University Instruction in the Structure and Use of Chemical Literature in Central Europe

R. T. BOTTLE
Department of Chemical Technology, Bradford Institute of Technology, Bradford 7, United Kingdom

Received July 19, 1965

The results are given and discussed on the instruction in the use of the chemical literature in universities in Austria, Germany, Holland, and Switzerland and compared with the results from a previous survey of British universities.

Measured in terms of the man-years taken to produce it, the literature is by far the most expensive tool which is available to the chemist. Mainly because of its size, it is perhaps one of the more complex ones. There must be many graduates of American universities who take it for granted that chemistry majors receive formal instruction in the structure and use of chemical literature. Such courses in American universities are long established and some even count for credit towards the B.S. degree (*1*). A survey of British universities and colleges was carried out in 1960 (*2*). This showed that the average undergraduate was lucky to receive one hour of instruction in the use of the chemical literature and that this was usually confined to *Beilstein*. About a sixth of the respondents thought that formal instruction was undesirable. The National Lending Library for Science and Technology (NLL) has recently run a number of short courses on the structure and use of scientific literature for university librarians and for academic staffs. Although some of the participants have been stimulated to start up short courses for their students, these have been mainly outside the fields of chemistry (*3*). One gets the impression that the amount of literature instruction in British chemistry departments has, unfortunately, changed little since 1960. Eleanor Buist has discussed (*4*) the training which is now given to Soviet graduate students. In 1961 the USSR Ministry of Higher and Intermediate Specialized Education introduced a syllabus for a sixteen-hour elective course of instruction on sources of scientific information including mechanized techniques. Details have recently been published (*5*) of an obligatory course in chemical documentation which has evolved during the past decade in the Organic Chemistry Department of the Technical University, Budapest. It largely uses preparations from the literature as the vehicle of instruction. Half the course is devoted to practical work. The results of a general survey on undergraduate instruction in British Commonwealth universities is available (*6*) but gives little information about specialized courses in the use of scientific literature.

In chemistry, as in many other subjects, the Germans have produced some conspicuous literary monuments and it was therefore interesting to discover whether German students were taught to use them and other bibliographic tools. Germany also would provide a contrast between educational methods in a communist and a noncommunist state. As Austria, Holland, and Switzerland have educational systems analogous to Germany, the teaching of chemical literature in these countries was also investigated. Only universities in the German-speaking parts of Switzerland were surveyed.

The questionnaire shown in Figure 1, which was used in the British survey (*2*), was translated into German and Dutch. Experience in the British survey had confirmed the impression that organic chemists take more interest than most in instructing their students in the use of the literature. During the spring of 1965, questionnaires, together with a covering letter indicating the possible scope of instruction and referring to the results of the earlier British survey, were sent to one professor of organic chemistry in each university, technical high school, or similar institution. The names of the professors were obtained from "The World of Learning" (15th Ed., Europa Publications, London, 1964–1965); in the few cases where no professor of organic chemistry was listed, questionnaires were sent to a professor of analytical or inorganic chemistry. If no reply was received within six weeks, a follow-up letter and another copy of the questionnaire was sent. This produced an over-all response of just under 80%. The replies are summarized in Tables I and II.

Excluding Holland the replies did not vary much with country, although the East Germans seem to provide significantly more instruction than others, which is perhaps not surprising in view of the current Soviet edict on instruction in the use of scientific literature (*4*). Possibly the Technische Hochschulen tend to schedule more formal instruction than do the universities. With these two possible exceptions the replies seem to show a reasonably normal distribution.

A number of respondents implied that instruction was given only in the institutes for organic chemistry and not in those for the other branches. Other respondents, however, stated that instruction in organic and other branches of chemistry was given.

Please underline as appropriate.

	Studenten (undergraduates)		Diplomanden Doktoranden (graduate students)	
1. Is formal instruction in the use of chemical literature (as outlined in the letter) given to	Yes	No	Yes	No
2. If instruction is offered, is this given by				
(a) chemistry department		(a)		
(b) library staff		(b)		
(c) both		(c)		
3. Approximately how many hours are spent in such instruction?	.....			
4. Does this include directed library work? If so, how many hours?	.....		Yes	No
5. Is the student made to become acquainted with the literature by setting him essays or short reviews to write rather than by formal instruction?			Yes	No
6. Do you think formal instruction in the use of the chemical literature is desirable?			Yes	No
7. Further comments.....				

Figure 1. English version of questionnaire survey on formal instruction in the use of the chemical literature.

