Another advantage: easy accessibility of reference librarians and library resources such as geological maps. "Being in the library for this project is being at the nerve center of the knowledge they need to have," Bruzelius says.

- Caroline Bruzelius

Professor Bruzelius' has posted reflections on her LINK experience along with samples of student work in a series of CIT blog posts (Part 1, Part 2, Part 3)

D. Informal learning spaces

The LINK is clearly a desirable and flexible study environment and a popular destination for students. A majority of students who come to the LINK to study bring their personal laptops, and students show a preference for spaces with tables that enable them to spread out. During evenings when few classes are scheduled, students often turn formal learning spaces into informal ones. In Classrooms 3 and 4, for example, students often arrange the furnishings to support multiple study groups within the same space and make extensive use of whiteboards and, to a lesser extent, the A/V equipment in the rooms. Student comments on the survey about the comfort and flexibility of the space were almost uniformly positive, with the purple tongue chairs and whiteboards singled out most frequently.

During a typical mid-semester week observations show that 2/3 of LINK occupants, typically between 50-100 students on Sunday-Thursday evenings, can be found using the group study rooms and common areas. The most common complaint voiced by students was that group study rooms are frequently all occupied. Observation confirms that by early
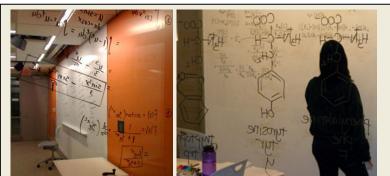
"You can adapt the Link to fit your studying needs- lots of movable furniture and ample study space."

"I use the computer cluster in between classes because of the convenient location and the desks have enough space for me to spread out my materials. The location has a general atmosphere conducive to working."

afternoon these rooms are frequently all occupied and remain so throughout the evening. Students voiced particular frustration at the phenomenon of individuals monopolizing spaces intended for groups and many students used the survey as an opportunity to suggest possible strategies to prioritize the use of group study spaces by groups rather than individuals.

Mobile whiteboards provide not only writing surfaces but also as portable walls.

It's a great working environment, the lights are bright and keep you up, and the white boards and writeable walls are amazing. -Student survey comment

E. Technology in the LINK

Technology plays a variety of roles in the activities of the LINK. As outlined above, technology is available in formal learning spaces and Faculty and students alike remarked on the convenient access to workstations for use between classes and equipment for checkout. Currently, the LINK can provide up to 40 tablet PCs and 20 MacBooks for classroom use. Some experimental mobile equipment is also available including a Mimeo whiteboard capture device, a portable digital whiteboard, and the student response system ("PRS") maintained by Arts & Sciences. A large pool of multimedia loaner equipment supported by the Duke Digital Initiative is circulated from the Service Desk and includes 100 Flip video cameras, 100 web cameras, 100 mini-DV tape video kits, 10 hard drive video kits, 5 high definition video kits, 50 microphone headsets, and 200 5th generation video iPods. The Service Desk processed over 600 loans of multimedia equipment in Fall 2008. Plans for Spring 2009 include relocating one of the Echo 360 (formerly Lectopia) devices into the space in response to some requests from faculty for lecture capture.

Additional technology in the non-formal learning spaces offered students options for both individual and collaborative work environments. Two separate locations provide informal group study spaces, with large flat panel displays that can be driven by laptops or other multimedia devices. The Link also provides 12 dual boot (Window and Mac OS) iMac computers with productivity software tools (word processing, spreadsheet, web editing, mathematics) as well as multiple ePrint release stations.

F. The LINK Service Desk and Faculty Support

The OIT Service Desk (formerly known as OIT Help Desk) was relocated to the LINK in August 2008. This move included establishing the public service point by relocating

staff formerly housed in the Bryan Center. Also, the OIT staff position responsible for managing the SWAT students was assigned the additional duties of coordinating LINK services and was moved from ATC to the LINK. Two staff from Arts & Sciences are now based in the LINK. Governance of the Link primarily consists of a Link Services Team led by Ed Gomes that includes representation from OIT & CIT. This group manages operational issues; due to the unique nature of the facility, this group also reviews all requests for use of the space.

