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Coping with the Academic “Tragedy of the Commons”: Renovating Classrooms at Carnegie Mellon University

Edwin Fenton

Carnegie Mellon University

In the December 1968 issue of *Science*, the biologist, Garrett Hardin, discussed what he termed “the tragedy of the commons.” Picture a pasture open to all, he suggested. Each herder, assuming that adding one or two more cattle will do no harm, will keep as many cattle as possible there, but when all herders act on this premise, the pasture will soon become a wasteland with dire consequences to both cattle and people. Hardin used this example to dramatize the problems posed by pollution. All of us add our share to the pollutants that foul our water and air. Eventually, the effects of this activity can poison the planet.

Colleges and universities face a different “tragedy of the commons.” Powerful departments and colleges protect their private spaces with militant vigor. They keep research laboratories up to date, make sure that offices for faculty members and staff have the latest equipment, and do battle with each other over scarce resources, particularly funds and space. But in many postsecondary institutions, no one lobbies with equal vigor for common facilities such as classrooms and educational laboratories. Grounds, yes; classrooms, no. After all, prospective students and their parents see the grounds, but except for a few showcase assembly halls, athletic facilities, and dormitories, no one sees classrooms except faculty members and students who soon become accustomed to inferior facilities. The result is an academic tragedy of the commons.

Carnegie Mellon: A Case Study

The situation

In 1984, Carnegie Mellon University's (CMU) classroom space was scattered among eight academic buildings, most of which were constructed more than fifty years ago, a situation common in many institutions (Majority of classrooms found defective, 1986; Schwartz, 1987; Owu, 1991). Many had never been renovated. Lighting and acoustics were far below standard. No rooms were carpeted. Chalkboard space was inadequate for quantitative courses. Old wooden tablet-arm desks bore the traces of generations of graffiti. Every week, a number of window shades were torn from their rollers. All audiovisual equipment except for chalkboards and permanently installed screens came from central facilities, and departments were assessed a fee for every usage. Both the nuisance and the cost discouraged faculty members from using audiovisual materials in their classes. When faculty members complained, renovations were made on an ad hoc basis, but without an overall plan to bring all facilities up to an agreed-upon standard. Ironically, these conditions existed in a University with, arguably, the most sophisticated and comprehensive computer system in the nation.

But obsolete facilities were only part of the problem at CMU. Under the administration of President Richard M. Cyert, research had grown dramatically, and as a result, what we came to call the Research Pac Man gobbled up classroom space at an alarming rate. President Cyert's strategic plan focused on hiring excellent researcher-teachers who either brought grants with them or soon acquired funding. What was the University to do when several million dollars in grant money depended on the availability of more space? In all too many cases, it gobbled up classrooms during a period when both the undergraduate and the graduate enrollments were growing. We were on the verge of a classroom crisis.

1. An action plan and its recommendations

Then the administration decided to take action. Vice President John P. Crecine asked 13 winners of the University's Ryan Teaching Award to develop recommendations for the improvement of the University's educational facilities. After widespread consultation throughout the faculty and staff, the Planning Committee issued a report containing eight recommendations. Seven of the suggested reforms (all except new undergraduate science laboratories) have already been accomplished or are on the planning boards

for the near future. Four of these recommendations had an impact on classrooms and lecture halls. They were:

1. Establish a standing committee to assist in the planning and design of educational facilities. Members should be people who use the facilities and have broad knowledge of educational facility needs within their colleges and the University as a whole.

2. Designate one administrator as a "Classroom Czar" responsible for coordinating classroom maintenance.

3. Add enough additional money to the sums now projected for classroom renovation to renew and equip at least four lecture halls a year for the next four years. Each hall should have one or more features such as video monitors, double screens for slide projection, or data projection equipment suitable to the needs of the faculty who use the facility.

4. Increase annual budget expenditures for audiovisual and graphic delivery and production services in order to encourage their use for educational purposes. This recommendation implies that audiovisual equipment should be delivered, operated, and picked up without charge to departments and that charges for AV and graphic production for classroom use should be reduced or eliminated.

