

THE RISE AND FALL OF DOMESTIC CHEMISTRY IN HIGHER EDUCATION IN ENGLAND DURING THE EARLY 20TH CENTURY

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Introduction

In Britain, during the 1880s and 1890s, there had been an increasing interest in the teaching of domestic subjects to girls (1). Initially, it was domestic economy—cooking, laundry work, and so on. Educators thought such mandatory instruction was important for two reasons: first, it was believed that the squalor and drunkenness that prevailed among the lower classes could be prevented by education in “home-thrift” and economic cookery; and second, there was a fear of a shortage of domestic servants for upper-middle-class homes. Two subsequent reports, the Interim Report on Housecraft in Girls’ Secondary Schools in 1911 and the Consultative Committee on Practical Work in Secondary Schools in 1913, both contended that, in the new “scientific age,” the teaching of domestic subjects should have a strong foundation in science and become domestic or household science. At the core of domestic science was chemistry—especially the chemistry of foodstuffs and household cleaners.

Women had only a few years earlier gained admission to university to take academic chemistry. As a result, a fierce debate arose in England among the first generation of women chemists and their supporters as to the type of chemical education most appropriate for young women. That is, should the next generation of girls learn “real” chemistry, which would continue to give them access to the same opportunities as men? Or should they learn domestic chemistry as a component of domestic

science, which would enable them to undertake their role as wives and mothers in a scientific manner? A leading proponent of domestic science for girls was Arthur Smithells, Professor of Chemistry at the University of Leeds. Smithells, who had given lectures at Manchester High School for Girls, was a strong champion of education for girls (2). He saw domestic science as a means of bringing an applied aspect that would, in particular, be beneficial for women’s roles in society.

Having fought so hard for getting girls an academic education equal to that of boys, many women scientists saw domestic science as a reversal of those gains, limiting girls’ aspirations and opportunities to that of domesticity. Ida Freund, Lecturer in Chemistry at Newnham College (3), was one of the most vociferous opponents of the teaching of science to girls through the context of domestic science. In particular, she authored a lengthy denunciation in the feminist publication, *The English-woman* (4):

It was erroneous to think that through the study of the scientific processes underlying housecraft and especially cookery, you can teach science, that is, give a valuable mental training which should enable the pupils in after life to judge whether an alleged connection between effect and cause has been established or not.

Most of the influential headmistresses of girls’ schools similarly opposed the introduction of domestic science. For example, Lilian Faithfull, Principal of the prestigious Cheltenham Ladies College concurred (5):

The foundations of a knowledge of chemistry and physics should be built up on a well-ordered system which must not be subordinated from the outset to the requirements of home science. The teaching of science during the school years should be such as to prove equally useful to the pupil who elects to take at a later stage a university course in science and to the pupil who enters upon the home science course.

In terms of the chemistry component, there were two parallel threads to the debate: the type of chemistry taught at girls' secondary schools, and the offering of courses in domestic chemistry at colleges, polytechnics, and universities. Manthorpe has provided a detailed discussion of the former (6), but the latter, in particular, the chemistry content of domestic science programs in higher education, has not previously been researched.

The debate about the college teaching of domestic chemistry is illustrated by the exchange in 1911 initiated by Hall and Grünbaum, science lecturers at Avery Hill [Teachers] Training College, Eltham. They contended that incoming women students in domestic science programs required only very basic chemistry before being taught household chemistry (7):

Before "domestic" chemistry can be introduced with profit, they [college students] must understand the composition of air and water and the nature and reactions of acids, bases, and salts. In the short time at our disposal we do not think that chemical formulæ and equations can be explained with any advantage, nor do we consider such explanation absolutely necessary. When the effects of air and of water on ordinary substances have been grasped, the methods of cleaning such substances can be deduced and practiced on all the available household appliances. The lessons on natural waters teach the methods of softening and make an introduction to the chemistry of laundry work.

Among the respondents was Hilda J. Hartle of Homerton College, Cambridge, another teachers' training college. Hartle was opposed to the whole concept of domestic science, contending that it did not have a basis in science. She pointed out (8)

The science of cookery and of laundry work is yet in its infancy. No literature of the subject exists. Not even the most brilliant organic chemist can be said to "know" the chemistry of foods, still less can such a subject be within the grasp of students in training.

