STUDIO STRATEGIES FOR APPROACHING MORE UNIVERSALLY-DESIGNED RESIDENTIAL KITCHENS: EXPERIENCING WHILE DESIGNING

Thomas L. Houser

Abstract

Strategies were developed to facilitate designing flexible kitchen layouts that enable individuals of varying abilities to prepare food in user-friendly environments. The strategies were rooted in a design philosophy based on empathy for the physical and emotional experiences end-users may have in a space, as well as on generally accepted kitchen design standards. College sophomores in the interior design program became acquainted with functional requirements of kitchen layouts through lectures and in-class exercises before beginning studio projects. Given that few interior design students appeared to have experiences beyond basic survival skills in the kitchen, they prepared meals based on a set menu. Students documented each step of the process-from bringing supplies into the home, through preparing and serving the meal, to cleaning up afterwards. Students used this documentation to evaluate existing kitchens and to reassess and then revise their studio design projects. Next, students researched and discussed special needs of individuals with various disabilities. Using full-scale, cardboard box mock-ups, they simulated preparing the assigned meal as though they faced limitations inherent in less able-bodied circumstances. Finally, they modified studio projects to create adaptable environments responsive to the changing needs of end-users.

Perspective

We are accustomed to adapting ourselves to the built environment rather than adapting the built environment to meet our needs. The building and its contents have been considered immutable, and anyone unable to conform to the provided conditions must be impaired or disabled (Wylde, Baron-Robins, & Clark, 1994, p.1).

Thomas L. Houser is an Assistant Professor of Interior Design in the School of Art, University of Georgia, Athens, GA.

This indictment goes to the heart of a matter we must address in the design professions and in academia: universal design (see Mace, Hardie, & Place, 1991). For far too many interior designers the problems people encounter while using interior spaces are induced by the end-users, not by the designers. Designers may have trouble seeing beyond the aesthetics or perceived functionality of their designs to empathize with people who actually use the spaces. Faculty must help students develop sensitivity to affective, as well as effective ramifications of design issues and provide them with experiences to elucidate what it is like to have less-abled bodies, to use prosthetic devices, to have difficulty interpreting spaces. Studio instructors need to address issues across the lifespan in manners that enable students to synthesize into their design philosophies sensitivity to people, as well as to processes; so new generations of designers rid themselves of "codes and checklists" mentalities.

Adaptability is a key element of universal design. Needs of users with specific limitations will vary and change over their lifespans. A few examples relative to kitchen design illustrate the improbability of addressing all abilities with one solution.

- Appropriate manual plumbing controls vary for people with differing limitations based on their abilities to grasp or turn objects. Tilley (1993) illustrates disparate handles appropriate for individuals with arthritis, Parkinson's disease, muscular dystrophy, or muscle weakness.
- Mace (1991) notes that vertical reach zones vary for individuals with standing mobility limitations from those who use wheelchairs: 24 to 72 inches above the floor for the former and 9 to 54 for the latter. It is not difficult to imagine that an individual who uses a cane may some day use a wheelchair. Storage and counter designs should allow potential modification to accommodate this possibility.
- As the negative symptoms of Alzheimer's disease increase over time it may be necessary to install locks on cabinets to limit access to potentially harmful supplies, or to add separate power switches to appliances used for cooking to ensure safety for both the individual and the home (Calkins, 1988).

Although the concept of universal design encompasses the needs of all people, codes, regulations and guidelines tend to be impairment or age specific. By passing the 1988 Amendment to the Fair Housing Act, members of the U.S. Congress addressed extant and predictable needs of wheelchair users living in multi-family dwellings (Wylde, et al., 1994). They went further with the passage of the Americans with Disabilities Act of 1990 by setting design guidelines to ensure accessibility for, and provide protection of individuals with mobility, sight, or hearing limitations. These guidelines apply to the design of public buildings, institutions, and work places (Tilley, 1993). But does completing checklists based on ADA, FHAA or other legal requirements ensure designers will create accessible interiors? Do codes fully address the needs of 31 million Americans with arthritis (Leibrock, 1993) or the 7.4 million estimated to have Alzheimer's related disabilities by the year 2040 (Calkins, 1991)? What about the maneuvering space needed by people who use three-wheeled scooters instead of wheelchairs (Mace, 1991)? Clearly regulatory requirements must be met on all projects, but they should serve as starting, not ending points in the quest to create environments enabling people to function safely and comfortably. Interior designers and architects tend to follow "behind the lawmakers, complying with applicable regulations but not exhibiting a hearty commitment to them, much less going beyond point-by-point compliance to envision new design methods and strategies" (Lifchez, 1987, p. 2).