In general, the Service Desk succeeded in meeting faculty and student requests and expectations. Three-quarters of faculty survey respondents were satisfied with technical support (43% very/33% somewhat); a larger number (83%) reported being satisfied with customer service provided by the Service Desk (46% very / 38% somewhat). Walk-in traffic to the Service Desk increased substantially with nearly 9000 cardswipes at the Service Desk, a 68% increase over the same period in Fall 2007.

One source of increased traffic to the desk has been the expanded equipment loaner pool program provided by the 2008-09 Duke Digital Initiative.

> *Faculty comments on tech support*
>
> *"It's nice to have OIT available and accessible right where you need them and not have to wait."*
>
> *"…it is exciting to move into digital teaching and learning---without handy help it would be slower and I would less likely try out new things."*
>
> *"Although I have experienced continual problems with the classroom [3] technology, the Link staff has been immediately available to address (if not solve) the problems."*

Communication, outreach and marketing about the space and its capabilities has not yet succeeded in achieving adequate levels of awareness about services and policies. In survey responses and conversations, faculty, students and staff expressed low awareness of services available, confusion over policies, and a desire for more readily available information about the LINK. Multiple means do exist for contacting LINK staff for assistance (email, web form, and walk-up). Traffic through these channels was substantial – for example, 416 requests were submitted via web forms. However, most of these means are only publicized via the new (and not well known) link.duke.edu web site, and several faculty and administrators expressed frustration during the assessment about the inability to telephone the service desk directly. Some expressed confusion over whom to contact and how to get information. Neither the web form nor email has yet been linked to a ticket system, making it difficult for staff to ensure that each question received a timely response (and also did not receive multiple responses).

IV. Current challenges and future needs

By several measures, LINK has succeeded in raising the bar for the quality of learning environments at Duke. The experimental and innovative nature of the space will continue to require a higher level of support and attention than other spaces distributed across campus.

In the faculty and student survey, when asked what suggestions they had for Improving the Link, the most frequently cited suggestions include:

- More group study rooms
- Reservation system for group study rooms
- More "tongue chairs"
- More booth seating with tables
- Ensure availability of whiteboard markers and erasers
- Vending machines or other food options, especially when Perk is closed

Improved cell phone signal coverage was also suggested; however, the survey was conducted prior to recently completed improvements over Winter break. A reservation system for group study rooms was also implemented mid-semester; the frequency of this request on the survey seems to indicate that many students were still unaware of this service by the end of the semester. In addition to considering ways other student suggestions might be addressed, several areas were identified by the Link assessment team for close monitoring as the level and intensity of use increases and faculty and students continue to explore the potential of the facility.

1. Prioritize academic use to meet teaching and learning needs.
LINK is first and foremost a teaching and learning facility. Ensuring that the 10 classrooms and seminar rooms are well-equipped, clean and ready for scheduled classes involves collaboration among many individuals. Academic use of the space is a clear priority. However, the attractiveness and unique features of the space have already created a demand for not only a wide range of academic uses but also co-curricular activities, administrative use and special events. High levels of interest in have resulted in hundreds of individuals and groups touring the space, which some students and faculty find distracting. Academic departments and student groups have submitted requests to use LINK for administrative meetings; this demand appears to be driven by a scarcity of comfortable, technology-equipped meeting space. Many of these requests have been denied in order to prioritize academic use. Accommodating special events without compromising support for regular classes may become an increasing challenge.

2. Ensure that the Link's infrastructure supports high-end users of technology without compromising ease of use and reliability for all users.
The integration of the NetStream video system into the A/V technology has been more time-consuming and problematic than anticipated. These problems impacted not only the courses planning to experiment with the high-end video system but also the ability to use basic A/V capabilities in Classroom 3. It remains to be seen whether this system can function reliably and if so, whether it will enable innovative activities with multi-point video recording and playback in Spring 2009. The performance of the wireless network for intensive computing with mobile equipment fell short of faculty and student expectations in at least two courses in Fall 2008; changes have been made which should improve performance in Spring 2009. The wireless network must eventually support large numbers of students in the common areas while simultaneously providing reliable support for high bandwidth activities in the adjacent classrooms.