Nevertheless, the teaching of domestic science thrived in some English institutions of higher education for many decades. Bird has compared the Gloucestershire School of Cookery and Domestic Economy and the Bristol

University B.Sc. in Domestic Science (9) but without a comparison of the science component. Here we will contrast the rise and fall of the chemistry content of domestic science programs at four well respected institutions of higher education in the London area: those at Berridge House, a college for working-class girls; two polytechnics with very different programs, the chemistry-weak program at South-Western Polytechnic and the chemistry-strong program at Battersea Polytechnic, both aimed at middle-class young women; and that at King's College for Women, designed for upper-middle-class women students.

Domestic Chemistry at Berridge House, Hampstead

In the 1890s and 1900s, some colleges were established specifically to teach domestic subjects to girls (10). The women students were primarily recruited from the lower classes of society and many, upon graduation, obtained employment as maids with "fine families." The emphasis at these institutions was less on science than on domestic training in a "scientific manner." For example, Elizabeth Atkinson, teacher at the Manchester Municipal Training College of Domestic Economy, described in her book, *The Teaching of Domestic Science* (11), that a course of laundry-work should contain theoretical and practical studies on the laundry roles of starch, bran, water, soap, soda, salt, bleaching, patent cleaners, stain-removing, and paraffin wash.

The most renowned institution of this type was the Training College of Domestic Subjects, Berridge House, Hampstead (Fig. 1), opened in 1909 by the National Society for Promoting Religious Education. Berridge House was proud of its well-equipped Science Laboratory, and it was the first Domestic Science Training College in Britain to appoint a lecturer with a science degree.

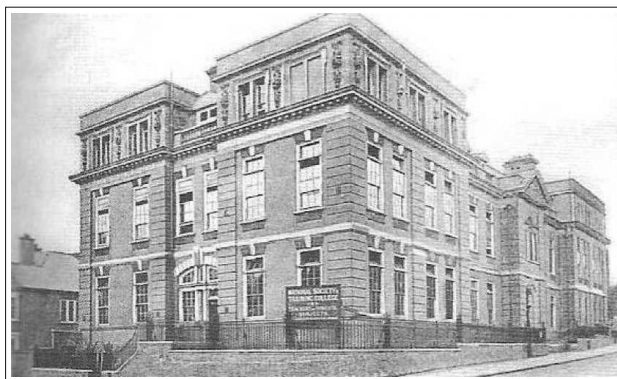


Figure 1. Berridge House.

In 1910 the girls' magazine, *The Girls' Realm*, devoted a whole article to the Domestic Science program at Berridge House. Besides the more traditional domestic science topics of cookery, needlework, and housewifery, the magazine lauded the chemistry component of the program (12):

Specially interesting is the laboratory, where the students actually make their own tests, classify foodstuffs, ascertain the chemistry of bread-making, the composition of soap, the properties of starch, borax, soda, etc., as applied in washing and naturally manufacture for themselves such household commodities as baking powder and furniture polish according to their own tried formulæ.

From 1911 onwards, the science lecturer at Berridge House, Miss Marshall, took the students annually to a soap manufacturing company. The students watched each of the steps involved in producing the different types of soap. One of the students added (13), "In the Chemistry Lab we saw the experiments for testing the purity of soaps, and also saw growth of disease germs and action of disinfectants..."

In 1964 Berridge House was merged with St. Katharine's, Tottenham, to form the College of All-Saints, Tottenham. The Berridge House site was closed. The combined institution became a teachers' training college offering home economics and general science, the domestic science program never surviving the merger (14).

Domestic Chemistry at South-Western Polytechnic and Battersea Polytechnic Institute

The undefined nature of "domestic science" meant that the chemistry component at each polytechnic differed considerably and also varied over time at any particular institution. We have chosen to contrast the domestic chemistry content at South-Western Polytechnic (Chelsea College, as of 1922) and at Battersea Polytechnic Institute, the former being chemistry-poor and the latter being chemistry-rich.

The offering of domestic science at South-Western Polytechnic was noted in *Nature* in 1899 in the context of new diploma offerings aimed at middle-class women (15). It reflected the growing scarcity of domestic workers as a result of the increasing opportunities for the employment of working-class women in other areas: "In this connection may be cited the work now being done on the women's side of the institute in the direction of

offering ladies of the middle classes such instruction in domestic science as will make them independent of servants." Whatever the views of the author, such training also opened up new opportunities for the employment of middle-class women as supervisors in domestic and catering organizations.