2. The Educational Facilities Committee

The University's Resource and Capital Allocation Boards accepted these recommendations and increased the annual appropriation for classroom renovations from \$150,000 to \$300,000. This decision launched the Educational Facilities Committee (EFC) to which the Boards gave responsibility to set priorities for the renovation of all registrar-controlled classrooms—not only the 16 lecture halls suggested in the Planning Committee's report, but also the 44 smaller registrar-controlled rooms. The mandate did not cover the 21 classrooms, nine seminar rooms, and 19 conference rooms that fell under the control of individual departments or colleges. Most of them were in excellent condition anyway because each department or college renovated and furnished its own seminar and meeting rooms. The EFC, as appointed by Vice President Crecine, consisted of one representative from each of the University's seven colleges, the Registrar, the Director of Planning, three staff members from Instructional Technology, a project architect, a designer, and the Director of Construction from Physical Plant.

How the Committee functions

Chaired first by Professor James Hoburg of the Department of Electrical and Computer Engineering, and two years later by Edwin Fenton, Co-Direc-

tor of the University Teaching Center and Professor of History, the Committee began to work. We decided to renovate the lecture halls in order from worst to best and then to tackle classrooms in the same order. We were able to identify and rank the lecture halls with little trouble. Our members from Physical Plant informed us they had funds under their budgets to renovate HVAC (heating, ventilation, and air conditioning), saving our funds for other purposes.

First, Professor Hoburg sent a memo to every faculty member asking for suggestions as we began to plan renovations. About 20 percent of the faculty responded to his request, identifying a number of renovations that none of the Committee members had thought about. Then, Hoburg began a series of Committee breakfast meetings, the only time which fit all our schedules. The project architect, relying heavily on national recommendations for classrooms (Ramsey & Sleeper, 1981; Reznikoff, 1986) worked up plans and estimates for each room we identified, submitted them to the Committee, and got a go-ahead to make drawings so that the work could proceed during the summer. In some instances, we had the work done in-house; in others, particularly when extensive renovations were called for, Physical Plant farmed the work out to the lowest bidder. After five years of experience, the Committee now meets five or six times a year, with much preliminary planning falling to subcommittees and the actual work of renovation in the hands of Physical Plant. Minutes of each meeting comprise a record of our decisions.

We have assessed needs in four ways. First, every two years we have sent questionnaires to the entire faculty asking them for suggestions. Last fall, we asked for comments about all of the rooms we had renovated thus far and received 70 responses, largely about minor irritations—for example, broken tablet arms, drapes that did not quite close, and sliding chalkboards that rose so high shorter faculty members could not reach them. We took these suggestions to mean that the major renovations were acceptable. Second, subcommittees have twice spent several days during winter breaks walking through all of the classrooms, making plans for major renovations, and deciding which rooms to tackle next. Third, we have hired a retired public school teacher to inspect the classrooms weekly and submit work orders for repairs, orders that have provided valuable information to the Committee. Finally, we receive a number of unsolicited suggestions each year from faculty members, again usually about minor irritants.

Students have played only minor roles in these developments. Before our renovations began, complaints about poor acoustics, poor lighting, or the absence of tablet-arm chairs for left-handed students occasionally reached

the ears of administrators, but, in general, students seemed willing to accept classrooms as they found them. When asked by Committee members, however, students who had seen rooms transformed over a summer commented that the new versions were far more pleasant than the old ones. Even though we have received no complaints about renovations from students, we believe in retrospect that we missed an opportunity to get their advice about what they would like to see in classrooms.

The roles of Committee members

The Educational Facilities Committee includes 15 members, each of whom plays an important role. They are:

Seven faculty members, one from each college. Each of the University's seven colleges has one member on the Committee. The Dean appoints this person. Three members have served since the Committee began, and no college has had more than two appointees. Willingness to serve stems from two factors: the relatively infrequent meetings of the Committee and the general belief that the Committee does something rather than merely turn in reports. Each Committee member represents the interest of his or her college, but no rancor has developed over this role, perhaps because the Committee established a principle governing priorities for renovating rooms that forestalled debate over what should come first. Nevertheless, Committee members have proved to be valuable conduits for requests from within colleges.

A representative from the University's Planning Department. This individual supplies information about the numbers of students enrolled in courses, general university plans, and the activities of the major administrative boards to which our Committee reports. This representative also serves as a liaison to the Resource and Capital Allocation Boards.

Three representatives from Academic Computing & Instructional Technology. These people include the department chair, an expert in electronic equipment, and the person who oversees delivery and maintenance of audiovisual equipment to classrooms. Each lends expert knowledge about a vital specialty.

The Registrar. The Registrar provides information about enrollment and demands for different sizes and types of classrooms, and makes sure that no classes are scheduled during the summer or midwinter break in rooms being renovated.