Educators, practitioners and students routinely develop design philosophies that address the physical, functional, and aesthetic qualities of space. However, their design philosophies also should embrace issues of the quality of experiences end-users will have within the designed spaces. To make this point, Davis and Lifchez (1987) noted:

> If a facility can accommodate the needs and wants of disabled people, allowing them not only to enter the place but also to experience it in a meaningful and reasonably comfortable fashion, then its designer has really achieved something. For accessibility is more than a matter of admittance or logistics; it is also a quality of experience. How one feels about a place, how one interprets it, or even if one can adequately interpret it – these are all less quantifiable, but crucially important, aspects of accessibility. A place that supports people's activities and desires, permits them to be and do what they want, and causes them a minimum of pain, frustration, and embarrassment, is more accessible than a place that confuses, harasses, or intimidates people. Many ostensibly accessible sites differ substantially in the quality of experience they offer (p.40).

Lyndon suggests design "can be enabling only if architects [and designers] develop empathy – not just for the way . . . the idealized body stands upright and intact like a column, but for the ways that architecture [and interior design] enters into the lives of the people. . ." (Lifchez, 1987, p. xii). A truly accessible interior is one that enables the user. The goal of universal design must be to accommodate, or be adaptable to meet the needs of the vast majority of users, enabling them to function at maximum capacity, without using specialized, conspicuous designs whenever possible. Designers must be empathetic, as well as analytical and artistic beings. The strategies presented below are based on the assumption that personal experience fosters empathy.

Introduction to the Project

Kitchens are more than just a place to zap, stir, or burn, but what really goes on in a kitchen? We know the basics: refrigerating, freezing, chopping, mixing, cleaning, cooking, baking, serving, storing, and often, eating. We fear the inevitable: burning, charring, boiling-over, spilling, and scrubbing. More goes on: planning, reading, writing, and visiting. However, there are other levels of activities: selecting, crushing and smelling spices; creating and modifying recipes; blending, pulling and kneading dough. There's process. There's ritual. There's a sense of magic. Students must appreciate these complexities of kitchen design to provide enabling interiors.

Food preparation can be seen as a microcosm reflecting the types of support needed for any task or operation that requires workers to process materials or ideas. A key to a successful kitchen is how well it supports logical work flow. Storing, handling and staging very hot and cold materials, as well as carefully timing processes, are critical considerations that must be met conveniently and safely. By meticulously addressing these ideals on a common issue – designing a kitchen – students learn the complexities of problem-seeking and problem-solving on less familiar ones, such as designing nurses' stations in special care units for residents with Alzheimer-related conditions.

Faculty apply many strategies while teaching kitchen design to lower-division interior design students. Some common ones were employed here: lectures, readings, drafting exercises, and original design projects. The thrusts of this paper, however, address two atypical approaches: actually cooking meals and simulating the preparation of meals while assuming specific limiting factors confronted by individuals with disabilities. Both of these strategies evolved over a three-year period with each new step better enabling student designers to empathize with the physical and emotional needs of clients of varying abilities.

The cooking experiences and universal design mock-up exercises described are simulations designed to engender empathy for both able-bodied and less-able people. The effective use of full-scale and other simulation techniques to evaluate behavioral ramifications a space places on end-users is well documented in the literature (see, for example, Appleyard & Fechtner, 1982; and King, Marans & Solomon, 1982). Participants can determine/express underlying values and prioritize amenities through affective responses to preset or variable conditions in cost-to-benefit trade-off gaming experiences (Canestaro, 1987). The effectiveness of simulations or mock-ups is ensured by verifying the validity of the model via input from people who experience the situation in real life. (This is done here through input from students with disabilities.) Debriefings at the end of simulation exercises enable students to see how the perceptions garnered from the experiences can effect or be applied to their future endeavors (see Bosselmann & Craik, 1990).

Teaching Objectives

As is the case with most interior design studio projects, primary goals of the exercises and projects described here were for students to demonstrate:

- fundamental knowledge of various functional approaches to kitchen design;
- abilities to produce floor, electrical and lighting plans, cabinet elevations and specifications; and
- two- and three-dimensional presentation techniques.