3. Engage more faculty and courses in experimentation with promising classroom technologies, especially those already available in the Link.

Most faculty scheduled in the LINK in Fall 2008 had explicitly requested this space. Emboldened by ready access to equipment and support, many faculty teaching in the space experimented with some new technology or pedagogy in Fall 2008. Macbooks and Flip video cameras were an essential part of course activities and assignments in several classes. Some equipment procured for the space (digital whiteboards, whiteboard capture systems, and tablet PC carts) were not fully ready at the start of the semester; since many faculty are hesitant to introduce a new technology into their teaching mid-semester, very little experimentation has occurred yet with these resources. Opportunities for faculty to see peer demonstrations of effective use (both live and via online profiles) will be incorporated into faculty outreach and training programs in Spring 2009.

4. Develop a seamless, proactive support structure that can effectively scale to support increased use of the space as well as higher levels of Service Desk traffic.

Evening classes or special events outside of regular business hours with intensive IT support needs require special arrangements. Only one course fell into this category in Fall 2008, but increasing use of the space in evenings and on weekends (particularly for special events) could negatively impact the readiness of the facility for daytime classes. Communication and cross-training among staff from different administrative units has not yet reached a point where all staff can assist with most routine needs. At times when traffic to the desk is heavy, no mechanism currently exists to provide faculty with priority access to classroom support.

5. Improve communication and outreach about LINK, including information to Duke faculty, staff and students about features and policies for use.

Signage in the space is minimal and many students and faculty are unaware of the LINK web site (link.duke.edu). A common theme heard during this assessment was the desire for clear information about the facilities, policies for use and means for requesting access. Communications in a variety of formats are needed to ensure that faculty, students and external visitors are directed to the most current source of information available, currently the LINK web site. Resources for updating and maintaining the web site or pursuing other marketing efforts may need to be augmented.

6. Collaborate with students to identify feasible ways to prioritize group use of group study spaces.

The group study spaces are very popular with students; this popularity also results in disappointment when none are available. This disappointment becomes frustration when group study spaces are occupied by individual students rather than study groups. Even with the increased number of spaces made available by the opening of the Link, demand for these types of spaces remains very high. On a typical day, all group study rooms in the Link are occupied by early afternoon and remain so late into the evening. Beginning in October, students could reserve group study spaces up to one week in advance, although students were frequently unaware of this option. The reservation system has not fully addressed concerns, however; both faculty and

students reported frustration with the need to 'evict' students using these spaces, even when the spaces were reserved in advance. More work is needed to identify feasible ways to maximize use but minimize conflict.

7. Ensure that lessons learned continue to be captured and shared broadly for the benefit of all stakeholders at Duke and across the higher education community. Plans for the link.duke.edu web site included a blog to support faculty and staff contributions; this feature of the site has not yet been implemented. Some faculty blogs have been posted to the Center for Instructional Technology web site, but more work is needed to capture the depth and range of use in the space. This report along with other findings and recommendations, when appropriate, should be made publicly available via this avenue.

Appendix A: LINK Classroom Survey Summary

Background
Faculty and students with classes scheduled in the Link during fall 2008 were asked to complete an on-line survey to provide feedback on the classrooms and other features and services in the Link. A total of 677 students and 39 instructors received an email request to complete a short on-line questionnaire. Responses were received from 29% of the students and 62% of the instructors. This report summarizes the findings from the survey.

Link Concept
Question: *Do you think the Link concept of clustering classrooms, group study, technology services, and informal interaction spaces in one location is a concept that should be replicated elsewhere on campus? Please explain why or why not.*

Of the 17 instructors who expressed an opinion, 100% agree that the clustering concept should be replicated elsewhere on campus, with positive comments such as:
> *Yes. I think the concept is great, and I've seen it work very successfully at other universities. The students love it and I think it breeds community when they get together to study late at night.*

Instructors also applaud the infusion of resources into modernizing the classrooms:
> *I do think this clustering idea could work elsewhere on campus, but I think the first priority should be providing more and better classrooms. For another course this semester, I was initially assigned an absolutely dismal classroom in the basement of the Languages building with exposed pipes, low ceiling, uncomfortable hard plastic chairs and dreadful lighting. It felt oppressive, like a classroom in a prison or a mental institution. Duke should make classroom space a priority, not an afterthought.*

Of the 120 students who expressed an opinion, 85% agree that the clustering concept should be replicated elsewhere on campus. Of the students who do not think the concept should be replicated, most indicated that they like the Link, but feel that one location is sufficient. A few believe that the creation of the Link was not the most effective use of resources.