An architect. The Physical Plant architect is in charge of planning and estimating each renovation and of submitting plans for review by the Committee. The architect and a Project Manager from Physical Plant monitor the

construction process whether done by outside contractors or by Physical Plant crews.

A designer. The Physical Plant interior designer works closely with the architect in selecting carpets, drapes, furniture, and coordinated color schemes.

The Construction Director. The Director of Construction in Physical Plant determines strategies for construction bidding and negotiating or for assigning the work to Physical Plant personnel. The Director sees that construction costs are monitored through the entire construction process, and also advises the design team on evaluating systems for constructability and on scheduling.

Committee Funding

Money has come from four major sources. First, the University has allocated \$300,000 each year for the past six years to the Committee, a total of \$1,800,000. We have been assured by the administration that this funding will continue until the Committee reports that the job is done. Second, the Commonwealth of Pennsylvania has given each postsecondary institution in the state a sum of money during four of the past five years to purchase instructional technology for use in classrooms. CMU's portion of these funds, which depends on the number of Pennsylvania residents enrolled, has approximated \$245,000 annually, a total of \$735,000. Third, as I have already indicated, Physical Plant has used its appropriations to renovate heating, ventilation, and air conditioning, approximately \$100,000 during the past six years. Finally, the University has built and paid for one additional lecture hall and seven new classrooms as it renovated old buildings recently acquired from the federal government.

These are substantial sums, but they have come from numerous budgets and have been spread over a six-year period. Compared to other capital improvements at CMU, moreover, they have had a marked impact per dollar spent. Every CMU student uses these new classrooms several times a day. One new research laboratory for an incoming senior scientist and his or her associates can cost more than \$1,000,000. Renovating chemistry laboratories used primarily by freshman students for their lab classes will cost \$8,000,000. Nothing the University has done in recent years has made such a dramatic impact per dollar spent on the quality of academic life as the classroom renovation project.

In addition to these developments, the University has built a comprehensive and sophisticated computer network costing millions of dollars which plays an increasingly important educational role (Cursor, October, 1990;

January and February, 1991). The network contains about 12,000 outlets, and at least one in each University room including all dormitory rooms, to which are connected about 7,500 PC's or work stations. During the past decade, CMU has located four hundred of these machines in 18 public clusters which contain between 4 and 50 machines each. Thirteen of these clusters are open 24 hours daily. Eight of the public clusters are dual purpose—that is, faculty members may reserve them for classes, but if no classes are taking place, individual students may use the machines. An additional 320 machines are located in departmentally controlled clusters.

During the fall, 1990 semester, clusters were reserved for teaching purposes for nearly 1800 hours by faculty members from 12 departments. The availability of modern computing hardware and a large and increasing software collection is rapidly transforming the ways in which many courses are taught. The Educational Facilities Committee has cheered the development of this computing system and contributed slightly to it, but, on the whole, the computing system has grown independently of the EFC.

3. The results: improved facilities and enhanced learning

Improved Facilities

Six major improvements have resulted from the decision of the University to set up this Committee.

- **Modernized lecture halls.** All of the University's lecture halls have been brought up to standards established by our architects in such areas as HVAC, lighting, furnishings, aesthetics, and audiovisual equipment. In four instances, we gutted old halls and began anew. These four rooms are now among the best in the University. In the remaining cases, we were able to make more limited changes.
- **Modernized classrooms.** We have brought all 44 of the old registrar-controlled classrooms up to standard: HVAC, lighting, new ceilings, carpets, drapes, modern sliding chalkboards, new furnishing in many rooms, and appropriate resident AV equipment.
- **Additional classrooms which came under the control of the Registrar.** The Committee offered to renovate two classrooms controlled by Biology and Chemistry and nine classrooms in five departments in the College of Fine Arts if the departments would release them to the control of the Registrar. The departments still get first call on these rooms, but the Registrar may schedule classes from other departments or colleges when the original owners do not schedule them. This reform has added the equivalent of two new classrooms to the stock of space.