The cooking and mock-up strategies were developed with the hope of transcending basic functional and technical concerns and engendering:

- awareness of behavioral ramifications of layouts and details;
- empathy for end-users; and
- underlying sensitivities to universal design issues and concerns.

Preparing Students

The instructor began by lecturing on kitchen design, exposing students to:

- work triangles, the five work centers-refrigerator, mix, sink, cook, serve, and other procedural considerations (see Faulkner, Faulkner, & Nissen, 1993);
- internal and external traffic flow, pathways and adjacencies; (see Wylde, et al., 1994);

- traditional layouts and configurations – one-wall, Pullman, L-shape, U-shape, islands, peninsulas (see Faulkner, Faulkner, & Nissen, 1994);
- anthropometrics and ergonomics (see DeChiara, Panero, & Zelnik, 1991; and Tilley, 1993);
- human variations – intra-individual, inter-individual and secular (Tilley, 1993 and Henry Dreyfuss Associates, 1974);
- task and ambient lighting (see Wylde, et al., 1994);
- materials and finishes (see Leibrock, 1993; and Calkins, 1988);
- ventilation (see Wylde, et al., 1994); and
- overview of building, life safety, and accessibility codes and regulations, including ADAAG (see Ballast, 1994).

As these materials were covered at the beginning of the term, students drafted given plans to learn conventional layouts by rote and to reinvigorate drawing skills which laid dormant over the summer. They also drafted plans and elevations of kitchens they used daily or ones to which they had easy access; and then analyzed the layouts based on lecture and reading materials. They noted work triangles; labeled work centers and appliances; and coded the counters (C-1, C-2 etc.) and the base, wall, and overhead cabinets (B-1, B-2, W-1, W-2, O-1, O-2, etc.). Subsequently they used these annotated plans during the cooking experiences.

Cooking a Meal

Typically, design students have appeared to lack significant practical skills in food preparation beyond opening cans, ordering Chinese, or using microwaves. This reality hampered their abilities to design kitchens effectively. Lacking practical experiences they often made design decisions on purely aesthetic bases. With some acquired acumen in food preparation they appeared to become more likely to meld form and function and to empathize better with potential end-users.

Student teams prepared meals based on somewhat complicated recipes (grilled mushroom salad, ragout of shrimp or chicken over a bed of spinach fettucini, green bean vinaigrette, scalloped summer squash, sourdough boulle, and a beverage). These recipes were chosen because they: ensured the use of all work centers; represented a medium level of difficulty to prepare; and required as much planning as cooking. Students worked in kitchens for which plans, elevations and coding systems were developed in the studio exercise noted above.

The instructor provided two handouts for each recipe. The first indicated the ingredients and preparation instructions and included an analysis column for recording when work centers were used; where ingredients were stored; and what utensils, pans and supplies were required and where they were kept before their use (see Figure 1).

The second handout was a blank, generic diagram used to track the preparation of each dish. The diagram was employed on several occasions when the course sequencing precluded the students from preparing actual elevations of the kitchens before the cooking exercise commenced.

Shrimp or Chicken Ragout au Vin Rouge

Ingredients

Ragout

2 red onions sliced paper thin
6 cloves garlic diced
2 tablespoons olive oil
1/2 teaspoon dill
1 1/2 cups Gamay Beaujolais or red cooking wine
1 tablespoon soy sauce
2 lbs. fresh shrimp or cubed chicken breasts (1/2" pieces)
1 cup snowpeas

Fettucini

8 ounces of spinach fettucini
1 tablespoon butter, margarine or olive oil
4 quarts water

Instructions

Ragout

1. Preparing the Ragout.
   a. Saute onions and garlic in olive oil until translucent.
   b. Add dill, wine and soy sauce.
   c. Bring to a boil.
2. Poaching.
   a. Add seafood or chicken and poach until barely done.
   b. Add snowpeas in last minute of poaching.
   c. Serve in bowls over spinach fettucini.

Pasta

1. Cooking pasta.
   a. Bring water with oil added to a rapid boil.
   b. Add pasta and continue boiling until al dente.
2. Drain pasta and add butter, margarine or olive oil to taste.