The diploma program at South-Western Polytechnic became the autonomous School of Home Training in Domestic Science in the 1903-04 academic year (16). In its second year of existence, the program included a course titled "Household Chemistry" consisting of 25 lectures. By 1909-10, the chemistry content had decreased and the course had been renamed "Household Science." During the 1920s, that course disappeared to be replaced by one titled "Applied Electricity" later renamed "Domestic Electricity."

In the 1913-14 year, the school had changed its name to the School of Training in Housecraft and Household Management. Nevertheless, the near science-less Domestic Science Department continued on until the 1940s, when there was increasing pressure for the college to discontinue nondegree programs. As the anonymous biographer of Chelsea College (formerly South-Western Polytechnic) noted (17):

The domestic science department was the first to go, in 1949, to provide space for pharmacy; vocational work was transferred to Battersea [Polytechnic], and non-vocational work to a women's institute.

By contrast, the chemistry component at Battersea Polytechnic Institute was much stronger. Battersea introduced a School of Domestic Economy in the early 1890s (18); and from its very inception, the chemistry of food and cookery was a significant part of the syllabus (19). The *Battersea Polytechnic Magazine* reprinted an article from the British women's weekly, the *Gentlewoman*, lauding their domestic science program (20):

One of the most thorough and up-to-date establishments for training in the science of domesticity is the Women's Department of the Battersea Polytechnic, Battersea Park Road, which is staffed by highly trained teachers under the control of Miss M. E. Marsden. Thither flock girls from all parts of the world, even from South Africa and Japan, and many of them, especially those who intend to follow domestic science as a profession, take the three-year course. ... Special stress is laid on the scientific principles underlying household processes, and the work of the kitchen and laundry is co-ordinated with that of the scientific laboratory and the lecture-rooms.

The School subsequently became the Department of Domestic Science and, by 1919-20, in addition to traditional general and organic chemistry courses, a course "Chemistry as Applied to Household Processes" appears, containing the following topics:

Air. Water. Chemical theory. Acids, alkalis and salts. Carbon and its oxides; fuels. Soaps. Textile fabrics. Water softeners. Sugars, starch, alcohol, acetic acid. Proteins. Fats. Vitamines. Yeasts, moulds, and bacteria. Study of certain foods. Preservation and sterilisation of food stuffs. The practical work will be partly illustrative of the lectures and partly experimental craft work, i.e.:-

Experimental Housewifery. – Study of metals, causes of tarnish, metal polishes and preservers, stainless cutlery. Study of woods, dry rot, furniture polishes, stains, paints and varnishes. French polish. Lacquers. Care of leather. Materials used in making floor coverings, and scientific reasons for methods of cleaning and preserving them. Household disinfection.

Experimental Laundrywork. – Comparative value of methods of softening water for laundry purposes. Study of detergents and their action on textile fabrics. Methods of testing fabrics, and the reactions of laundry reagents on them. Experimental removal of stains; bleaching and dyeing. Laundry blues. Microscopic and chemical examination of starches. Disinfection of clothing.

Experimental Cookery. – Examination of the chemical and physical natures of various foodstuffs, e.g., flour, fat, fish, meat, eggs, vegetables, pulses, milk. The effects of heat, and of different methods of cooking on these food stuffs. Study of yeast and its action on bread making. Examination of sugar substitutes. Experiments to attempt the solution of problems encountered in the kitchen.

The continued strength of the chemistry content at Battersea from 1919 until 1948 seems to have been the



Figure 2. Battersea Polytechnic.

exception among domestic science programs. It is of note that all the chemistry staff at Battersea throughout the program's history were women. Claudia McPherson was the senior chemistry instructor from 1915 until 1948 and every year the junior instructor or instructors were also women. In addition, from 1926 until 1948, the Head of the Department of Domestic Science was a woman chemist, Helen Masters. Both Masters and McPherson retired in 1948, and it seems quite probable that the survival of a strong component of domestic chemistry until that year was the result of their influence.

In 1948 the Department of Domestic Science became a separate entity: the Battersea College of Domestic Science. Thereafter, the syllabus no longer included any specific mention of chemistry; instead there was a course "Science, Physiology, and Nutrition." In 1963 the College was transformed into the Battersea Training College for Primary Teachers, offering courses leading to a Teachers' Certificate with special reference to domestic subjects.

