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Equipped for Life: Gendered Technical Training and Consumerism in Home Economics, 1920-1980

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Abstract
In tracing the development of technical education in American colleges and universities, historians have tended, perhaps inevitably, to concentrate on engineering departments. Those programs tell an important story: the evolution of specialized disciplines from practical, shop-oriented learning to theoretical science. Also, engineering schools were (as many still are) dominated by male students and faculty, who often connected technical expertise to masculinity.

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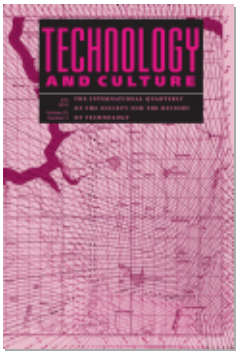

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Equipped for Life

Gendered Technical Training and Consumerism in Home Economics, 1920–1980

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In tracing the development of technical education in American colleges and universities, historians have tended, perhaps inevitably, to concentrate on engineering departments. Those programs tell an important story: the evolution of specialized disciplines from practical, shop-oriented learning to theoretical science. Also, engineering schools were (as many still are) dominated by male students and faculty, who often connected technical expertise to masculinity.[1]

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1. On the history of engineering education, see David Noble, *America by Design* (New York, 1977); George Emmerson, *Engineering Education: A Social History* (New York, 1973); Terry S. Reynolds, ed., *The Engineer in America* (Chicago, 1991); and Bruce Seely, "Research, Engineering, and Science in American Engineering Colleges, 1900–1960," *Technology and Culture* 34 (1993): 344–45. On specific disciplines, see Monte Calvert, *The Mechanical Engineer in America 1830–1910* (Baltimore, 1967), and Karl Wildes, *A Century of Electrical Engineering and Computer Science at MIT, 1882–1982* (Cambridge, Mass., 1985). As examples of books on specific institutions, see Michael Bezilla, *Engineering Education at Penn State* (University Park, Pa., 1981); Samuel Rezneck, *Education for a Technological Society: A Sesquicentennial History of RPI* (Troy, N.Y., 1968); and Judith Goodstein, *Millikan's School: A History of CalTech* (New York, 1991). For the link between masculinity and engineering education, see Ruth Oldenziel, *Making*

Yet, shifting our focus across campus, we find another center of technical training in the history of higher education: departments of home economics. Professors there cooperated with and modeled their outlook and teaching after science and engineering programs. At the same time, home economics was defined by and for women, explicitly addressing females' presumed sphere of interest, domestic life. In that fashion, these programs created an alternate vision of gendered knowledge, asserting a link between technical mastery and femininity—at least in the domain of the kitchen.

This construction of female technical awareness appears most clearly in the emergence of programs specifically aimed at teaching students about domestic equipment. As the twentieth century proceeded, American families adopted appliances of growing sophistication in increasing numbers, from electric refrigerators and ranges to waffle makers, microwaves, and food processors. Rapid changes in tools of cooking and housekeeping could prove confusing; home economists aimed to ease the transition by giving women systematic instruction in modern technology. As the appliance industry grew in size and economic significance, the notion of cultivating appliance consumers acquired particular potency.[2]

This article illustrates that history by analyzing the department at Iowa State College (later University) that pioneered equipment training. Iowa State led the way in the nineteenth century toward inaugurating "domestic economy" as a field of female education; for many years in the twentieth century it surpassed all other American schools in home economics enrollment. More specifically, starting in 1929 Iowa State became the first (and for several decades remained the only) U.S. institution offering an undergraduate major in the study of household equipment. Over the twenty-five years between 1930 and 1955, the equipment department granted 308 bachelor of science degrees. Through the 1940s, Iowa State also remained the sole program granting a master of science in household equipment; by

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Technology Masculine: Men, Women, and Modern Machines in America, 1870–1945 (Amsterdam, 1999); Cynthia Cockburn, *Machinery of Dominance: Women, Men, and Technical Know-How* (London, 1985); Amy Bix, "Feminism Where Men Predominate: The History of Women's Science and Engineering Education at MIT," *Women's Studies Quarterly* 28 (spring/summer, 2000): 24–45, and "'Engineeresses' Invade Campus: Four Decades of Debate over Technical Coeducation," *IEEE Technology and Society Magazine* 19 (spring 2000): 20–26.

2. For background on women and gender in the history of technology, see Judith A. McGaw, "Women and the History of American Technology," *Signs* 7, no. 4 (1982): 798–828, and "No Passive Victims, No Separate Spheres: A Feminist Perspective on Technology's History," in *In Context: History and the History of Technology*, ed. Stephen H. Cutcliffe and Robert C. Post (Bethlehem, 1989), 172–90; Ruth Schwartz Cowan, "From Virginia Dare to Virginia Slims: Women and Technology in American Life," *Technology and Culture* 20 (1979): 51–63; and Nina E. Lerman, Arwen Palmer Mohun, and Ruth Oldenziel, "The Shoulders We Stand On and the View From Here: Historiography and Directions for Research," *Technology and Culture* 38 (1997): 9–30.

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1955, it had awarded sixty-one such graduate degrees. By then other schools (including Purdue University, the University of Minnesota, Ohio State University, Washington State University, and Teacher's College of Columbia University) had started their own equipment courses, yet Iowa State remained preeminent. One graduate student of the era remarked, "Iowa State College and Household Equipment are almost synonymous."[3]

From the beginning, Iowa State's program was built around a fundamental assumption that women could and should acquire a practical yet scientifically based understanding of household technologies. Faculty created a context in which coeds were not only permitted but required to take apart and reassemble machinery in order to appreciate details of its construction, operation, and repair. Iowa State aimed to educate self-reliant homemakers who would confidently accept active responsibility for their kitchen equipment rather than cultivate attitudes of feminine helplessness. Other graduates would professionalize that knowledge, parlaying their education into employment with appliance companies, utilities, and publishing. Through extension-service publications, radio programs, and demonstrations, Iowa State faculty reached thousands of women outside the college each year with lessons about equipment. Such efforts bridged the production and consumption of new home appliances, attempting to ease the introduction of unfamiliar technologies while analyzing their value.[4]

As leaders in the academic analysis of new kitchen technology, Iowa State faculty conducted systematic research and wrote numerous books setting out parameters and principles of this emerging discipline. Such textbooks filled an important niche; *Household Equipment*, written by Louise Peet and fellow faculty and alumnae, went through nine editions between 1934 and 1986, shaping the field for decades. These treatments embedded lessons in physics and engineering squarely inside culturally acceptable boundaries of woman's knowledge. Far from feeling threatened, Iowa State engineering faculty cooperated in equipment teaching and research. The

3. Carleton John Lynde, "Household Engineering," *Journal of Home Economics* 24 (October 1932): 889; Elaine Knowles Weaver, "Let's Have More Equipment Teaching," *What's New in Home Economics*, September 1952, 74–75, 116, 118, 120; *Homemakers' Half Hour* script, no title, 29 March 1951, Louise Jenison Peet Papers, Iowa State University Archives, Ames, box 2, folder 3.

4. On gender and technical skill, see Nina E. Lerman, "'Preparing for the Duties and Practical Business of Life': Technological Knowledge and Social Structure in Mid-19th Century Philadelphia," *Technology and Culture* 38 (1997): 31–59, and "From 'Useful Knowledge' to 'Habits of Industry': Gender, Race, and Class in Nineteenth-Century Technical Education" (Ph.D. diss., University of Pennsylvania, 1993); Arwen Mohun, "Why Mrs. Harrison Never Learned to Iron: Gender, Skill, and Mechanization in the American Steam Laundry Industry," *Gender and History* 8 (August 1996): 231–51. For another perspective on women's skill, see Rachel Maines, "The Tools of the Workbasket: Needlework Technology in the Industrial Era," in *Bits and Pieces: Textile Traditions*, ed. Jeannette Lasansky (Lewisburg, Pa., 1991).

college in Ames thus established kitchen appliance studies as a female technical space, one that sought to empower women to cope with modernized equipment.