Preparation Process Analysis

Work Centers	Used
Primary	
refrigerator	____
mix	____
sink	____
range	____
oven	____
serve	____
Secondary	
mix	____
range	____
serve	____

Ingredients	Stored
red onions	____
garlic cloves	____
olive oil	____
dill	____
wine	____
soy sauce	____
shrimp	____
snowpeas	____
fettucini	____
water	____
other	____
other	____

Utensils, Pans and Supplies (list sequentially)	Stored
________________	____
________________	____
________________	____
________________	____
________________	____
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________________	____
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Figure 1. Representative menu item. Students indicated work centers and storage areas involved in preparing the dish by listing numerical codes which were cross-referenced with their plans and elevations. They were allowed to make reasonable substitutions for the ingredients, e.g. red cooking wine in lieu of gamay beaujolais. (Recipe: Hebert, M. [1983]. California wine lover's cookbook. San Francisco: The Wine Appreciation Guild, p. 95.)

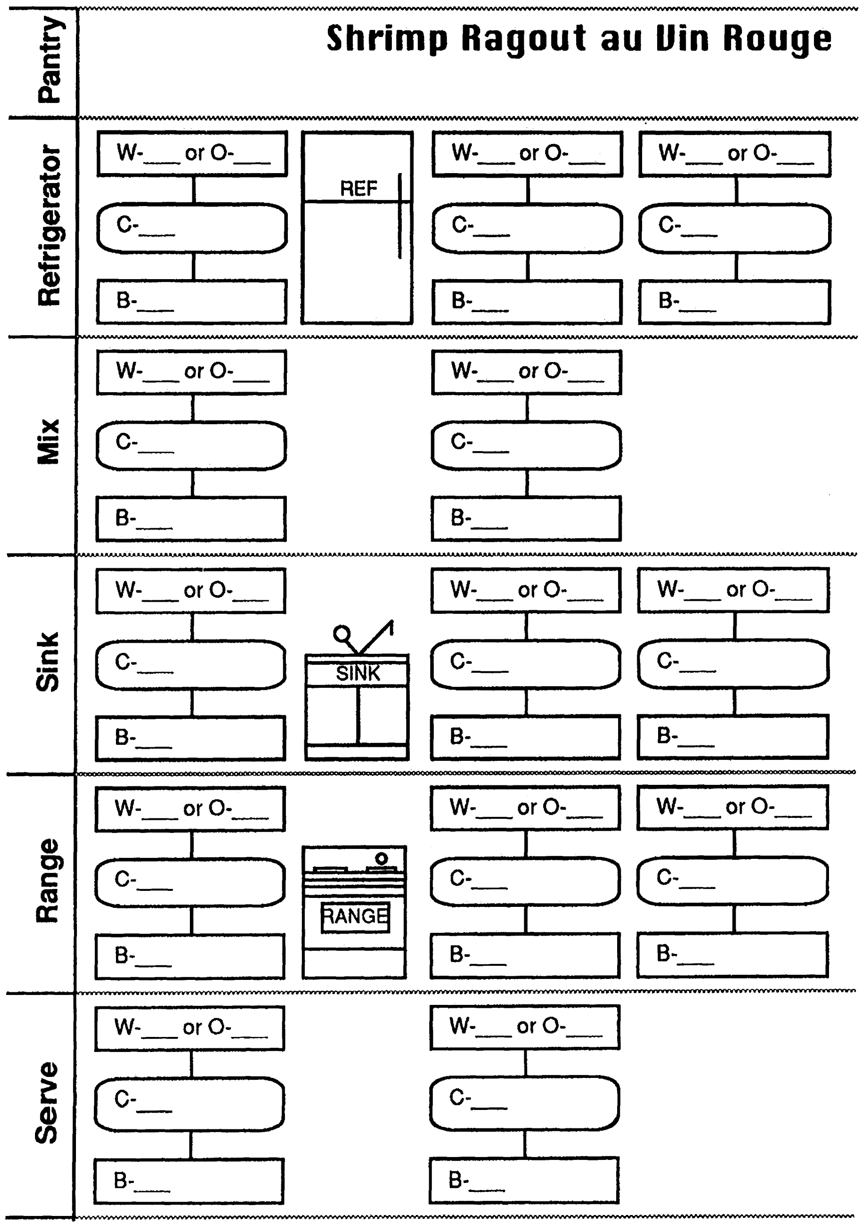

Figure 2. Work flow analysis diagram. Students traced each step of the preparation by drawing lines from a counter to a cabinets and back for each movement. The numerical codes were indicated in the third column of this diagram, as well as on the elevations. With this particular menu they created six such drawings which were transferred to plans and elevations for analysis.