- ***Dividing large spaces into two rooms.*** Three classrooms in older buildings were about four times as long as they were wide and seated about 60 students. Prompted by the Planning Office, the Committee divided these classrooms into two rooms each — in one instance, two seminar rooms and in the other two, one smaller classroom and a seminar room. This change added three rooms to the stock under the control of the Registrar.
- ***Installing resident AV equipment.*** The Committee purchased and installed a strong, lockable metal cabinet in every classroom and lecture hall in the University, a project suggested by Instructional Technology. Each one now holds an overhead projector, chalk, and erasers. Many of them also contain other equipment such as a VCR, double slide projectors, a film projector, sound equipment, or any other equipment a faculty member needs on a regular basis. Faculty get keys to the classroom and the cabinets from Instructional Technology. In addition, each lecture hall and 10 classrooms have video monitors. Six rooms have been equipped with data projectors that project colored images from computers. Two rooms have been outfitted as sophisticated media rooms with a computer that controls a wide range of projection and recording equipment. Instructional Technology delivers any other equipment needed on an irregular basis for regularly scheduled classes from a central store without charges to the user.

This project has been expensive—the cabinets alone cost \$350 each. In the long run, however, these changes will pay for themselves in saved delivery charges and better education. For example, even with the extensive supply of resident AV equipment in classrooms, requests for the delivery of equipment from the central store in Instructional Technology doubled last year. For this reason, we are increasing the supply of resident equipment and reorganizing classroom assignments to get faculty members who consistently use AV equipment into appropriate classrooms. But no matter how much equipment our budget allows us to deploy, we will still need some equipment to be delivered on demand from a central source. The requests from faculty for new computer software and new video releases has increased at a somewhat similar pace. Making the hardware rapidly available has played a major role in this later development.

- ***Maintaining these facilities.*** During the past five years, we have gradually brought the maintenance problem under control. Instead of a Classroom Czar, which the original recommendations suggested, the University placed maintenance in the joint hands of Instructional Tech-

nology and Physical Plant. Each week, Instructional Technology inspects all classroom spaces under the Registrar's control using a checklist which these groups have developed. When something is awry, IT personnel enters it in a data base that is sent weekly to Physical Plant. Once the requested repairs are made, Physical Plant responds so that all parties are fully informed. Although some faculty members still contend that repairs move at a snail's pace, they are much faster than they used to be — immediate for items such as broken windows and usually within four days — and they are less frequent than in former times.

Enhanced Learning

The Committee has identified at least six ways in which these reforms have had an impact on education in CMU's classrooms.

- First, the rooms are far more comfortable and attractive than they used to be; excellent lighting and acoustics, improved HVAC, newly painted walls, new ceilings, and carpeted floors have all contributed to a positive learning atmosphere.
- Second, the renovations have brought additional flexibility to the classrooms. Carpeted floors, for example, facilitate moving chairs from rows to a circle, a much better arrangement for discussions, simply because the carpets reduce the noise level.
- Third, changing the furniture in seven rooms from tablet-arm chairs to tables and chairs has provided excellent teaching space in which students and faculty can see and hear each other well in seminars and small discussion classes.
- Fourth, the use of media in classes has increased by 50 percent each year for the past three years. Both the presence of resident AV equipment in classrooms and the agreement that media will be delivered to classrooms without charge to a department account for much of this change.
- Fifth, the new classrooms have begun to have a marked impact on the curriculum. Both the presence of resident data projectors in five lecture halls and the ease with which data projection devices can be obtained from instructional Technology have encouraged faculty members throughout the University to utilize this technology widely (Cavalier, 1991).
- Finally, improved classrooms have sent a quiet message to faculty members: the University cares about quality teaching and will make substantial efforts to provide the facilities that can improve both teaching and learning.

4. What we have learned

Our six years of experience suggest a number of generalizations which may apply to other colleges and universities with obsolete classroom facilities.

1. Assign responsibility for classroom renovations to a committee similar to ours in which all major actors are represented. Ideally, a staff person from faculty development should head the project or play a substantial role in its deliberations. More than regular faculty members, faculty developers know about the relationship between learning environments and the teaching-learning process. Moreover, an organization such as the Educational Facilities Committee gives a faculty development center visibility throughout the campus and sets up lines of communication with individuals who might not otherwise interact with staff members.

2. Don't let the process become too involved or too time consuming. Our Committee now meets about five times a year for 90 minutes at breakfast. Subcommittees, the University Architect, the Designer, and staff members from Design and Construction do the detailed work, following guidelines that the Committee established.