Emergence of Equipment Studies

Iowa State College represented a natural site for the nation's first home economics equipment program. As a land-grant school, Iowa State emphasized the importance of technology and applied science for its Midwestern male students. In many ways, household equipment studies developed as a feminine parallel to agricultural engineering. Since its founding in the 1860s, the institution had been committed to admitting women alongside men. Trustees declared, "If young men are to be educated [as] successful, intelligent and practical farmers and mechanics, is it not as essential that young women should be educated to properly understand and discharge their duties as wives of farmers and mechanics? We must teach the girls to acquire by practice a thorough knowledge of the art of conducting a well-regulated household."[5]

That vision of female students as the source of rural family strength led to the initiation of housekeeping instruction at Ames. The first official class, "Chemistry as Applied to Domestic Economy," was offered in 1871, followed by requirements in cooking and family care. By 1912, home economics had grown into its own division, which expanded rapidly.[6]

Instruction in equipment use was initially incorporated into other home economics classes, then envisioned as a full-length course in its own right. In 1924, Eloise Davison, a graduate student in household administration, wrote a master's thesis reporting on a one-quarter course she had helped introduce the preceding year, focused on domestic equipment. Significantly, the new class, test-taught twice, was a cooperative venture of the home economics division and the agricultural engineering department.[7]

Davison established a teaching style derived from one crucial assumption, that rapidly changing technology offered enormous advantages to

5. Ercel Sherman Eppright and Elizabeth Storm Ferguson, *A Century of Home Economics at Iowa State University* (Ames, Iowa, 1971). As general background, see Carolyn Goldstein, "Mediating Consumption: Home Economics and American Consumers, 1900–1940," (Ph.D. diss., University of Delaware, 1994). See also the essays and sources in *Rethinking Home Economics: Women and the History of a Profession*, ed. Sarah Stage and Virginia B. Vincenti (Ithaca, N.Y., 1997).

6. "The Nation's First Home Economics School Reviews 75 Years of Progress," *Iowa Homemaker*, November 1947, 5–6; Eppright and Ferguson. Even before the first official class was created, Mary Welch, wife of Iowa State's first president, offered lectures in housekeeping to female students.

7. For more on cross-disciplinary intersection of interests, see Grace L. Pennock, "The Relationship Between Engineering and Home Economics," *Agricultural Engineering* 11 (November 1933): 299–301, 308.

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twentieth-century homemakers. Reflecting sentiments common in 1920s America, Davison wrote: "The whole modern period in which we live is an age of machinery." She insisted that progress in domestic habits "must come through the adoption of household machinery," which could reshape everyday life even in remote rural areas. Davison equated the value of technology for women inside the farmhouse with its importance for men inside the barn. Pointing to USDA charts tying the purchase of farm equipment to crop value, Davison argued that "Money invested in home machinery shows similar returns in the saving of time and money." She regarded such improvements not as an end but as a means, freeing women from drudgery to undertake more meaningful purposes. "There never has been a time when demands upon the homemaker were greater than today. Her responsibility of taking active part in both social and political questions [means] routine work in the home must be simplified."[8]

Such gains would not come automatically, Davison warned. She bemoaned the fact that average homemakers lacked experience in handling machinery, meaning that "much prejudice, fear, ignorance, and tradition must be overcome before electrical, mechanical, or steam-power devices can be introduced into our households." But Davison insisted that expert training could ease women past intimidating technical mysteries, encouraging them to master and even welcome new appliances. Just as Iowa State men received systematic training to familiarize them with the latest tractors, so Davison would transform coeds into "household engineers" by making them skilled in "selection, utilization, manipulation, and care of household equipment."[9]

8. Eloise Davison, "A Course in Home Economics: A Report of a Successful Course Offered to Sophomore Women at Iowa State College" (master's thesis, Iowa State College, 1924), 6, 9, 21. See also Eloise Davison, "Electricity and the Farm Home," *Journal of Home Economics* 18 (April 1926): 215–16. On the history of gender and domestic technology in rural America, see Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore, 2000); Katherine Jellison, *Entitled to Power: Farm Women and Technology, 1913–1963* (Chapel Hill, N.C., 1993); and Gregory B. Field, "'Electricity for All': The Electric Home and Farm Authority and the Politics of Mass Consumption, 1932–1935," *Business History Review* 64 (1990): 32–60. In practice, rural women complained that men proved reluctant to invest money to improve farmhouse work; given farms' limited economic resources, purchasing new equipment for the field and barn often remained a higher priority. Christine Kleinegger, "Out of the Barns and into the Kitchens: Transformations in Farm Women's Work in the First Half of the Twentieth Century," in *Women, Work, and Technology*, ed. Barbara Wright (Ann Arbor, Mich., 1987), 162–79. For more on the struggle to overcome such resistance and get rural men to appreciate the value of home technologies, see Lynne Curry, *Modern Mothers in the Heartland: Gender, Health, and Progress in Illinois, 1900–1930* (Columbus, Ohio, 1999).

9. Davison, "A Course in Home Economics," 7–9. On the perceived link between electricity and progress, see David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880–1940* (Cambridge, Mass., 1990), and Mark Rose, *Cities of Light and Heat: Domesticating Gas and Electricity in Urban America* (University Park, Pa., 1995).

By 1928 Iowa State had made equipment classes part of its regular home economics curriculum. Describing the rationale behind this move, graduate student Vivian Brashear wrote: "The fact that the homemaker of today must meet problems quite different from yesterday requires that provision be made to prepare her for changing conditions." Teaching sophomore-level equipment classes, Brashear echoed Davison's assumptions. Her approach was not value neutral; Brashear explicitly aimed to convince new generations "to appreciate the importance of utilizing and encouraging mechanical inventions." She saw much room for advancement, considering that millions of women still cooked "in kitchens differing but little from a hundred years ago." When Brashear's students asked their mothers to track time-use, analysis revealed that the study's seventy-two farm homemakers typically devoted eleven hours daily to domestic chores, while the seventy-seven townswomen spent nine hours (figures close to those uncovered in other studies of the period). Such long workdays, Brashear asserted, clearly demonstrated "tremendous waste of time and human energy which could be reduced were advantage taken of the improved facilities and labor-saving equipment commonly found on the market today." According to Brashear, women already perceived potential for improvement; Iowa State's home economics division received dozens of letters monthly from women seeking reliable advice on choosing and using equipment.[10]

In 1929 the home economics division promoted equipment studies to the status of a department, organized by Eloise Davison, now assistant professor. The first faculty roster consisted of Brashear and mechanical engineering professor Herbert Sayre, signifying the perceived connection between engineering and equipment studies. Undoubtedly, elements of engineering authority and masculine representation lent legitimacy to the new discipline, yet from the outset it was clear that women would define the field.

Davison and Brashear were the first of several strong personalities who shaped Iowa State's equipment program. After Davison left to become home economics director for the Tennessee Valley Authority and the National Electric Light Association, Louise Peet headed the department for twenty-two years. Peet had received bachelor's and master's degrees in

10. Vivian Jordan Brashear, "A Beginning College Course in Household Management Based on the Problem Method" (master's thesis, Iowa State College, 1928), 5–7, 20. As an example of other time studies, see Hildegarde Kneeland, "Is the Modern Housewife a Lady of Leisure?" *Journal of Home Economics* 21 (October 1929): 745–46. See also Florence F. Ward, "The Farm Woman's Problems," *Journal of Home Economics* 12 (October 1920): 437–55. For background on women, technology, and housework in this era, see Ruth Schwartz Cowan, "Two Washes in the Morning and a Bridge Party at Night: The American Housewife Between the Wars," *Women's Studies* 3, no. 2 (1976): 147–72. For an overview of the history of time studies, see Ronald Kline, "Ideology and Social Surveys: Reinterpreting the Effects of 'Laborsaving' Technology on American Farm Women," *Technology and Culture* 38 (1997): 355–85.