Convenience was frequently cited by students as an advantage of the clustering concept:
> *Yes. It makes things very convenient especially when you have a lot of things to do between classes. I have an hour off between classes, so the Link allows me to eat a small lunch, check my email, get a little work done, and then go right to class there.*

Several students indicated that Lilly Library would be a good location for another cluster:
> *Yes. Try East, there's nothing here. It's very hard to find a space to work with a group in Lilly because most of the rooms require that one be quiet. It's not like the link, where a group can shut itself off from the rest of the area in a*

room so that their discussions do not disturb others and are not disturbed by others either.

Factors that Make the Link Successful
61% of students cited the location of the Link on West Campus as a very important factor, but other features of the Link are also important to making the classroom cluster successful:

How important are each of the following to making the Link an attractive location for classrooms?

	unimportant	of little importance	moderately important	very important	Total
Location on West Campus academic quad	3.2%	4.3%	31.6%	61.0%	100.0%
Proximity to library services	4.3%	13.5%	36.8%	45.4%	100.0%
Technology support from the Link Service Desk	7.5%	16.6%	38.5%	37.4%	100.0%
Availability of food and drinks from the Perk	8.6%	26.9%	38.7%	25.8%	100.0%
Space to hang out before/after class	11.2%	21.9%	39.0%	27.8%	100.0%

In an open-ended question, students and instructors were asked what they like best about the Link, but most who responded identified multiple "best" features. The general enthusiasm and the number of superlatives (e.g., "freaking awesome") expressed in the comments is striking. Many of the comments related to the overall look and feel of the space and for both students and instructors the overall ambiance of the Link was the most frequently cited feature that they like best:

What do you like best about the Link?

Rank	Students	Instructors
1	ambiance	ambiance
2	technology	help desk
3	furniture	whiteboard walls
4	study space	technology
5	group study rooms	location
6	whiteboard walls	spaciousness

Link Classrooms
Feedback on the various features of the Link classrooms was generally very positive. Most respondents report that the furniture is comfortable, the acoustics and lighting are good, they like the décor and the use of glass walls, and they find the rooms are clean and orderly when they arrive. Most students and instructors rate their Link classroom as one of the best classrooms at Duke, which is a higher percentage than was found when the same question was asked in recent surveys of other newly renovated classrooms:

Compared to other Duke classrooms, which of the following best describes the overall quality and feel of this classroom?

	Link Classrooms		Surveys of Other New/Renovated Classrooms			
			Fall 2007		Fall 2008	
	Students	Instructors	Students	Instructors	Students	Instructors
one of the best classrooms at Duke	53%	56%	36%	18%	38%	50%
above average, but not outstanding	36%	33%	45%	52%	55%	45%
average	10%	11%	14%	18%	5%	0%
below average, but not among the worst	1%	0%	4%	7%	1%	5%
one of the worst classrooms at Duke	0%	0%	1%	4%	1%	0%
Total	100%	100%	100%	100%	100%	100%

One key to why the Link classrooms are rated higher than other newly renovated classrooms may be related to spaciousness. In the fall 2007 survey of 15 new and renovated classrooms, one of the frequent comments from students and faculty was that the room was too crowded with furniture and 24% of respondents reported that the room felt cramped. As a result, the classrooms that were renovated in 2008 as prototypes of a new design were decompressed, and in the follow-up survey, the percent of respondents in 2008 who reported that the room felt cramped was reduced to 12%. For the Link classrooms, however, only 7% of respondents feel that the classroom is cramped. An examination of the square feet per seat in classrooms with 20-25 total seats confirms a significant difference in the actual spaciousness of the Link classrooms:

Average Sq. Ft. per seat for 20-25 Seat Classrooms		
Link	2008 Prototypes	All other A&S and Pratt rooms
36	27	22

Suggestions for Improving the Link
When asked at the end of the questionnaire for additional comments, the most frequently cited suggestions include:
- More group study rooms
- Reservation system for group study rooms
- More "tongue chairs"
- More booth seating with tables
- Ensure availability of whiteboard markers and erasers
- Vending machines or other food options, especially when Perk is closed
- Improve cell phone signal

Appendix B: Assessment plan

Purpose of the evaluation

1. Confirm that the space planning principles used in designing this space meet the needs and expectations of faculty and students and provide concrete recommendations for future academic space planning
2. Determine whether the service model, staffing, and equipment at the Service Desk meets the needs of formal and informal use of the facility
3. Assess policies developed by the TLC Core Planning Group and Service Team and recommend necessary changes
4. Capture and describe examples of innovative teaching and collaborative, authentic learning experiences
5. Determine the operational costs associate with managing services, technology and facilities in the Link.

Unique features of the Link / Key Evaluation Questions

- Characteristics of classroom and informal learning spaces – this facility is different from other academic space in a number of respects. The assessment should gather reactions and feedback from faculty, students and staff to each of these features to determine whether such characteristics are effective and would be desirable in more learning spaces at Duke and should provide a basis for comparing student and faculty reactions to the Link facility with other existing spaces.
    - The relatively large number of co-located classrooms in this project (6 classrooms + 4 seminar rooms)
    - The availability of reserveable small group breakout rooms adjacent to classroom spaces
    - The close proximity of informal learning spaces and classrooms, and the types of informal and co-curricular activities that occur in the space.
    - The significant increase to the number of registrar-controlled classroom spaces within the library
    - The impact on faculty and student expectations for what Duke learning spaces should look like and contain, including the ambiance, art and media displays
    - The implementation of flexible and collaborative learning space design principles
- Unique and improved technologies – in addition to some unique technologies, this facility also offers improvements to the baseline level of classroom technology as compared with many other spaces on campus. The evaluation should assess how well-utilized and effective each of the following elements of the project are.
    - Relatively unique or high-end technologies such as integrated videoconferencing, multi-projection and real-time video recording and playback, including local media storage
    - Types of classroom spaces, equipment and technologies that receive the heaviest use / are most well-received by faculty and students

- o Baseline technologies (e.g. basic projection & podium system) that are easy to use and accessible to a wide majority of faculty with a minimum level of assistance and training

- Service Desk and other services- no other grouping of classroom spaces available will have the same level of access to equipment and technology support. The impact of these services on staff, faculty and students should be carefully examined.
    - o Success of the Service Desk in meeting faculty and student requests and expectations
    - o Impact of the physical location of the Service Desk on the types and numbers of inquiries
    - o Impact of extended Service Desk hours as compared with previous OIT Help Desk hours
    - o Alignment with library building hours and impact on OIT staff and services
    - o Impact on faculty and student expectations of services and equipment available in TLC as well as more generally in other campus learning spaces
    - o Impact on use and engagement with library services and resources
    - o The effectiveness of communication, outreach and marketing about the space, its capabilities, availability of services and equipment, awareness of Link features
    - o Success of the expanded equipment loaner pool program via the Service Desk (evaluation task shared with DDI evaluation)

Details of Evaluation Activities (Purpose)
- Usage of and general reaction by faculty and students of all registrar-scheduled classroom spaces (1,2,3)
- Case studies of 3-5 individual faculty and courses in the Link (1,2,3,4)
- Observation and analysis of teaching strategies and learning activities (1,2,3,4)
- One or more focus groups of instructors teaching in the Link (1,2,3,4)
- Usage of group and informal learning spaces
- Analysis of support issues via Remedy tickets, Service Desk records, linksupport@duke.edu submisions (2,3)
- Analysis of impact on library resource and service use (1,2)
- Moderated public blog on Link web site with ability for comments by Duke affiliates (1,2,3,4)