Students documented each step taken in the process of preparing the meal-from bringing supplies into the home, through cooking and serving the meal, to cleaning and returning supplies to storage afterwards. On the diagram sheets they graphically tracked food preparation by noting the appliances, counters or cabinets used. To indicate vertical or horizontal movement they drew an arrow from the appropriate counter each time they reached for an ingredient, supply, utensil or pan; and drew a second one back to the counter when they had retrieved the item. They repeated this procedure for each horizontal or vertical movement.

An alternate approach to recording the steps taken while cooking has been used in some classes, depending on when the project occurred during the semester. If students had prepared elevations of the kitchens they used, they tracked the meal preparation on a print of those elevations in much the same way as described above. A supplemental approach would be to then mount those elevations on cardboard and tape them perpendicular to a print of the floor plan. Students should gain a clearer picture of the combined horizontal and vertical steps taken to prepare the meal.

Upon completing the meal students analyzed the diagrams to evaluate relationships among work centers, appliances and cabinetry. After transferring the information from these diagrams to floor plans and elevations they identified potential strengths and weaknesses in the layouts, as emphasized by the graphic appearances of the diagrams. Compact, almost flower-like patterns tended to suggest convenience. Lengthy, jumbled, or crossed patterns generally highlighted inefficiency within or among work centers. Such conclusions could not be made universally, as some of the kitchens, particularly those located in student housing, were quite compact. Students used the diagrams twice more: first as a way to check the convenience of on-going studio design projects; and second as procedural models for the universal design simulation exercises.

Experiencing a Disability

Via lectures and handouts the instructor presented alternate approaches to conventional systems to accommodate changes throughout the individual's life span, including:

- an overview of human abilities – physical, sensory and cognitive (see Leibrock, 1993; Wylde, et al., 1994);
- the concept of environment as prosthesis (see Calkins, 1988);
- overriding safety considerations (see Calkins, 1988; and Mace, 1991);
- principles of wayfinding related to interpreting the environment, sparking memory, and limiting confusion for people with dementia (see Calkins, 1988);
- anthropometric and ergonomic data related to individuals with mobility limitations and to the elderly (see Tilley, 1993; and Henry Dreyfuss Associates, 1974);
- manoeuvering room and placement of features within appropriate reach zones for people with mobility impairments while walking or standing or for those who use support devices or wheelchairs (see Mace, 1991; and Ballast, 1994);
- forward, side and ambulant reach zones (see Tilley, 1993) for individuals with varying limitations (see Mace, 1991);

- configurations that enable individuals with limitations to use kitchens more easily (see Wylde, et al., 1994; and Mace, 1991);
- lighting and the importance of controlling glare to limit confusion (see Calkins, 1988);
- knee spaces and handedness related to fixture and equipment locations (see Wylde, et al., 1994);
- adjustable counter and shelf heights (see DeChiara, et al., 1991);
- electrically and manually adjustable counter heights (see Mace, 1991);
- removable counters (see Leibrock, 1993);
- fixture and appliance products (see Wylde, et al., 1994; Leibrock, 1993);
- shapes and effects of appliance controls and handles (see Mace, 1991);
- redundant controls on appliances used by individuals with dementia (see Calkins, 1988);
- cabinet and storage options – full-extension and low-sided drawers, rolling carts, counter-top shelves, overhead swing-up cabinet doors, etc. (see Mace, 1991);
- cabinet handles and pulls (see Leibrock, 1993);
- miscellaneous kitchen products (see Pirkl, 1994);
- plumbing hardware products (see Leibrock, 1993; and Wylde, et al., 1994);
- life safety and accessibility codes and ADA guidelines (see Falconnier, 1992); and
- special considerations for active families where members with varying capabilities may share in kitchen activities (see Mace, 1991).

Throughout in-class discussions emphasis was placed on the reality that universal design is good design – that an interior designed to support an individual with a disability should be no more or less a machine, and no more or less stark than one designed for an able-bodied person. This point is supported in research findings. For example, after observing people ranging in age from 15 to more than 90 years and varying in abilities from having no limitations to being effected by multiple impairments, researchers noted "the design flaws that stopped (i.e. 'disabled') those with reduced capacity are the same . . . [design attributes that] those without disabling conditions find inconvenient, troublesome, dumb or 'cheap'" (Wylde, et al., 1994, p. 2). Conversely improvements making environments more user-friendly are appreciated by all regardless of abilities.

