

FEATURE ARTICLES

THE PROBLEMS OF THE TRANSITION FROM HIGH SCHOOL TO UNIVERSITY SCIENCE

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ABSTRACT

This study addressed the question of whether a problem of transition exists for science students moving from high school to university, and if so, what is the nature of that problem. Four questions were examined: 1) Does a problem exist? 2) If so, what is the fundamental character of this problem? 3) To what extent do the stakeholders (professors, university freshmen, high school students, and high school science teachers) agree or disagree with causes of the problem identified from the literature? 4) What do they recommend to change it? Data were collected through questionnaires and interviews. The study indicated that a transitional problem does exist. Further analysis of the data showed different cultures in the high school and university, inadequate counselling, and poor teaching, to be fundamental explanations of the problem.

INTRODUCTION

Does a problem of transition exist as science students move from high school to university? The literature dealing with first-year university students suggests that university freshmen see the initial semester as a period of transition in which they adjust to new routines, to independence, and to increased academic demands (i.e. Chase, 1968). But the literature also points out that the transition is not a smooth one (i.e. Boyer, 1986); students are poorly prepared (i.e. Majeda, 1981; Gaudin, 1984; Volpe, 1984); and, universities do little to improve the problem (i.e. Renner, 1965; Tamir, 1969).

The problem of high school to university transition has been examined in the literature from the perspective of college drop outs (i.e. Chase, 1970; Cope 1972; 1978; Cope & Hannah, 1975; Cairns, 1982), students' withdrawal from college courses (i.e. Astin, 1975), student attribution and retention (Lenning, Beat & Sauer, 1980; Beal & Noel, 1980; Cairns, 1982; Stewart, 1983), high school and college science (biology) textbooks (i.e. Blystone, 1987; 1988; Cho & Kahle & Nordland, 1985), and the kind of academic programs or courses that should be developed in first year university to expand the academic background of the newer students. The majority of these studies did not, however, address the problem directly. Rather, they made reference to it in studies dealing with some other issue. As well, most of them focused on why particular courses or programs were not successful from the point of view of college or university. The broad question of transition was never addressed, nor were the different stakeholders considered.

To fill this lacunae we examined the general problem of transition from senior high school to university science taking into account the views of the different stakeholders. The specific objectives were to:

- a) identify the perceived causes of the problem both from the literature and from people involved; and
- b) determine how the problem was perceived by the different stakeholders; (university instructors, teachers, and students).
- c) explore in depth the fundamental bases of the problem.

We first conducted a review of the literature to identify the perceived causes of the problem. A questionnaire survey and follow-up interviews were then conducted to gain a first-hand impression of the views of the major stake holders. The two were then compared. Through a reflective analysis we sought to probe the deeper meaning of the problems.

BACKGROUND LITERATURE

The literature dealing with the transitional problem from high school to university was first examined to identify the perceived causes of the problem from that perspective. While our concern was with science teaching we did not limit ourselves to that area in this part of the study. In some papers, the authors argue their case on the basis of empirical data or on theoretical grounds. In other papers, such as those cited earlier, the causes for the problem had to be inferred from the paper. Generally, most felt that a problem did exist.

The nine views that emerged from the literature concerning the causes of the problem (shown in Table 1) fell roughly into three categories. The first category which includes a, b, and c refer to inabilities of students to cope with university work. They are poorly prepared academically, or they lack critical thinking, or independence. A cultural gap between the high school and the university constitutes another category which includes views d, e and f. Here there appears to be a lack of communication on different settings to which students need to adapt when they move from one to the other. Inadequate teaching and course materials comprise a third which includes the remaining three views.

METHOD

Through questionnaires and interviews we solicited responses from students, teachers, and professors to the questions informing the study. These questionnaires were prepared after broad