Although a few formal lectures are given at many institutions, these are usually supplemented by "preparations from the literature." A few centers use only this method during which students are given individual instruction by the Assistenten (7) as required. "Preparations from the literature" are exercises in which the student is asked to prepare a compound for which instructions are not available in the usual text books and for which he must look up the practical details in the original literature. Typical exercises are the preparation of 2,6-dinitro-4-methoxyphenol from hydroquinone, 2-butoxy-tetrahydropyrane from tetrahydrofurfuryl alcohol, or fluorenone from phenanthrene. Several respondents mentioned that they used "Organikum" (8), a text which features this type of exercise and which is very widely used in both East and West Germany. "Organikum" also contains six pages on how to use the chemical literature and this was mentioned as forming the basis of instruction in at least three institutions. Estimates of the amount of time which students spent in the library in connection with their "preparations from the literature" varied from under ten to about sixty hours. Time so spent is not included in the course times summarized in the tables.

Other methods of bringing students into contact with the literature include a "literature task" (review?) of 15–50 pages from abstracts, or a review of an important paper from a well-known journal each semester, giving seminars, and one university even specified "writing reviews for journals."

The timing of literature courses was normally at the beginning of the organic practical course or about half-way through the student's training when he starts his "preparations from the literature."

Outside of East Germany, most instruction is given at a West German Technische Hochschule which has a two-weeks' course which includes 30 hours of library work. Several East German universities give extensive courses and details of one are given as an example. At Rostock University (9) first year students use textbooks only, but in the second year they do inorganic preparations and analyses, details of which they must search out for themselves from the original literature after they have been introduced to the use of the chemical literature by the Assistenten. In the sixth semester the students do organic "analyses and preparations from the literature." In the seventh semester a similar program on practical physical chemistry is arranged. Literature study during the eighth or specialization semester is particularly wide ranging as the techniques to be used in the Diploma project are being studied. After two semesters of research the student writes a thesis as part of his Diploma examination. A chemistry major at Rostock is scheduled to spend 25 hours per year on literature work. What is even more interesting is that student teachers spend 40 hours per year. Biology majors are given 20 hours per year instruction and physics majors 35 hours.

In Holland the equivalent of the German, etc., "Student" was taken as "Doktorandus" and that of "Diplomand" and "Doktor" (7) as "Doktor". Much less instruction is given than in the other countries surveyed. A typical comment was that "a very short introduction in the library is sufficient." A reply was also received from the newly established Technische Hogeschool Twente which has not yet started instruction but plans for about two hours to be given by the librarian to second- or third-year students. Only its reply to question 6 has been included in Table II. The Dutch survey uncovered one interesting fact: that one university institute for organic chemistry employed a documentalist who prepares surveys, checks references for draft papers, screens the literature for new projects, and draws the attention of staff to recent relevant papers. Originally the professor's secretary, with a degree in English, she audited some courses in organic chemistry and also took a course at

Table I. Schools Responding to Survey and Their Answers

Center	University	THS	Question 1: Studenten Yes	Question 1: Dipl. and Dokt. Yes	Question 2: a	Question 2: b	Question 2: c	Question 3: Hours: 1	Question 3: Hours: 1-2	Question 3: Hours: 3-6	Question 3: Hours: 7-10	Question 3: Hours: >10	Question 3: Hours: Unspecified	Question 4: Yes	Question 4: No	Question 5: Yes	Question 5: No	Question 6: Yes	Question 6: No	Remarks
Austria																				
Graz	x		x		x								x					x		
Graz		x	x	x	x					x				x		x		x		
Vienna	x			x	x					x					x	x		x		
Vienna		x	x	x	x								x			x		x		
German Democratic Republic																				
Berlin	x		x	x	x							x		x		x		x		
Dresden			x		x								x	x		x		x		Tech. University
Griefswald	x			x	x							x		x			x	x		
Leipzig	x		x	x	x					x					x		x	x		
Merseburg		x	x	x	x					x					x	x		x		THS for Chemistry
Rostock	x		x	x	x							x		x			x	x		
German Federal Republic																				
Aachen		x	x	x	x							x		x		x		x		
Berlin	x																		x	
Berlin			x	x	x					x					x			x		Tech. University
Bonn	x		x		x								x					x		
Cologne	x		x		x				x						x			x		
Darmstadt		x	x		x				x						x		x	x		
Erlangen-Nürnberg	x		x	x	x								x		x	x		x		
Göttingen	x		x		x								x							Qualified yes to Q. 6
Hamburg	x			x	x						x				x	x		x		
Heidelberg	x			x	x		x								x	x		x		
Karlsruhe		x	x		x				x						x	x		x		
Kiel	x		x		x					x				x		x		x		
Mainz	x		x	x	x						x			x		x		x		
Marburg	x		x	x	x								x			x		x		
Munich	x																	x		
Munich		x	x	x	x								x				x	x		
Sarrbrücken	x		x	x			x						x					x		
Stuttgart		x	x	x			x					x		x				x		
Tübingen	x		x		x					x					x	x		x		
Würzburg	x		x		x				x							x		x		
Holland																				
Amsterdam	x		x		x								x		x			x		No reply from Vrije Universiteit
Delft		x																	x	
Groningen	x																	x		
Leiden	x		x				x						x		x		x		x	Informal introduction only
Nijmegen	x		x		x				x						x		x	x		
Twente-Enschede		x	x			x			x									x		Proposed course, see text
Switzerland																				
Basel	x		x	x	x					x					x	x		x		German-speaking parts only
Bern	x		x		x					x				x			x	x		
Zurich	x		x	x	x				x						x	x		x		
Zurich		x	x		x					x					x	x		x		