3. Assess the relationship between the problem and financial support carefully. All classrooms in a university such as ours do not require a full complement of residential AV equipment, for example. We have installed resident video monitors in many rooms, double slide projectors in others, videodiscs elsewhere, data projectors in five lecture halls, and so forth. We placed triple sliding chalkboards in rooms widely used for quantitative courses, but not in rooms used primarily by faculty members from the humanities. Finally, we did not replace many of our old tablet-arm chairs that, although unattractive, were still useable. In later years, we will replace these chairs, but with limited funds we tried to bring all rooms up to acceptable standards rather than build a smaller number of showcase rooms.

4. Consult widely with the faculty. Sending out questionnaires brought us many useful suggestions and indicated clearly that the University was taking dramatic steps to improve educational facilities. A questionnaire to faculty members in Humanities and Social Sciences, for example, revealed that many instructors preferred tables and chairs to conventional tablet-arm chairs. Having a representative on the Committee from each college has provided a useful channel for information.

5. As much as possible, customize classrooms to the needs of departments. Our Modern Language staff requested tables and chairs instead of tablet-arm chairs, a triple sliding chalkboard, both American and European VCR players, two video monitors, and a tape player as resident equipment

in a room near the departmental offices. Both students and faculty testify to the significant improvement these changes have made in instruction. We have installed a whiteboard instead of a chalkboard in a new media-enriched classroom designed mainly for the Art Department whose members like to use colored markers instead of chalk. Customizing causes problems for the Registrar, but our Registrar has learned to live with them.

6. By all means, find a way to deliver media to classrooms without charges to departments. This one reform has multiplied the use of media many fold.

7. Hold workshops on the effective use of media in the classroom. Many faculty members know little or nothing about the use of media or the research that supports it. During one spring semester, CMU's Teaching Center in a cooperative venture with Academic Computing and Instructional Technology conducted a series of seven faculty luncheon seminars on the use of media. Each session featured a faculty member who demonstrated materials which he or she had used effectively (Fenton, 1988).

8. Develop and distribute widely a Guide to Classrooms. Each year, Instructional Technology and University Planning publish a classroom guide (Instructional Technology and University Planning, 1987, and annually thereafter). Among other information, this Guide tells faculty members how to schedule rooms and contains a map of every classroom along with information about accessibility, lighting, seating, screen and chalkboard areas, the location of electrical outlets, air-conditioning, and a list of resident AV equipment. Faculty members can consult the Guide as they request rooms that meet their instructional needs. In addition to sending the Guide to each faculty member, they also have been sent to all departmental offices where secretaries and administrative assistants, who do much of the scheduling, have ready and accurate access to this vital information.

Conclusion

As a result of this entire project, Carnegie Mellon now has classrooms that provide excellent educational environments for students and faculty. The faculty are delighted with the changes they have seen over the last six years. Teaching is much more productive than it used to be now that the classrooms are comfortable and fully equipped. Students now take better care of the classrooms, although torn shades and drapes, spilled drinks, and graffiti on desktops will be with us always. We are convinced that few changes would have been made in lecture halls and classrooms without the work of this Committee. Garrett Hardin would probably be pleased to learn about how we have adapted his environmental warning to university life.

References

- Cavalier, R. (1991). Knowledge & values. Unpublished paper, Carnegie Mellon University.
- Cursor*, the academic services newsletter of Carnegie Mellon University (October, 1990; January and February, 1991). Pittsburgh: Academic Services, Carnegie Mellon University.
- Fenton, E. (1988). *In most cases, it's the message that counts, not the medium: An analysis of research about the use of media in education*. Pittsburgh: University Teaching Center, CMU.
- Instructional Technology & University Planning (1987 and annually thereafter). *CMU guide to classrooms and lecture halls*. Pittsburgh: Instructional Technology, CMU.
- Majority of classrooms found defective. Campus Report. Stanford, CA: Stanford University, October 29, 1968, p. 1.
- Ramsey, C.G., & Sleeper, H.R. (1981). *Architectural graphic standards* (7th ed.). New York: John Wiley.
- Hardin, G. (1968). The tragedy of the commons. *Science*, 162, 1243-1248.
- Owu, M.K. (1991, March). The classroom: Physical environments that enhance teaching and learning. Paper presented at the meeting of American Association for Higher Education, Washington, D.C.
- Reznikoff, S.C. (1986). *Interior graphic and design standards*. New York: Watson-Guptill.
- Schwartz, K. (1987). Classrooms need renovation. *The Tech*, 107,4. Cambridge, MA: MIT.