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chemistry at Wellesley and studied chemistry at the University of Zurich before earning her doctorate in nutrition and physiology at Iowa State. As frequently happened with emerging disciplines in that era, Iowa State's faculty grew from within. Elizabeth Beveridge received a master of science degree in household equipment in 1934, then returned to Ames as department chair in 1953. At least six other women (Vivian Brashear, Mary Pickett, Faith Madden, Lydia Inman, Lenore Enid Sater, and Virginia Lincoln) joined the expanding equipment faculty after graduating from Iowa State. Some, like Peet, had a solid grounding in science; Lincoln majored in physics at Wellesley before coming to Iowa State for her equipment master's, while Sater took a teaching sabbatical to pursue her physics doctorate.[11]

Recognized as a distinct department, Iowa State's equipment program rapidly gained status. A 1936 booklet told prospective students:

> The modern house, with its gleaming array of light fixtures, refrigerator, range, vacuum cleaners, mixer, dishwasher, washing machine, iron, toaster, waffle iron and garbage grinder, is a complex and puzzling workshop for the young woman about to embark on a homemaking career. Even the most modest home boasts enough mechanical gadgets to make today's homemaker not only need but welcome a knowledge of their selection, use and care. Household Equipment is one of the newer branches of home economics, and at the present time Iowa State is the only institution offering a major sequence in this field.[12]

The majority of coeds attending Iowa State enrolled in the home economics school, which made the equipment program naturally attractive for women with mechanical talents. But while the department allowed and even encouraged women to assert an interest in technology, such opportunities also proved a gender-stereotyped trap. Lenore Sater became interested in machinery as a child, helping her father maintain family cars and handle farmstead repairs. When she arrived in Ames, the dean of engineering steered her into household equipment studies. The engineering profession simply was not perceived as appropriate for women; the dean perhaps intended to do Sater a favor in shielding her from the hostility of men indignant at having their turf invaded.[13]

11. "Observe Tenth Anniversary," *Iowa State Daily Student*, 11 November 1941, 5; "Louise Jenison Peet," obit., *Ames Daily Tribune*, 11 May 1983. Peet was listed in the 1940 edition of *American Men of Science*, and she continued teaching at Iowa State until age eighty-eight. See Louise Jenison Peet Papers, box 1, folder 1. For historical background on female faculty in home economics, see Margaret Rossiter, *Women Scientists in America: Struggles and Strategies to 1940* (Baltimore, 1982), and *Women Scientists in America: Before Affirmative Action, 1940–1972* (Baltimore, 1995).

12. *Home Economics at Iowa State College* (booklet), Iowa State publication 35, no. 8 (Ames, 1936).

13. "Another Viewpoint on Home Freezers," *Electrical Merchandising*, October 1945,

Women who entered equipment studies faced extensive requirements, including three physics courses and two classes in household electrical equipment, plus one six-hour introduction to laboratory research methodology. Soon the department added a two-hour household equipment seminar, a three-hour course in electric circuits, and a one-hour "electrical laboratory." Equipment students also enrolled in a battery of general home economics courses (food chemistry, textiles and clothing, home management, child development), sciences (bacteriology, biology, physiology), social sciences, and humanities. Majors were expected to draw on this cross-disciplinary curriculum in giving required public demonstrations of new appliances. Knowledge of nutrition should help a student explain how a particular range enhanced preparation of balanced meals; economics courses would help her compute the value of an electric refrigerator, while art and psychology courses would let her show audiences the aesthetic appeal of modern equipment design.[14]

Iowa State required equipment majors to make public presentations, learning to translate technical knowledge into layman's language, as preparation for employment. Though many graduates soon married and did not pursue careers, dozens chose to enter the business world. Their skills were in steady demand by utility companies and appliance manufacturers pursuing an expanding market. For example, during the 1930s graduates secured positions with Chicago's Commonwealth Edison, Milwaukee's Gas and Light Company, and gas companies in Tulsa, Kansas City, and Topeka. These home-service employees gave shop-floor presentations to potential buyers and offered equipment demonstrations to local women's clubs, high schools, and adult-education groups. They ran company display booths at fairs, model homes, appliance shows, and furniture conventions. Working for Buffalo General Electric, 1935 Iowa State graduate Betty Melcher described to later students how she wrote tips for electric range users and gave new owners personalized instruction. "If Mrs. Jones swears she can't bake a cake and threatens to throw her range out, it is my job to prove to her that she can, and incidentally sell her on keeping the range." Coeds still in school prepared for such duties by answering real home-service calls around Ames. To expose young women to corporate culture, faculty took juniors,

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108, 110; Catherine Raymond, "Behind Closed Doors in Appliance Research," *Iowa Homemaker*, February 1941, 4. On the subject of women "invading" engineering, see Bix, "'Engineeresses' Invade Campus" (n. 1 above). Women who defied expectations and chose a science major also sometimes found the home economics equipment program a welcoming haven when their major departments proved inhospitable to coeds or when they chose a "feminine" topic of research. For example, during the early 1940s, Margaret Woodrow, a graduate student in applied math and physics, conducted her master's work in the equipment labs, investigating improved methods for testing efficiency of electric ranges.

14. "Equipment Majors Give Demonstration," *Iowa State Daily Student*, 5 March 1942, 5.

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seniors, and graduate students on field trips across the Midwest. In 1937, sixteen students visited metallurgical and chemical testing labs of the Hoover Vacuum Cleaner Company, as well as General Electric's Kitchen Institute, where they talked with engineers developing new ranges, refrigerators, and dishwashers.[15]

As additional career training, journalism classes taught equipment students to write about technology for a general readership. Iowa State placed graduates with *McCall's Magazine* laboratories, with the Searchlight Kitchen of *Household Magazine*, with *Women's Home Companion*. After receiving her master's degree, Elizabeth Beveridge became equipment specialist at the *Ladies' Home Journal*, where she tested new appliances and answered readers' questions about kitchen improvement. Other graduates went into government; Lenore Sater became head of the Housing and Household Equipment Division in the Department of Agriculture's Bureau of Nutrition and Home Economics. Still others went into academia, developing equipment courses at institutions such as the University of Georgia.[16]

Along with training undergraduates, Iowa State also reached out to older women and those not enrolled in college. Extension service represented an important land-grant mission; experts sought to educate housewives about proper appliance use and raise their comfort level with new technologies. In 1925, for "Farm and Home Week," equipment studies faculty and students encouraged female open-house visitors to enter department labs and try new equipment themselves. Faculty routinely answered queries from across the country about what type of refrigerator suited a family's particular needs. During the 1940s, through notices in newspapers and farm periodicals, the department invited homemakers to send in pres-

15. "Alums at Work," *Iowa Homemaker*, May–June, 1936, 6; Vivian Brashear, "Housework to Testing Lab in Equipment Field," *Iowa Homemaker*, May–June 1935, 6; "Does It Work?" *Iowa Homemaker*, November 1937, 5; Virginia Berry, "Equipment Students Travel," *Iowa Homemaker*, May 1937, 11. See also Mary Camille Grout, "Knowledge with Fun!" *Iowa Homemaker*, March 1953, 14, and the American Home Economics Association booklet *For You A Career in Home Economics* (Washington, D.C., 1948). On the history of women's employment with utilities and other equipment businesses, see Carolyn M. Goldstein, "From Service to Sales: Home Economics in Light and Power, 1920–1940," *Technology and Culture* 38 (1997): 121–52, and "Part of the Package: Home Economists in the Consumer Products Industry, 1920–1940," in Stage and Vincenti (n. 5 above), 271–96; James C. Williams, "Getting Housewives the Message: Gender and Energy Marketing in the Early Twentieth Century," in *His and Hers: Gender, Consumption, and Technology*, ed. Roger Horowitz and Arwen Mohun (Charlottesville, Va., 1998), 95–113. For a British perspective, see Suzette Worden, "Powerful Women: Electricity in the Home, 1919–40," in *A View from the Interior*, ed. Judy Attfield and Pat Kirkham (London, 1989). On women's corporate employment, see Regina Lee Blaszczyk, "'Where Mrs. Homemaker is Never Forgotten': Lucy Maltby and Home Economics at Corning Glass Works, 1929–1965," in Stage and Vincenti, 163–80.

16. "Brief Outlines of Courses in Household Equipment Taken by Majors," n.d., Louise Jenison Peet Papers, box 3, folder 14.

sure-cooker gauges to be checked for accuracy and recalibrated. During Iowa's annual state fairs and VEISHEA, the college's own yearly festival, faculty and students displayed kitchen floor plans, demonstrated electric washers, and handed out cookies baked in the latest ovens.[17]

Starting in 1926, home economics faculty presented shows on Iowa State's radio station. By 1931 *The Homemakers' Half Hour* had become a regular weekday feature, frequently featuring such equipment-instruction themes as "Refrigerator Facts and Fancies." Programs reflected a conviction that ordinary housewives could and should acquire technical knowledge; every year, faculty delivered a program titled something like "What Every Woman Should Know About Wiring." Vivian Brashear's 1942 version detailed electrical functions step by step, from volts, amperes, and watts to the difference between starting and operating load demands on a washer. Couching her points in accessible language, Brashear explained changes in resistance by saying, "That good old waffle mold that always turned out such nice brown waffles suddenly gets tired and turns out pale softies no one wants." Programs were also packed with practical hints; Lydia Inman advised that washing waffle makers was unnecessary, since "nickel or chromium finish can be kept nice by wiping with a damp cloth and polishing." Presenters challenged audiences not to be frightened away by technical terminology, and indeed, listeners showed interest in equipment questions. Each month, Iowa State received hundreds of requests for program scripts.[18]

17. "Iowa State College," *Journal of Home Economics* 17 (April 1925): 242; "Women Check Gauges," *Iowa State Daily Student*, 27 May 1943, 6; Adelaide Richardson, "Veishea Presents a Study in Modernity," *Iowa Homemaker*, May 1940, 14. On the history of Iowa State home economics extension work, see Neale S. Knowles, *Home Economics Extension Work in Iowa: An Informal Review* (Ames, Iowa, 1939); Dorothy Schwieder, *Seventy-Five Years of Service* (Ames, Iowa, 1993), and "Education and Change in the Lives of Iowa Farm Women, 1900–1940," *Agricultural History* 60 (spring 1986): 200–15. VEISHEA is derived from the names of Iowa State's five colleges in 1922, when the festival got started: the "V" stands for veterinary medicine, "E" for engineering, "IS" for industrial science, "HE" for home economics, and "A" for agriculture.