Table II. Analysis of Replies to Questionnaire

	West Germany Universities	West Germany THS	East Germany	Austria	Switzerland (German-speaking parts only)	Holland	U. K.[a]
Questionnaires sent	16	9	8	5	4	9	38
Replies received	14	6	6	4	4	6	37
1. Studenten Yes	10	6	5	3	4	3	22
Diplomanden and Doktoranden (7) Yes	6	4	5	3	2	0	16
2. (a)	11	5	6	4	4	2	24
(b)	0	0	0	0	0	0	0
(c)	1	1	0	0	0	1	1
3. 1 hr.	1						7
1–2 hr.	2	2			1	1	6
3–6 hr.	2	1	2	2	3		4
7–10 hr.	2						
More than 10 hr.		2	3				
Unspecified	5	1	1	2		2	8
4. Yes	2	2	4	1	1	0	9
No	5	3	2	1	3	3	13
5. Yes	8	2	3	3	3	2	28
No	0	2	3	0	1	2	5
6. Yes	12[b]	6	6	4	4	4	29[c]
No	1	0	0	0	0	2	6

[a] Data from 1960 survey (2). [b] Includes 1 in qualified agreement. [c] Includes 4 in qualified agreement.

the Netherlands Institute for Documentation and Registration (NIDER). How useful would such a person be in any chemistry department, yet how few are employed.

One point in which European practice differs from that in the United States is the almost complete lack of participation by librarians in the courses reported. (Only one case of librarian participation was reported in the survey of British universities (2)). One gets the impression from American writings that a number of literature courses are largely run by librarians. The literature exists for using, and, as there will be more chemists using it than librarians conserving it, it is perhaps unfortunate when chemistry students are not given most of the course by chemists with considerable practical experience and a knowledge of the literature but are taught entirely by librarians with considerable literature knowledge but little or no experience of practicing chemistry. Perhaps the reason for American practice is that it is rather difficult to make viable the average "1-credit-hour" course unless considerably more detail is included than most chemistry professors would wish to give. Much of the extra detail on such things as biographies, historical works, etc., however, would seldom be required by the average chemist.

ACKNOWLEDGMENT

The writer is very grateful to all those who have cooperated by supplying the information presented and to my colleagues who translated the questionnaire.

LITERATURE CITED

(1) See, for example, Clemons, J. E., *Coll. Res. Libraries*, **17**, 403 (1956); or Griffin, L. W., Clarke, J. A., *ibid.*, **19**, 451 (1958).
(2) Bottle, R. T., *J. Roy. Inst. Chem.*, **85**, 173 (1961).
(3) Wood, D. N., Barr, K. P., *J. Doc.*, in press; or, more briefly, Bottle, R. T., *Technologist*, in press.
(4) Buist, E., *Am. Doc.*, **13**, 397 (1962).
(5) Tauber, M. F., *Chemiker Ztg.*, **89** (11), 374 (1965).
(6) Havard-Williams, P., Dovey, L. A., *Library Assoc. Record*, **62**, 10 (1960).
(7) For a brief account of the German university system, see Bunett, J. F., *J. Chem. Educ.*, **39**, 225 (1962).
(8) "Organikum, Organisch-chemisches Grundpraktikum," by an Author-collective from Dresden Technical University, 3rd Ed., VEB Deutscher Verlag der Wissenschaft, Berlin, 1964.
(9) Professor H. Zinner, personal communication.