Domestic Chemistry at the Women's Department of King's College

Located in Kensington, the Women's Department of King's College, University of London, opened a Home Science and Economics Department in 1908. The Department offered a three-year program, initially as a College Certificate, and it was aimed to attract upper-middle-class women who would become high school teachers of domestic science. In the interwar period, there was also a steady demand for the graduates in hospital dietetics. There were three mandatory areas of study: applied chemistry, sanitary science, and economics (21). The chemistry instructor of the time, Margaret McKillop, wrote an enthusiastic account of the program and of its possible conversion to full degree status (which occurred in 1921) (22):

There is no doubt that the idea of the possible new degree, with as good a standing as that to which engineering and agriculture have now established their claim, is gaining ground with most people. Meanwhile headmistresses have begun to ask, much too early for our present achievements, for the "new sort of domestic science teacher." They mean, or ought to mean, someone who teaches science with constant reference to home life, a practical-minded woman who can also be a good form mistress and bring a little college atmosphere; but at present, it is true, they are a little inclined to expect a first class chemist combined with a first class cook, who can also take odd sciences and other subjects throughout the school! There is no doubt that many girls' schools are going to

have Domestic Science now put right into the ordinary curriculum instead of being left as a top-dressing for a possible (but unusual) last year.

This enthusiasm was not totally shared. In addition to contesting the teaching of domestic science as a science at secondary schools, Freund strongly opposed the offering of a degree in domestic science. In a 1911 rebuttal of Freund's views, Sir Arthur Rucker, past Principal of the University of London, contended that domestic science degrees and their associated research programs could pave the way for new discoveries in academic science (23):

... it must be remembered that great outbursts of technical activity have frequently been accompanied by a rapid development of the sciences concerned. ... The ordinary text-book proof of the second law of Thermodynamics is evidently based on a knowledge of the steam engine. It will be the same with Domestic Science.

The chemistry content of the program was very strong, as exemplified by the requirements in the *1912-13 King's College, Women's Department Calendar: First Year General Chemistry* (60 lectures and 120 hours of practical work); *Second Year Organic Chemistry* (60 lectures and 150 hours of practical work); and *Third Year Applied Chemistry* (60 lectures and 180 hours of practical work). The Applied Chemistry course consisted of the following (24):

The constituents of the atmosphere and methods of estimation – water analysis with special reference to its use for drinking purposes, cooking, and in the laundry – the constituents of foods, adulterants, and preservatives, with a value to determining their wholesomeness – the chemistry of cooking and of the materials used in cooking – the chemical changes caused by organized and unorganized ferments, applied to the preparation, preservation, and deterioration of foods and to digestion – the chemistry of laundry work and other cleansing processes – the nature and quality of textile fabrics in common use; the physical and chemical properties of their constituent fibres – disinfectants and antiseptics – scientific principles underlying the care and preservation of the chief materials used in the structure and equipment of a house.

Christina Bremner, famed advocate of female education (25), contended that graduates from this program would have excellent employment possibilities in hospitals, schools, and other public organizations; and, of course, such graduates would excel at scientific homemaking.



Figure 3. Student in domestic chemistry laboratory of King's College.

She described the chemistry component (26):

Students of chemistry must learn to perform simple analyses, to study hydrocarbons, alcohols, acids, and so forth, so that in the final year they may deal effectively with water analysis, constituents and relative values of different foods, the chemical changes of ferments, preservation and deterioration of food, purity of milk, and so forth.

She assailed those who argued that only "pure" or "men's" chemistry should be taught to women students (26):

It would be interesting to know precisely how far feminism and opposition to a Domestic Science course in a University coincide. I cannot think the lines of demarcation correspond perfectly, for I have known advanced feminists, and count myself amongst them, who for years have bitterly complained that so little of the money devoted to technical training has been spent on women, and also how very lacking in thoroughness have been many domestic science courses carried on all over the country.

Bremner was correct in that the pro and con divide did not correspond perfectly to the division among women in society. Some feminist chemists, such as Ida Smedley Maclean, supported the teaching of domestic studies on a scientific basis (27).

Bremner's optimistic view of the program was challenged by Rona Robinson. Robinson, a chemistry graduate, and at the time a Gilchrist Post-Graduate Scholarship holder at King's College for Women, wrote a fierce rebuttal, first of all noting that Bremner's rosy description of the program was based on a one-day visit. In particular, Robinson took the College to task for claim-

ing that the first- and second-year chemistry was strong enough to provide sufficient theory for the third-year Applied Chemistry (28):

Such “applied Chemistry” is far beyond the reach of beginners in science, and it is nothing short of charlatanry and deception on the part of the authorities to state that they teach anything of this nature. To talk of the students *applying* the knowledge of such matters in the third year is to apply knowledge which they do not possess. The student who is going to work on the *chemistry of foodstuffs* would have first to do an amount of pure chemistry that would shatter the whole curriculum of this course...