18. Vivian Brashear, "Odds and Ends in Keeping Them Working," *Homemakers' Half Hour* script, October 1942, and Lydia Inman, "Handle Your Christmas Presents With Care," *Homemakers' Half Hour* script, 4 January 1951, Louise Jenison Peet Papers, box 2, folder 3. See also Gaynold Carroll, "Home Ec Women Take the Air," *Iowa Homemaker*, October 1939, 5, and "Homemaking Travels by Radio," *Iowa Homemaker*, November 1947, 11. On the history of the *Homemakers' Half Hour*, see Jason B. Chrystal, "'Always Worth While': The *Homemakers' Half Hour* at Iowa State College, 1925–1939," Department of History, Iowa State University. As background on gender and the history of radio, see Michele Hilmes, *Radio Voices: American Broadcasting, 1922–1952* (Minneapolis, 1997); Susan J. Douglas, *Inventing American Broadcasting, 1899–1922* (Baltimore, 1987); Reynold M. Wik, "The Radio in Rural America During the 1920s," *Agricultural History* 55 (October 1981): 339–49; and Morleen Getz Rouse, "Daytime Radio Programming for the Homemaker, 1926–1956," *Journal of Popular Culture* 12 (fall 1979): 315–27.

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FIG. 1 Women in Iowa State College's household equipment laboratory, 1935, studying the question "how fast do electric surface units heat?" (Iowa State University Library, Special Collections Department.)

To support outreach and teaching, Iowa State took pains to keep equipment labs up to date. Research by faculty, graduate students, and undergraduates analyzed new models of different appliances, collecting quantitative data about their capacities (fig. 1). For her master's degree in 1923, Eloise Davison measured the comparative efficiency of coal, kerosene, and gas stoves, using a calorimeter specially designed to measure water evaporation rates. Faith Madden's 1936 thesis tested four kerosene and gas ranges to judge their cooking efficiency, simplicity of use, ease of cleaning, fuel cost, and operating speed. Other student research topics included "Comparative Efficiency of Electric and Hand-Operated Utensils," "Recommended Methods for Testing Performance of Electric Roasters," and "The Effect of Added Rotations of the Bowl of an Electric Mixer on Certain Food Products." Investigations reflected practitioners' awareness of technical subjects such as materials science; Lenore Sater's thesis studied how thickness of sheet aluminum affected utensils' thermal efficiency.[19]

19. Eloise Davison, "Stove Efficiency Tests" (master's thesis, Iowa State College, 1923); Faith Madden, "The Operating Efficiency of Certain Liquid-fuel Ranges" (master's thesis, Iowa State College, 1936); and Miriam Rapp, "Some Factors Affecting the Efficient Operation of Electric Stoves" (master's thesis, Iowa State College, 1926). As examples of joint faculty-student research, see Harriet B. Breckenridge and Louise J. Peet, "Combination Dry and Steam Flatirons Tested," *Journal of Home Economics* 40 (March 1948); Florence Ehrenkranz and Margaret Lee De Atley, "Temperature-Measuring Devices for

In conducting original research, the equipment program stressed its disciplinary authority and intellectual legitimacy. Faculty and students published results in experiment station newsletters and leading home economics journals; underlining parallels with science, papers bristled with diagrams, data, and tables. Equally important, by maintaining a nationally recognized research agenda, Iowa State established dialogue with equipment businesses that submitted products for testing and evaluation. Ultimately, faculty believed, knowledge gained through careful investigation would trickle down to both manufacturers and consumers, fostering long-term improvements in equipment.

Teaching Women Technical Understanding

From the start, Davison established a characteristic instructional style for a new equipment studies discipline. She insisted that students learn the scientific and technical principles behind cooking and other chores to comprehend how and why appliances worked (or didn't). Second, women should absorb that theory through hands-on experience, experimenting on equipment in structured laboratory courses. Finally, coeds should apply such knowledge to everyday problems, transforming themselves and their parents, students, and neighbors into better homemakers.

Davison's scientific and technical emphasis appeared most clearly in her unit on electrical equipment. At a time when electricity remained unfamiliar to many Americans, Davison set out to make future homemakers comfortable with it. After explaining the nature of electricity, she taught students how to apply Ohm's law to equipment questions. In the lab, women learned to replace worn-out fuses, repair a lamp socket, and fix an iron's electrical cord. They investigated electric-range construction, studying different types of heating elements and problems of burnout.[20]

Davison's contemporary, Vivian Brashear, equally embraced the idea that women must understand the scientific and technical foundations of equipment, and that from those foundations they could derive practical conclusions. A segment of one of her courses explained the importance of maintaining temperature control and then asked students to scrutinize

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Meat Cooked in a Pressure Saucepan," *Journal of Home Economics* 41 (October 1949); Florence Ehrenkranz, Virginia E. Hirschbeck, and Margaret I. Marron, "Temperatures of Ice and Food in a Home Freezer," *Refrigerating Engineering* 57 (August 1949). Reflecting continued commonality of outlook and interests, engineering staff occasionally joined home economics specialists for interdisciplinary research; Florence Ehrenkranz and graduate student Kathryn Philson collaborated with agricultural engineer Landy Altman Jr. in studying electric demand on sixteen Iowa farmsteads. Landy B. Altman Jr. and Florence Ehrenkranz, "Sixteen Farm Families Watch Electric Use," *Iowa Farm Science*, April 1952, 24.

20. Davison, "A Course in Home Economics" (n. 8 above), 25–26, 48–51.

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three refrigerators (gas, electric, kerosene) and determine which had the best insulation, which kept food compartments coolest, which operated most easily and economically. In another exercise, Brashear asked: "When Miss Sheets tried to use the electric oven on the Crysteel, she found the electricity did not seem to turn 'on'. Next to the Crysteel is the L and H electric range. On which of these stoves would it be easier to locate trouble? Why?"[21]

Defying notions of feminine technical and scientific ignorance, Iowa State required equipment majors to study physics, math, and electric circuits. When World War II began, that background made its students a valuable commodity in industries and government agencies short on manpower. Representatives of the Naval Research Laboratory traveled to Ames to interview equipment majors for engineering posts. At recruiters' suggestion, the program in 1942 added a five-hour algebra, trigonometry, and calculus course to accelerate the women's preparation for emergency employment. Majors could also sign up for special wartime electrical engineering classes; those students were nicknamed WIRES, standing for "Women Interested in Real Electrical Subjects." Iowa State's engineering professors reported that they originally planned to give "these girls elementary background [as] a gentle transition from biscuit baking." As things turned out, one instructor reported, anyone "who expect[ed] to see the girls changing a fuse or repairing a toaster cord [was] sadly disappointed. Baby stuff! They learned those things in their own equipment lab when they were freshmen." Coeds were ready to pursue "more rugged topics" such as magnetic circuits, vector diagrams, transformers, and synchronous motors. Though the special class yielded only a handful of graduates, Iowa State WIRES immediately entered wartime testing and design work for General Electric, Western Electric, and General Motors.[22]

Other equipment students prepared for wartime engineering through on-the-job crash training. Desperate for technical staff, GE announced it was "hiring young college women to do work formerly done by male engineers [to] make computations, chart graphs, and calibrate fine instruments

21. Brashear, "A Beginning College Course in Household Management" (n. 10 above), 50–51. In order to help students practice appliance use, the department arranged its classroom equipment in different layouts reflecting variations in space, wealth, and context: one setup represented a typical farm kitchen, another a small apartment kitchen, another incorporated the most modern innovations. Students acquired further hands-on equipment experience by working in Iowa State's institutional kitchen and tearoom, or by living in home-management practice houses.