Students then researched special needs of individuals with various sight, mobility and orientation disabilities, paying particular attention to ramifications for designing kitchens. They prepared annotated bibliographies and collected product information beyond that given in required textbooks and handouts. Additional perspectives were gained from videotaped and actual classroom interviews conducted between interior design students and campus volunteers who had mobility and sight limitations.

Next, a full-scale, cardboard box mock-up of a kitchen was staged for exercises in which students simulated previously assigned mobility, sight and orientation disabilities. Students used wheelchairs, walkers or darkly shaded glasses while enacting the preparation of the same meals they fixed in their homes (see Figure 3). They followed the processes documented during the cooking exercises, paying particular attention to movement between work centers and the ease with which they retrieved supplies and went through other steps to prepare the meal. After the simulation they discussed problems and frustrations they encountered and made recommendations for modifying the mock-up. They then rearranged the model to accommodate better the needs of individuals with specific disabilities. As a culminating experience to appreciate the effects garnered from the changes, the students reenacted the preparation of at least one of the dishes.

Designing a Kitchen

The strategies described above reinforced, but did not replace studio projects. Cooking and simulation experiences occurred while students were designing kitchens. Studio project details and expectations were similar to those found in many sophomore-level interior design courses and do not merit elaboration here; however, capitalizing on the empathy engendered by the cooking and simulation exercises does.

For logistical reasons students completed the food preparation exercise while in the schematic design phase of kitchen projects. At the beginning of design development they made plan overlays illustrating the steps needed to complete the recipes in the kitchens they designed. They referred to the analysis diagrams recorded during the cooking exercises and graphically traced the processes in the manner they might occur in the new layouts. Students then prepared overlays showing design modifications to resolve concerns – e.g. lengthy travel distances, conflicting traffic patterns, excessive crisscrossing or retracing movements – that became apparent graphically on the first overlays. Before the end of this design phase students massaged plans to facilitate using the kitchens.

The universal design simulation exercises occurred during the later stages of the studio projects. As before students prepared two overlays for their drawings: on the first they analyzed plans based on the simulation experiences; and on the second they noted modifications suggested by their observations. Students then adapted the original designs to create accessible kitchens responsive to the needs of specific end-users, and adaptable for others. Final presentations included annotated layouts for clients who are able-bodied and for those who have certain limitations (see Wylde, et al., 1994). Reviewers, including individuals with disabilities, juried the projects on criteria based in part on how discreetly the students incorporated universal design features.

Allowing Time for Exercises

Justifiably, class time spent on projects is an issue for design educators. Cooking exercises and analyses consume one or two class periods. Kitchen mock-up simulations require one studio session and several evenings, depending on the number of students. Redesigning studio projects to enable users with disabilities adds approximately one week to the standard kitchen project.

