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Why Do High School Students Choose Chemistry?

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In our previous paper,¹ we sought answers to the question: "Why do college students choose chemistry as a major?" To follow up on that study, we have attempted to identify the major factors that lead high school students to anticipate a major in chemistry or in a closely related field.

Methods

In this study, we requested the help of a number of outstanding high school teachers from throughout the country. One such easily identifiable group of teachers is the Woodrow Wilson Dreyfus Master Teachers.² One hundred of these teachers from the 1982 and 1983 summer programs were asked to distribute questionnaires³ to their students who express an interest in majoring at college in either chemistry or a chemistry-related field. Forty teachers responded, and 321 students participated. Twenty-five different states are represented in the survey.

Students were asked a total of 29 questions, most of which were designed to solicit information about the students and establish the makeup of the sample, though many valuable inferences can be drawn from the results. Of primary interest, however, are the ranks assigned by students to the three most significant factors, among 13 listed choices, that influenced them to decide to major in chemistry or in a related field once in college.

Results and Discussion

Most of the students surveyed were juniors (43.0%) and seniors (49.2%). By the end of the academic year in which they were questioned, 63.1% expected to complete the first-year chemistry course, and 33.4% expected to complete the second-year course, with the remaining students finishing either one-half or one and one-half years of chemistry. Only 6.6% of the students had a unit of chemistry in elementary school (grades 1-6), while 31.6% had their first unit in junior high (grades 7-8) and 61.9% had their first unit in high school. The first full year of chemistry for most students was in grade 11 (60.4%), with 7.8% taking their first full year in grade 12, 25.5% in grade 10, 3.1% in grade 9, and the same for grade 8.

Only two students reported that their full year of chemistry included no laboratory time, and 32.7% of the students questioned said that they had performed chemistry experiments at home. The majority of students indicated that their most interesting science course was in high school (88.8%), and 64.1% wrote that their interest in a possible career in chemistry developed in high school, 24.7% in junior high, and 11.2% in elementary school.

When asked what majors they plan to pursue in college,

14.7% said chemistry, 18.1% biochemistry, 27.8% chemical engineering, and 39.4% were either undecided or planned other majors such as paper chemistry, geochemistry, forensic chemistry, or medical technology.

Finally, we asked students to rank, in order of decreasing importance, the three most significant factors among 13 listed choices that influenced them to major in chemistry or a related field. The responses to this question are shown in Table 1. These responses were weighted and ranked, as shown in Table 2. In order to show the importance of the first, second, third, and no choice, it was weighted by multiplying by 3, 2, 1, and 1, respectively, and then averaged.

The single most important factor (15.0%) was the student's recognition of a high aptitude for science. The influence of a high school chemistry or a science teacher ranked a close second (14.0%), with laboratory experience only slightly lower (13.6%). Chemistry as an entree to a career in medicine or related fields, and the importance of chemistry in

Table 1. Factors that Influenced Decision to Major in Chemistry or a Related Field

Factors	Ranking of Responses							
	1st Choice		2nd Choice		3rd Choice		No Choice	
	No.	Rank	No.	Rank	No.	Rank	No.	Rank
(a) Parent, relative, or friend is/was a chemist.	12	7	3	10	10	9	17	8
(b) Inspiring or encouraging high school chemistry or science teacher.	30	4	34	2	26	3	42	1
(c) Inspiring or encouraging junior high school science teacher.	2	10	3	10	7	10	5	10
(d) Suggestion or encouragement from guidance counselor.	2	10	5	8	5	11	4	11
(e) High aptitude for science.	31	3	42	1	31	1	35	2
(f) Attracted by reading, lectures, or TV programs about chemical science and technology.	13	6	13	7	16	7	23	5
(g) Interested in laboratory work, experimentation, or research experience.	36	2	27	4	24	5	34	3
(h) Importance of chemistry in medicine and health, energy, or environmental control.	29	5	30	3	17	6	32	4
(i) Diversity of career opportunities.	12	7	18	6	28	2	17	8
(j) Financial reward and opportunities for advancement.	13	6	20	5	25	4	18	7
(k) Chemistry as an entree to a career in business.	4	9	4	9	5	11	8	9
(l) Others, specify.	7	8	4	9	7	10	5	10
(m) Chemistry as an entree to a career in medicine or related field.	45	1	18	6	14	8	21	6

¹ George, B.; Wystrach, V. P.; Perkins, R. *J. Chem. Educ.* **1985**, *62*, 501.

² This title is conferred on teachers who have received the Woodrow Wilson Dreyfus Institute Fellowship and completed the summer institute at Princeton University.

³ The complete questionnaire can be obtained by writing to: Babu George, Department of Chemistry, Sacred Heart University, P. O. Box 6460, Bridgeport, CT 06606.

Table 2. Factors that Influenced Decision to Major in Chemistry or a Related Field (Weighted Composite)^a

Rank	Percent ^b	Factor
1	15.0 (16.8)	High aptitude for science.
2	14.0 (11.6)	Inspiring or encouraging high school chemistry or science teacher.
3	13.6 (13.8)	Excited by laboratory work, experimentation, or research experience.
4	12.7	Chemistry as an entrée to a career in medicine related fields.
5	12.1 (13.1)	Importance of chemistry in medicine and health, energy, or environmental control.
6	7.5 (6.1)	Financial reward and opportunities for advancement.
7	7.2 (9.8)	Diversity of career opportunities.
8	6.4 (7.3)	Attracted by reading, lectures, or TV programs about chemical science and technology.
9	4.3 (4.2)	Parent, relative, or friend is/was a chemist.
10	2.5 (1.9)	Other, specify.
11	2.0 (1.7)	Chemistry as an entrée to a career in business.
12	1.5	Inspiring or encouraging junior high school science teacher.
13	1.4 (1.0)	Suggestion or encouragement from guidance counselor.
	<u>100.2</u>	

^a The data from Table 2 were weighted then averaged, as follows, to reflect the relative importance of first and second choices: 3 × 1st choice; 2 × 2nd choice; 1 × 3rd choice; and 1 × no choice.

^b The percentages in the brackets are taken from the study conducted among college students.¹

medicine and health, energy or environmental control take up the fourth and fifth ranks (12.7% and 12.1%, respectively). The five highest ranking factors accounted for 67.4% of the responses. Students considered the role of high school guidance counselor to be of least importance (1.4%) in influencing their decision to major in chemistry or a related field.

Table 2 also ranks the responses of college chemistry students questioned in our earlier survey.¹ There is a remarkable similarity in the way college and high school students responded to the questions.

Conclusions

In high school, students generally receive their first major exposure to chemistry in the classroom and laboratory. Their teachers at this time seem to have an important influence on their attitudes toward the subject; their aptitude for chemistry is put to its first real test; and they probably first begin to think seriously about the social and personal consequences of various career choices.

In this study of high school students, as in our earlier study of college chemistry students, all these factors affecting high school students appear to play an important role. The results of this study clearly substantiate the conclusion of our earlier report that the high school years are the critical time for generating an interest in chemistry and encouraging further study in college.

Acknowledgment

We thank all the teachers who took the time to participate in our survey.