22. "Interview Women for Naval Jobs," *Iowa State Daily Student*, 9 October 1942, 3; "Require Equipment Majors to Add 5-Hour Course," *Iowa State Daily Student*, 15 October 1942, 4; and Ben S. Willis, "The Wires Take Over," *Iowa Engineer*, October 1943, 41. See also "Dean Fisher Tells Students They're Fit for War Work," *Iowa State Daily Student*, 11 November 1943, 5. As preparation for work in drafting, home economics students majoring in the applied art department or in textile and clothing studies signed up for wartime classes in engineering drawing.

for use in the machine-tool industry. Although no one expects these girls to become full-fledged engineers, most of them will be given the Company's famous 'test' course." Nine Iowa State women from the classes of 1940, 1941, 1942, and 1943 signed up. During the day, they reported for work testing radio transmitters, receivers, and airplane motors; evenings, they studied engineering theory and practiced using slide rules.[23]

Connections between corporate engineering employment and Iowa State home economics training continued into the postwar years. After finishing her equipment degree in 1951, Pat Traylor became a GE engineering aide. Refusing to be relegated to routine calculations, Traylor worked in GE's Aeronautics and Ordinance Systems Department. Other participants in the confidential project (testing components of a new U.S. Navy automatic pilot) regarded her home economics background as a curiosity. She next moved into the grease pits where GE's gas turbines were manufactured. "I made those test engineers swallow their guffaws about Home Ec majors! I was certainly glad I had physics and household equipment mechanics courses and could use testing instruments." Later assignments returned Traylor to more conventionally gendered territory; she became an engineering assistant in GE's Home Laundry Equipment Development, using radioactive bacteria to test the cleaning power of new washing machine designs.[24]

Despite the postwar reassertion of traditional gender roles (symbolized by the disappearance of Rosie the Riveter), Iowa State continued to insist that women learn to handle technology competently. Louise Peet wrote in 1958: "The complexities of lighting, plumbing, and heating once were considered too difficult for the feminine mind. Today's young homemaker finds it useful to have a working knowledge of these and other technical subjects such as electricity, gas, thermostats, insulation, or the characteristics of glass, plastics, and synthetics."[25]

Indeed, following World War II, Iowa State's equipment program grew increasingly intense. Students concentrating in equipment testing took nine hours' worth of classes in equipment mechanics, plus a two-hour equipment seminar, a three-hour course on gas and electric cooking appliances, and a three-hour course in refrigeration and home lighting. Majors also met considerable science requirements, including eighteen hours of physics, three hours of physiological and nutritional chemistry, five hours of food analysis, twenty-four hours of math, plus classes on research statistics and writing scientific papers.[26]

23. Bette Simpson, "Engineering Enlists Women," *Iowa Homemaker*, November 1942, 7. See also Frances Madigan, "Women Choose Engineering Careers," *Iowa Homemaker*, April 1943, 15.

24. Beverly Gould, "Meet Miss Engineer," *Iowa Homemaker*, February 1953, 7.

25. Louise J. Peet, *Young Homemaker's Equipment Guide* (Ames, Iowa, 1958), viii.

26. Bessie W. Spratt, "Development of the Home Economics Curriculums of Iowa State College from 1923 to 1953" (master's thesis, Iowa State College, 1953). The sequence

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Peet, together with her former student Faith Madden, maintained the department's scientific focus by expanding laboratory training and devising a new series of classroom experiments. Some of Madden's tests were relatively straightforward; students judged different waffle irons by baking plain waffles in each and comparing crispness, tenderness, and texture. Other classes literally took appliances apart in order to evaluate their manufacture and operation. One exercise asked students to dismantle a refrigerator completely and assess how its features applied fundamental physics principles of cooling and temperature control. Accompanying diagrams pinpointed locations of the evaporator, condenser, and other parts. Similarly, units on cooking assigned students to dismantle several ranges as completely as possible, examine their construction, and compare instruction booklets. After students filled out inspection sheets and reassembled the different models, Madden asked them, "What is the function of the heat distributor? What provision do manufacturers make in broiler construction to prevent smoking? What is the most common oven lining [and its] advantages and disadvantages? What construction differences are noticed in gas and electric range ovens?"[27]

Upper-division courses provided especially intense reviews of scientific information, including magnetism, electrostatics, resistance, capacitance, and schematic wiring diagrams. Seniors in home-refrigeration classes discussed problems of heat transfer and inspected installation of furnaces and air conditioners on local construction sites. Their final project involved planning a complete household heating and cooling system, including technical specifications and cost estimates.[28]

Iowa State stressed the scientific and technical dimensions of equipment study for several reasons. That emphasis gave home economics prestige, underlining practitioners' claim to academic respectability and professional standing. Secondly, faculty wanted to instill basic mechanical abilities in students, giving them the courage of self-reliance. Graduates of Madden's or Beveridge's lab should never need to pay handymen or beg a husband to change a fuse. Their manuals gave step-by-step directions and diagrams for repairing a socket, an electrical outlet, and an appliance plug. Charts explained the differences between common house circuits, listing wire size, ampere rating, voltage, and load capacity of each. So that students might see the danger of short circuits, Beveridge ordered them to overload a circuit and blow a fuse deliberately, reading voltmeters and ammeters at

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in home service substituted radio writing and broadcasting courses for some of the physics.

27. Faith Madden, *Household Equipment Experiments* (Ames, Iowa, 1952), 67. See also "Home Economics Training Provides Well-rounded Education," *Iowa State Daily Student*, 19 August 1942, 5.

28. "Brief Outlines of Courses in Household Equipment Taken by Majors" (n. 16 above).

each stage. Given this understanding of wiring, she then asked students to describe how electricity was transmitted from the generating plant to breakfast nook, explaining all factors. "What might cause your toast to be browner at one time than another, even though load on the house circuit is the same?"[29]

Equipment courses not only sought to teach students minor repair skills but also stressed strategies to avoid expensive major problems. Beveridge's textbook asked: "Are you plagued by frequent malfunction or breakdown? The homemaker who wants to 'run her home' rather than 'be run by it' needs an understanding of her tools and equipment so she can make them serve her." Faculty urged women to read instruction books carefully and to obtain copies of service manuals, which contained hints for better operation. They emphasized that appliances required active commitment; women should check equipment periodically and obey manufacturers' guidelines for oiling, filter replacement, and other preventive maintenance. Experts scolded irresponsible or uninformed women who let appliances collect so much dirt they broke. When equipment failed, intelligent housewives should check connections and other mechanical details before complaining. Reportedly, the professors noted, forty percent of service calls could be blamed on customers' inability to follow directions.[30]

Evidence suggests that equipment majors indeed took pride in being technically trained women. In 1931, the *Iowa Homemaker* (a publication by and for home economics students) told the morality tale of a graduate who failed to appreciate the value of her required lab courses, until the day she confronted multiple kitchen crises while preparing for important guests. After fixing the plug on a broken coffee percolator, she realized that her stove refused to work. "Before she got to the telephone, she remembered her husband laughing about the woman who called the day before for an electrician to put in a fuse." After changing the fuse herself, she found one burner still nonoperational. "Of course this was a man's job, but could she wait until an electrician came? She needed to use every unit. Well, she had learned something about it in college, so she pulled out the unit. A wire had come loose. Disconnecting the stove from the circuit, she diligently worked with the pliers and was successful. So simple! Perhaps it wasn't really a man's job after all." The young woman even finished cooking with spare time to fix an extension cord for a new lamp. "Her pride increased when her sister-in-law said, 'I had to run out this noon and buy lunch. Our fuse was burned out. Wouldn't it be nice if a woman could understand such matters?' 'A housewife really must know all those things,' our heroine answered, knowingly."[31]

29. Elizabeth Beveridge, *Choosing and Using Home Equipment* (Ames, Iowa, 1968), 50.

30. Beveridge, 7.

31. Thelma Carlson, "A Simple Tale of Science," *Iowa Homemaker*, June 1931, 5. See also Marjorie Griffin, "Why You Take 'Those Awful Sciences,'" *Iowa Homemaker*, January 1935, 4.