Smithells was a particularly outspoken supporter of the domestic science program at King’s College (29). He responded to Robinson’s attack on the program (30):

I think it is hardly necessary to assure your readers that the somewhat elementary educational questions raised by Miss Robinson have not escaped the notice of those who are responsible for the course. We have had many difficulties to face and still have problems to solve; we shall, no doubt, continually mend our ways. But the suggestion that the courses at King’s College for Women are superficial or unsound scientifically is one that I am sure would not have been made had Miss Robinson continued her studies.

Despite the criticisms of Freund and Robinson, the program prospered. We have an account of the experiences of a domestic science student, Lucy Smart, taking the first-year chemistry course (31):

... On other days we are startled by flames of burning ether and explosions in treacle tins – during the so-called Chemistry lecture. After spending several hours staining our hands in trying to detect arsenic, we are allowed to go to the “Workhouse,” where we learn how to remove the same stains and how to wash woollens.

Another student, Susan Lovell, commented (32):

There is far more Science attached to the Household than one would think. Physics, Chemistry and Biology take a far more prominent place during the first year than Household Arts.

In 1915, the arts and science departments of King’s College for Women were transferred to the Strand, the location of the main (men’s) campus of King’s College. The surviving portion, the Household and Social Science Department of King’s College for Women, became completely independent on a new site at Camden Hill Road, Kensington. This orphan unit became the King’s College of Household and Social Science (KCHSS). The two

Chemistry Department staff at this time, Charles Tinkler and Helen Masters (prior to her move to Battersea), collaborated on a text for the domestic chemistry course, *Applied Chemistry* (33). The book, published in 1926 as a two-volume set, became the standard reference work on analytical procedures for chemistry related to the home. It was still being reprinted into the 1950s.

In 1953 King’s College of Household and Social Science was renamed Queen Elizabeth College. Along

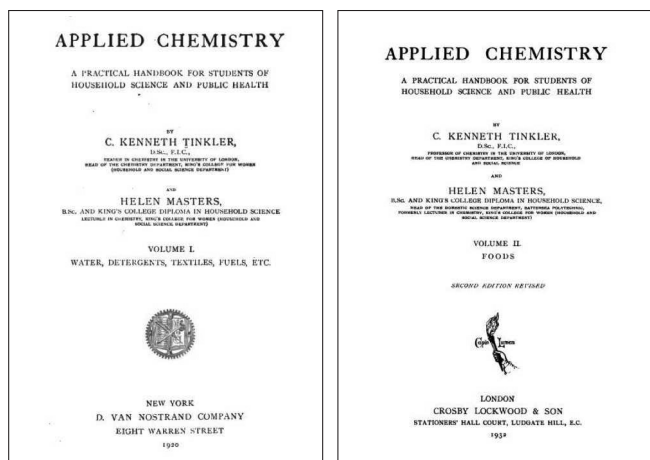


Figure 4. Applied Chemistry, the commonly used text for domestic chemistry.

with a change in name came a broadening of mandate, including the formation of departments in each of the pure sciences. That same year, the B.Sc. (Household and Social Science) was replaced by two separate degrees: B.Sc. (Household Science) and B.Sc. (Nutrition). The Department of Household Science only survived until 1966, the nutrition degree finding much more favor among incoming students. In that year, the Household Science Department was renamed the Department of Food and Management Science. Domestic science—and domestic chemistry in particular—was no more.

Commentary

In the late nineteenth and the first half of the twentieth century, domestic chemistry was taught in some English institutions of higher education as part of domestic science programs. Women chemists were divided about the validity of “domestic chemistry.” Nevertheless, for that period of time the subject of domestic chemistry, usually taught by women chemists, existed. Domestic science never did become defined as a science, and contrary to the grand vision of Sir Arthur Rucker, research into the chemistry of domestic technology never did flourish.

Over time, some of the domestic science departments tended to become orphaned from their parent institutions. Blakestad summed up the cause of the decline in household science (34):

Household science had sought to work within modern scientific paradigms and to develop a new type of scientific expert, yet its interdisciplinary approach to social problems, based on a similar holistic notion of women's domestic roles, was equally subject to displacement by specialist experts as the twentieth century progressed.

It was as if domestic science as a claimed science had become an embarrassment. Thus by the end of the 1960s, this chapter in the history of chemistry for women had come to an end.

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