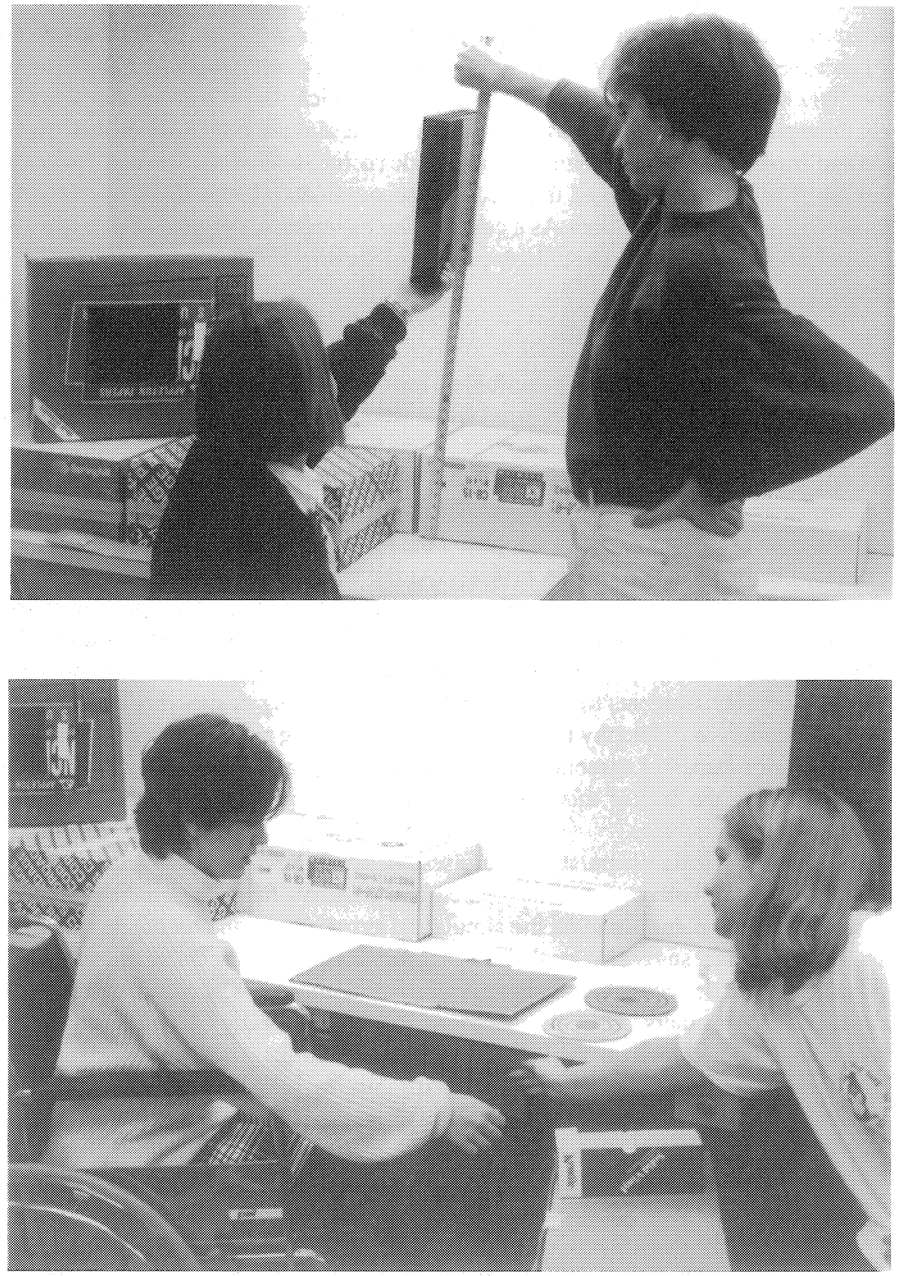

Figure 3. Universal design full-scale mockup simulation exercise. Students reenacted the preparation of the meal as though they had specific physical limitations. They then modified the mockup to enable easier and safer use of the area.

Evaluation of the Process

The food preparation process appears to give students clearer understandings of three-dimensional relationships supporting effective kitchen design than more conventional approaches – designing and analyzing two-dimensional plans and elevations – provide students lacking cooking acumen. Further, having experience cooking as able-bodied people, they appear to empathize more clearly with the challenges faced by people with limiting abilities. Inclusion of the food preparation exercise has been met enthusiastically by the vast majority of students, based on anonymous course evaluations. Most students find this to be a fun exercise. One suggestion that has been made is to work in groups of four instead of two. This idea has been promoted to reduce costs and to limit redundancy in recording the preparation process.

Pedagogically, using elevations of existing kitchens appears more successful than using the generic diagrams shown in Figure 2. Students seem to relate to scaled-drawings better than to non-scaled diagrams. Nevertheless, given the rigors of a course schedule, the use of generic diagrams for tracking food preparation appears adequate, though not preferable.

Student reaction to the full-scale kitchen mock-up exercise reflects the frustrations individuals with physical disabilities face daily. The simulation leaves a lasting impression on the students. Once completing the exercise, they appear to appreciate two basic universal design mandates: flexibility and adaptability.

A definitive marker for the success of these strategies is inherently elusive, as the ultimate goal is to affect how students think, feel, and proceed while designing. If the exercises are successful, the students derive heightened sensitivities to universal design issues; and further, their evolving personal design philosophies meld these issues into the natural flow of designing interiors. In subsequent courses students who have completed the exercises/simulations described here have demonstrated more sensitive concerns for end-users than earlier students who did not have these experiences. Likewise, they have expressed less frustration dealing with codes and guidelines. Empathy for the end-user allows them to embrace the spirit of universal design and to see regulatory checklists for what they are: starting points.

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