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As the final rationale for teaching scientific principles, professors emphasized that although design changes made a 1950s kitchen look very different from its counterpart of the 1910s, physics remained constant. Beveridge wrote: "Throughout your lifetime there will be many changes in equipment, and the second range you buy will likely be far different from the first. The method of producing or controlling heat may be new, but the laws of heat transfer will still operate to cook." Hence, courses on refrigeration set out equations for measuring insulating capacity and asked students to explain theories of conduction, convection, and radiation heat transfer, fluid flow, and thermodynamics. In lab, students analyzed refrigerator cycling by installing a recording ammeter in the circuit to measure the amount of time the compressor motor had to operate.[32]

According to Iowa State's philosophy, once women understood the principles of how equipment worked, they should be able to judge its inherent quality. Students who mastered the professor's description of kitchen tools as small compound machines would know that rotary beaters with long oval blades were more efficient than ones with small round blades. Helen Van Zante taught her Iowa State classes to calculate a beater's precise mechanical advantage by counting its cogs. Coeds could double-check that mathematical analysis against lab results, where the standard beater test called for comparing the quantity and texture of soapsuds whipped up by different models in a bowl of detergent.[33]

Scientific and technical competence were intended to transform women into informed consumers, ready to look beneath an appliance's fancy finish—literally. Professors advised buyers to tap a range's sides to gauge insulation, inspect the back for construction flaws, and examine door hinges. Courses devoted significant attention to construction details, asking students to figure out why manufacturers used screws on some parts of an appliance and welding elsewhere. Peet's teaching emphasized materials science; after reviewing her extensive charts listing properties of different metals, students should realize why aluminum's excellent conductivity made it a good material for cooking utensils. While valuable for homemakers, such knowledge was particularly essential for home economics professionals, who would solve problems for women lacking technical training. Beveridge asked students, "If you were a home economist for a gas or electric company and a customer told you her cookies were not baking evenly, what points [of ranges and pan materials] would you check to find the answer?"[34]

32. Beveridge, 7.

33. Helen Van Zante, *Household Equipment Principles* (Englewood Cliffs, N.J., 1964).

34. Beveridge, 91.

Technically Informed Equipment Consumers

The concept of using technical training as a tool to help consumers make wise decisions was a long-standing vision at Iowa State. Defining the first equipment course in the mid-1920s, Davison explicitly argued that, given the flood of new technology coming to market, women needed to become informed family consumers, taught to cope "with the confusing problems of modern salesmanship." Davison did not want women blindly running out to purchase every new appliance; students should cultivate a scientifically based "discriminating judgment" to "distinguish between true labor saving equipment and [what] so often is [really] labor complicating equipment."[35]

Brashear emphasized that intelligent equipment selection was contextual, that consumers must consider their personal situation and financial resources when choosing among options. She pushed students to move classroom knowledge into the real world, helping acquaintances pick appliances most appropriate for their situation. A typical exercise asked: "I have moved to a rented farm not knowing how long I shall stay. I need a stove which can be started quickly and heated fast, since I am away from home most of the day. In the laboratory are propane, gasoline, and kerosene stoves. Which would you select for me? Why?"[36]

The tone of such questions changed during the 1950s, as rates of teenage marriage rose. Instead of having pupils advise their mothers or adult neighbors on appliance choice, Iowa State asked students to select equipment of their own. Bringing immediacy to class work, faculty addressed coeds who were on the brink of weddings, if not already wives and mothers. In her 1958 *Young Homemaker's Equipment Guide*, Peet wrote: "You can't 'keep house' without a certain amount of basic equipment. Many of you will

35. Davison, "A Course in Home Economics" (n. 8 above), 12. For more on this subject, see Eloise Davison, "Standards for the Selection of Household Equipment," *Journal of Home Economics* 20 (December 1928): 879–81, and Faith M. Williams, "Purchasing Problems of the Household Buyer," *Journal of Home Economics* 21 (October 1929): 724–30. On the history of gender and domestic consumerism, see Joy Parr, "What Makes Washday Less Blue? Gender, Nation, and Technology Choice in Postwar Canada," *Technology and Culture* 38 (1997): 153–86, and "Shopping for a Good Stove: A Parable about Gender, Design, and the Market," in Horowitz and Mohun (n. 15 above), 165–87; Judy Wajcman, *Feminism Confronts Technology* (University Park, Pa., 1991); Katherine Jellison, "'Let Your Corn Stalks Buy You a Maytag': Prescriptive Literature and Domestic Consumption in Rural Iowa," *Palimpsest* 69 (1988): 132–39. For a signal analysis, see Ruth Schwartz Cowan, "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. Wiebe E. Bijker, Trevor Pinch, and Thomas P. Hughes (Cambridge, Mass., 1987), 261–80.

36. Brashear, "A Beginning College Course in Household Management" (n. 10 above) 48.

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start homemaking in rented apartments where none of the furnishings will be of your choosing, where manufacturer's instructions for use of equipment have been destroyed, and previous occupants have given no thought to improving working conditions. This book will help you develop initiative in getting the most out of what you have, so those first weeks of adventure will be cheerful instead of tearful." Lab exercises spoke to students as eligible young ladies: "When a girl marries, relatives and friends give [her an] electric coffee maker, toaster, grill-waffle combination, frypan, egg cooker, and corn popper. In choosing an apartment, what must she watch out for?"[37]

Coeds who took equipment classes picked up step-by-step instructions for judging potential purchases. After examining various refrigerators, ranges, and small kitchen devices, students filled out "buying guides" that defined criteria and highlighted differences between models. Beveridge advised coeds to save those lists for reference "later when you are choosing a piece of equipment for your home." One guide called for evaluating three blenders on their electric rating; number of speeds; special features; ease of use, cleaning, and storage; the type of materials used in the motor housing, container, and cover; the capacity and shape of the food container; whether blades were permanently attached or removable; whether it was well-balanced; and whether it had good instructions and an Underwriters' Laboratory seal of approval. In lab, students practiced reading specification sheets and interpreting codes on appliance nameplates to check a model's capacity and electrical requirements (fig. 2).[38]

Equipment classes encouraged women to become skilled judges of technical quality as a strategy for defensive shopping, to help them resist misleading, high-pressure sales tactics. Given appliances' sizeable price tag, homemakers needed to live with their choices for years, Helen Van Zante declared. "A homemaker can buy convenience foods and factory-made clothes, but she cannot blunder around with her equipment." Experts warned buyers to double-check serial numbers, guarding against unethical schemes to pass off prior-year models as new. Coeds visited Ames appliance stores to observe sales presentations, practice "buymanship procedures," and collect information for reports "on five appliances they would purchase for themselves." Since equipment design changed drastically over time, faculty noted, good housewives should recognize the necessity of continued consumer research. Peet recommended consulting "unbiased sources" such as *Consumer Reports*, Department of Agriculture publications, and the latest equipment textbooks, along with trade papers, manufacturers' literature, utility booklets, and journals such as *Electrical Merchandising Week* and *What's New in Home Economics*.[39]

37. Peet, *Young Homemaker's Equipment Guide* (1958), vii, 63.

38. Beveridge (n. 29 above), 8.

39. Van Zante (n. 33 above), v; Florence Ehrenkranz and Lydia Inman, *Equipment in the Home*, 3rd ed. (New York, 1973), 160–61.

FIG. 2 Iowa State College students in a household equipment class, circa 1943–44, evaluating small appliances. (Iowa State University Library, Special Collections Department.)

Iowa State faculty recognized that Americans would not and could not always adopt new equipment instantaneously. The 1949 edition of Peet's *Household Equipment* discussed iceboxes alongside electric, gas, and kerosene refrigerators. Her textbook did not eliminate sections covering wood, coal, and kerosene ranges until the 1961 edition.[40]

Nevertheless, equipment studies thrived on novelty, which represented not only a source of intellectual excitement but also justification for its educational and research agendas. With each new invention, the field gained momentum and purpose. In assigning class projects and updating textbooks, faculty added subject matter to both anticipate and reflect changes in technological availability. In the 1958 edition of *Equipment in the Home*,

40. Louise Peet and Lenore Sater Thye, *Household Equipment*, 3rd ed. (New York, 1949). For the history of different forms of home equipment, see Jane Busch, "Cooking Competition: Technology on the Domestic Market in the 1930s," *Technology and Culture* 24 (1983): 222–45.

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highlighting new trends, Inman referred to garbage disposals as "the appliance that really changes life in the kitchen." Since less than seven percent of electrified homes owned waste disposers in 1956, her book set out to explain their advantages in terms of sanitation and labor elimination (while cautioning unfamiliar users that disposals couldn't handle paper, glass, or large bones).[41]

Faculty encouraged new generations to covet new equipment; "mother's right-hand assistant" could even advise her parents on updating old-fashioned kitchens. To familiarize students with the latest innovations, Peet assigned them to examine sales literature for new forced-convection ovens, downdraft cooktops, and induction cooktops. Her textbooks introduced products by name and manufacturer; in 1974, she featured Corning's Pyroceram "counters that cook," praising the glass-ceramic top that stayed cool to the touch and wiped clean. Indeed, textbooks borrowed illustrations of the "Roast-O-Grill," "Toast-R-Oven," and the "Touch-N-Cook" range from Westinghouse and GE, and captions often reproduced manufacturers' boasts. Under a photo showing a woman staring in amazed admiration, Peet's 1963 book ran the legend: "Cook an egg on a paper plate with a gas flame! Although not a suggested practice, it can be done without burning the plate, demonstrating the low temperature control provided by a blower built into the Blanket-O-Flame gas range [by] RCA Whirlpool."[42]

Such amazing inventions represented dramatic progress for everyday life, home economists asserted. They emphasized that manufacturers kept improving appliance longevity and reliability even as prices fell, giving Americans the world's highest living standard. Peet and her Iowa State colleague and coauthor Mary Pickett wrote in 1974: "Today's equipment is interesting and exciting because space-age living has invaded the kitchen. Meat is tenderized automatically, ovens are cleaned automatically, ice cubes are produced automatically, so you who are starting homemaking now are fortunate." The 1986 edition promised that sophisticated engineering of the near future might allow users to operate ovens and dishwashers by voice command or remote computer links. Such comments reflected unstated class and racial assumptions; Peet and Pickett addressed upper-class and

41. Florence Ehrenkranz and Lydia Inman, *Equipment in the Home* (New York, 1958), 119. On invention, innovation, and novelty in home equipment, see Victoria Kasuba Matranga, *America at Home: A Celebration of Twentieth-Century Housewares* (New York, 1997). For a broader perspective, see Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York, 1983), and "The Industrial Revolution in the Home: Household Technology and Social Change in the Twentieth Century," *Technology and Culture* 17 (1976): 1–23.

42. Louise J. Peet, *Young Homemaker's Equipment Guide*, 2nd ed. (Ames, Iowa, 1963), 18; Peet, *Young Homemaker's Equipment Guide* (1958), vii; Louise J. Peet and Mary S. Pickett, *Young Homemaker's Equipment Guide*, 4th ed. (Ames, Iowa, 1974), 15.

middle-class homeowners, who had the economic assets to consider purchasing new equipment periodically.[43]

Educators sought to help homemakers embrace the latest technology by demystifying it. While noting that microwave equipment still remained too costly for average families, Peet's 1958 textbook described microwave cooking and explained the physics of how high-frequency waves penetrated food. Thus far, "microwave cooking has not proved too successful for baking angel cakes and soufflés," she admitted, "but experimental research may overcome the difficulty." Twenty years later, as the equipment became more accessible to American consumers, Iowa State professors assigned students to observe microwave demonstrations, study instruction booklets, and experiment with microwaving cupcakes, potatoes, and hot dogs. Peet's 1979 edition added a full chapter on the microwave, which she praised for easing women's lives, especially those of the majority working outside the home. Consumers "willing to try new techniques soon ask how they ever got along without this appliance." Yet faculty added that before rushing to buy one, homemakers should assess whether they really needed to speed up meal preparation, whether they could save time instead by using pressure saucepans or more ready-to-eat food, whether their kitchens had room for a new appliance, whether their families ate foods suited to microwave cooking. The very speed of microwave technology forced adjustments, experts noted. "With the slower range, the homemaker could set the table, prepare the salad, feed the baby while foods were cooking. [W]ith the microwave, she must be more alert to exact timing to get all foods ready at the same time in optimum condition."[44]

At the same time that Iowa State's program celebrated new equipment, it pushed students to become discriminating consumers. Even as Peet described the latest multipurpose features, such as refrigerators with built-in ice water dispensers, she took pains to point out that companies put the same operating unit into both basic and deluxe models, making fundamental technical differences negligible. "If one can disregard a desire to have better appliances than the neighbors, then frequently a piece of equipment that has all the essential features, but lacks attractive accessories, may be obtained

43. Peet and Pickett, *Young Homemaker's Equipment Guide* (1974), vii; Mary S. Pickett, Mildred G. Arnold, and Linda E. Ketterer, *Household Equipment in Residential Design* (New York, 1986). On household technology and economic class, see Joann Vanek, "Household Technology and Social Status: Rising Living Standards and Status and Residence Differences in Housework," *Technology and Culture* 19 (1978): 361–75.

44. Peet, *Young Homemaker's Equipment Guide* (1958), 92; Louise Jenison Peet, Mary S. Pickett, and Mildred G. Arnold, *Household Equipment*, 7th ed. (New York, 1975), 563; Louise Jenison Peet, Mary S. Pickett, and Mildred G. Arnold, *Household Equipment*, 8th ed. (New York, 1979), 219; and Pickett, Arnold, and Ketterer, 139. On the subject of decisions to purchase new technologies, see Tanis Day, "Capital-Labor Substitution in the Home," *Technology and Culture* 33 (1992): 302–27.

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at considerable savings." Beveridge and Madden reiterated the message that women should always "give first consideration to sound construction and weigh each special feature in terms of what it will do for you."[45]

Consumer choices only grew more complicated as postwar manufacturers began marketing an array of new "hobby appliances," such as an electric bacon grill, an electric hot dog cooker, and an "intriguing [wok] with a mandarin red or jade green finish." For television-age entertainment, tray tables and popcorn poppers facilitated late-night snacking. While textbooks advised that a "deep-fat fryer, and blender may well serve the teenage craving for hamburgers, French fries and malts," Peet again cautioned against pointless purchases. "Frequently, homemakers are persuaded to buy a variety of small appliances which they seldom or never use. Does the serving of waffles once or twice yearly make a waffle iron a good investment?"[46]

Faculty taught students to count not only financial costs but also practical tradeoffs involved in each decision. They reminded consumers to consider whether their kitchens had room for additional equipment, remembering that they would be less likely to use heavy appliances, such as mixers, if kept in an inconvenient place. Before purchasing, women were told to ask themselves, "Will [this device] aid in the effective performance of a given task? Have you space to use it comfortably and store it satisfactorily? Or will it increase noise and heat in your working area? Will it complicate or clutter rather than complement your work habits? Would it be better to save the money or use it for another purpose?" Iowa State wanted women to think critically about their needs and desires, to make rational choices based on solid technical knowledge.[47]

Such training in cautious consumerism was further reflected in Iowa State's discussion of equipment aesthetics. Praising postwar design trends, Peet rejoiced in the availability of blue refrigerators and pink sinks. "Resulting kitchens are very lovely, a far cry from the drab or cold-looking rooms of 20 or 30 years ago when everything was white. The modern kitchen, bright with color, becomes a second living room where family and friends enjoy good times together." Stressing kitchen beauty, Van Zante assigned students to test possible color schemes by making cloth, paper, and foil collages suitable for framing. "The kitchen can be an expression of art. The ideal would be a pleasant mixture of glossy and matte, dark and light, bright and pale, and warm and cool colors." At the same time, faculty emphasized that women should not get carried away with creative fads, since "extremes in style and color become tiresome in time." Textbooks rec-

45. Peet, *Young Homemaker's Equipment Guide* (1958), 1; Elizabeth Beveridge and Faith Madden Churchill, *Household Equipment Experiments* (Ames, Iowa, 1958), 9.

46. Peet and Pickett, *Young Homemaker's Equipment Guide* (1974), 10, 88–89; Peet, Pickett, and Arnold, *Household Equipment* (1975), 565.

47. Florence Ehrenkranz and Lydia Inman, *Equipment in the Home*, 3rd ed. (New York, 1973), 160.

ommended choosing neutral shades for major appliances (too expensive to replace at the dictates of fashion or whim), then adding decorative accents with curtains and accessories.[48]

As rationale behind intelligent consumerism, postwar courses repeated the faith that appropriate use of equipment could streamline housework, letting women engage in alternate activities. During the 1950s, local politics and civic affairs seemed an appropriate extension of women's family involvement, a nonthreatening outlet in public life. Peet told students, "When you become homemakers you will be interested in your communities—in the need for obtaining adequate schools, desirable recreational facilities for teenagers, honest city government. You will work through PTA, League of Women Voters, women's clubs," relying on laborsaving kitchen devices to squeeze all those commitments into twenty-four hours.[49]

Peet's equipment books of 1958 and 1961 spoke for the first time of women who held "a double job," spending eight hours daily in outside employment and then roughly as much time on domestic chores. "If she is to take care of both jobs successfully and have any free time and energy left to share in other activities, she must accomplish, in a comparatively short time, a maximum amount of work with a minimum of effort." Peet recommended that career women prepare meals in advance, then use a range's automatic time clock to have dinner ready when they returned home. Of course, manufacturers' advertisements had for decades promised that new appliances would offer women ease and an abundance of leisure.[50]

Almost two decades later, Peet ruefully acknowledged that even as more women moved into the nation's paid workforce, innovative technology had not dramatically reduced domestic demands. Her 1975 textbook noted: "Although many chores are being replaced by mechanical servants, a recent study shows that the total time Ms. Homemaker used for the family in 1967–1968 was not less, on the average, than 40 years earlier." Moreover, the sixth edition of *Household Equipment* frankly addressed the frustrations of routine meal preparation, the dullness of thrice-daily dish washing, the absence of a paycheck to honor housework. Such irritations gave women extra incentive to acquire up-to-date technology, Peet's coauthor Ilse Wolf argued. Even if machinery had not yielded leisure, it could still help overcommitted women juggle family and employment. "With an automatic washing machine, thermostatically controlled oven with a timer, and a thermostatically controlled iron, a homemaker may be washing the family laundry, baking an oven meal, ironing, looking after the children or chatting with someone at the same time without undue strain." Wolf concluded

48. Peet, *Young Homemaker's Equipment Guide* (1958), 92–93; Van Zante (n. 33 above), 185, 189.

49. Peet, *Young Homemaker's Equipment Guide* (1958), 140.

50. Peet, *Young Homemaker's Equipment Guide* (1958), vii–viii; Louise Peet and Lenore Sater Thye, *Household Equipment*, 5th ed. (New York, 1961), 340.

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that well-chosen equipment might yet give a mother the well-deserved opportunity to "add new, refreshing and relaxing interests and activities in her life."[51]

Meanwhile, subject matter covered in equipment classes reflected changing social concerns. Broadening the perception of equipment users and applying principles of "human engineering," Peet's 1979 edition (by then almost six hundred pages long) included a chapter on appliances adapted to help elderly and handicapped people live more independently. Peet recommended lowering sinks, countertops, and ranges to make them accessible to the wheelchair-bound. For people with vision loss, she suggested marking appliance controls with bright tape or sandpaper, raising counter edges to prevent items from rolling off, and installing pullout shelves. Students visited rehabilitation centers to observe how occupational therapists helped disabled people adjust to daily living.[52]

Adding another dimension to equipment study, Beveridge wrote in 1968: "Any study of equipment is a study of the environment in which we choose to live." With the green movement and awareness of global resource depletion, textbooks of the 1970s revealed a new consciousness of appliance energy demands. Earlier in the twentieth century, Davison and Brashear had echoed the era's common assumption that the spread of home electrification in the United States represented an unambiguous sign of national success. With the Carter-era oil crisis, faculty acknowledged the harm of America's insatiable appetite for energy; household electricity use had risen more than eighty percent between 1960 and 1970. Given that almost twenty percent of the nation's energy consumption took place in the home, Iowa State suggested, household conservation efforts could make a substantial impact. Peet praised the 1975 Energy Policy Act for mandating development of environmentally friendly appliances; between 1972 and 1982, refrigerator energy efficiency rose more than two-thirds. Experts listed tips to promote wise use, urging people to fill the oven every time it

51. Peet, Pickett, and Arnold, *Household Equipment* (1975), 1; Peet, Pickett, and Arnold, *Household Equipment* (1979); and Pickett, Arnold, and Ketterer (n. 43 above). Louise Jenison Peet, Mary S. Pickett, and Mildred G. Arnold (with Ilse H. Wolf), *Household Equipment*, 6th ed. (New York, 1970), 429. For more on the subject of domestic chores, time, and technology, see Ruth Schwartz Cowan, "A Case Study of Technology and Social Change: The Washing Machine and the Working Wife," in *Clio's Consciousness Raised: New Perspectives on the History of Women*, ed. Mary Hartman and Lois Banner (New York, 1974), 245–53; Christine E. Bose and Philip L. Bereano, "Household Technologies: Burden or Blessing?" in *The Technological Woman*, ed. Jan Zimmerman (New York, 1983), 83–93; Christine E. Bose, Philip L. Bereano, and Mary Malloy, "Household Technology and the Social Construction of Housework," *Technology and Culture* 25 (1984): 53–82; Susan Strasser, *Never Done: A History of American Housework* (New York, 1982). On the role of manufacturers in promoting the idea of domestic technology as a source of ease and leisure, see Cowan, *More Work for Mother* (n. 41 above).

52. Peet, Pickett, and Arnold, *Household Equipment* (1979).

was heated, baking ahead for another meal. Energy shortages also justified "intelligent neglect"; home economists advised against washing dishes after each meal, since the "energy used heating water for dishwashers is estimated at 0.12% of the total national energy." To create energy-conscious consumers, faculty sent students to visit appliance stores and compare the new bright-yellow Energy Guide labels on different models.[53]

Looking Beyond Engineering

By the 1970s, Americans owned nearly one billion household appliances. More than seven hundred million were small devices such as coffeemakers, toasters, and mixers; the rest were major pieces such as ranges, refrigerators, washers, dryers, dishwashers, disposers, waste compactors, and air conditioners. Kitchen equipment had evolved dramatically over the twentieth century, and Iowa State's program helped guide generations of homemakers through those changes. Its teaching, research, and outreach played a key role in attempting to help women adapt to an age of increasingly complex appliances and less household help. Graduates such as Betty Melcher became what historians of technology call "mediators," industry employees who facilitated manufacturers' response to marketplace demand and in turn promoted consumer acceptance of new equipment.[54]

Anticipating adoption of new technology, Iowa State students and researchers investigated microwave ovens and waste disposals as they appeared. Yet while textbooks gloried in the novelty of particular innovations, faculty did not become unthinking cheerleaders for unrestrained consumerism. Indeed, they repeatedly cautioned women to beware of wasteful fads and pointless extravagance, to use technical knowledge and practical considerations as an educated basis for choosing or rejecting manufacturers' options.

Faculty such as Eloise Davison, Louise Peet, Faith Madden, and Elizabeth Beveridge made their department a national leader, institutionalizing equipment study as a distinct discipline. A focus on household technology represented a natural outlet for Iowa State, reflecting the college's historic orientation toward everyday technical applications. Where male agricultural engineering students took apart and inspected tractors, female equipment majors disassembled and evaluated ranges; while men in mechanical engineering learned the thermodynamics behind diesel engines, women

53. Beveridge (n. 29 above), 7; Peet, Pickett, and Arnold, *Household Equipment* (1979); Pickett, Arnold, and Ketterer, 195.

54. For further discussion of this concept of technological mediators, see Carolyn Goldstein, "Mediating Consumption" (n. 5 above); Horowitz and Mohun (n. 15 above); and Regina Lee Blaszczyk, *Imagining Consumers: Design and Innovation from Wedgwood to Corning* (Baltimore, 1999).

systematically familiarized themselves with the physics of refrigeration. The department had no trouble attracting enrollment; some girls (such as Lenore Sater, with her rural background) came to Ames with a previous interest in equipment, while others considered it important to their future as professionals, housewives, or both.

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Iowa State's equipment courses undoubtedly thrived because women's knowledge of domestic engineering didn't seem to threaten men. Yet on balance the department's efforts served to subvert the notion of women's technological incompetence (which supposedly made them ripe for exploitation by greedy manufacturers, unscrupulous salesmen, and high-priced repairmen). Through courses, textbooks, research, extension service, and public remarks, faculty constructed a powerful alternate image of women as intelligent, informed appliance evaluators, consumers, users, and repairers. Faculty and students proudly exhibited both practical skills and theoretical understanding of technology. Such a case challenges historians to keep an open mind regarding the gendered aspects of technical knowledge, looking beyond engineering schools to the "women's sphere" of education.