Table 1
VIEWS OF THE CAUSES OF THE PROBLEM CITED IN THE LITERATURE

Root Cause	Explanation	Primary Authors
a. Poor academic preparation	High school students enter the university without adequate academic preparation. They have not taken science courses or if so such courses have not prepared them for the laboratory. Practically, most college freshmen are uneducated and/or illiterate arriving into university with misinformation that bears little relationship to the fundamentals of the science which formed the basis of the high school curriculum.	e.g., Madeja, 1981; Chase, 1968; King and Yager, 1985; Scherz, Michman and Tamir, 1985; Volpe, 1984; Estee, 1982; Wlvagg, 1990
b. Lack of critical thinking	University freshmen lack reasoning skills or critical thinking. They are not able to formulate new questions, generate ideas, or restate given scientific problems presented in a new context. This is because science students in high schools are not encouraged to think creatively and critically and to extend the scope of their subject. Therefore, there is a need for effective and simple techniques to strengthen and to improve thinking skills in science education.	e.g., Mercurio, Schwartz and Oesterle, 1982; Moll and Allen, 1982; Rosenthal, Morrison, and Kinner, 1977
c. Inability to work independently	Most students lack the ability to work on their own efficiently. They are not aware of the time needed for university success.	e.g., Deal, 1984; Chase, 1968; Scherz, Michman and Tamir, 1985
d. Little communication between high school and university faculty	Even though there are campus visits, they are socially oriented and fail to encourage interaction between high school and college faculty.	e.g., Ricketts and Kissinger, 1982
e. New environment for student	The strong parental role is replaced somewhat by campus residences, and those students who live there usually do better than off-campus students. Also, small high school to small university or large high school, large community to large university finds more success than vice-versa.	e.g., Astin, 1975; and Stewart, 1983; Cope, 1972
f. A cultural gap between high school and college science courses	Increased science and math requirements have been recommended by the National Commission on Excellence in Education because most high schools don't offer adequate courses for college-bound students.	e.g., King and Yager, 1985; Report of the National Science Board Commission, 1983; Madeja, 1981
g. Poor teacher-student involvement	Many professors unable or too busy to spend time communicating with their students, and students not expecting this, lack initiative to pursue much needed relationship.	e.g., Gadzella, 1971; Noel, 1976; Cope, 1978; Stewart, 1983
h. Methods of teacher differ	Topic-centred approach of science teaching is not appropriate to strengthen and to improve thinking skills which are necessary for science students to understand science and how it works. Most high schools have little or no lab experience for their students, while the university has the lab, but lacks communication and student feedback in the large standard lecture system.	e.g., Report of the National Science Board Commission, 1983; Osterman, 1982; Volpe, 1984; Rosenthal, Morrison, Kinnear, 1977; De Bono, 1971
i. Inadequate science texts in high schools	Most high schools use textbooks, which are usually self conclusive, unimaginative in style, impersonal, outdated, use many terms, include some misconceptions, and are developed independently from the introductory college science texts.	e.g., Schwab, 1962; Welch, 1979; Cho, Kahle & Nordland, 1985; Yager, 1983; Blystone, 1987; 1988

consultation with teachers, science educators, scientists, and students. Four slightly different instruments were developed to serve the three different groups surveyed. The four main questions asked on each were the following:

- Is there a transition problem from high school to university?
- If so, what are the explanations for it?
- To what extent do you agree with the views taken from the literature?
- What do you recommend to resolve the problem?

The questionnaires were distributed to university professors, university/college students, high school teachers, and high school students. Completed questionnaires were obtained from 118 people; the number for each group is shown in the first row of Table 2. The largest group sampled was the university/college group. Five people from each group were followed-up by means of an indepth interview using similar questions to those used on the questionnaire.

The questionnaire was distributed in three high schools and three universities in large metropolitan areas in Washington State and British Columbia. The selection of participants was done to ensure representative groups from each institution. The schools and the universities were typical of those in the areas. These findings from high school students, university freshmen, high school science teachers, and university professors were then compared to the perspectives from the literature. Interviews were then conducted with a subset of those surveyed to further identify the fundamental causes of the problems, and to gain a deeper understanding of them.

RESULTS

We first present the data from the questionnaire survey, and then discuss the themes that emerged from the interviews.

Questionnaire Data

1. Does the problem of transition from high school to university exist?

Substantial agreement existed among the participants that a problem of transition from secondary school to university exists (59% agreed it is a problem, 22% believed it is a minor problem, 57% saw it as a growth period, and 13% believed it is not a problem at all). All the professors believed that a problem existed. None of the freshmen university students saw it as a growth period. However, 18% of university students who participated in this study claimed that it is not a problem at all.

2. What are the perceived causes of the problem and how do they agree with the literature?

Respondents were asked to indicate which of the problems listed in Table 2 were in fact problems to them. They were also asked to identify the most important problem in the list. The results are summarized in Table 2 where the actual questions

are listed. These questions were formed using the results from the literature review presented earlier. Table 2 then presents the number of times each of the four groups identified one of the problems listed. For example, six (or 40%) of the professors identified 'a', as a problem. It also provides an aggregate total and a summary of the most important problem identified by the entire group.

Of interest in these results are the problems most frequently identified by the four groups and the aggregate sample. University students ranked "the method of teaching and grading", and "poor academic preparation" as number one causes of the problem (both having 56%); "lack of working independently" came third (51%); and "poor academic preparation" came fourth (50%). The students lack experience in working independently (80%), lack of critical thinking (66%), and lack of preparation for university courses (53%), were checked first, second and third respectively by the professors. High school teachers placed "moving to a new environment" and "inability to work independently" as the main causes (57%). High school students identified leaving the environment of their home (80%) and the academic differences between high school and university (70%). The aggregate group identified the inability to work independently and the leaving of the home environment as the first and second most important problems.

Interview Results

Twenty people were interviewed to gain a more indepth picture of the problem and to better understand the meaning behind the questionnaire data. The perceptions of the different players clustered around three themes: the deficiency syndrome, the gap between high school and university, and the inadequacy of materials.

The deficiency syndrome. Professors reported that students come to university with wide variation in academic preparation. Some have poor communication skills (reading, writing and speaking); others who appear to know what they want adapt very quickly and overcome initial deficiencies. Most professors feel that students are poor at critical thinking and at working on their own, and, thus, they often demand less of students in the first semester.

High school teachers on the other hand believe that students are well-grounded in the science fundamentals which the teachers consider to be of most importance. They contend that students can work independently but acknowledge that different strategies are probably required at the high school. Students in the high school expressed sentiments similar to their teachers.

Freshmen university students indicated that they were prepared well in some courses, such as biology, but ill-prepared for chemistry regardless of the background they had had in high school. They also found that a different type of critical thinking was necessary at the university, something for which they were not prepared.

The gap between high school and college science courses and

Table 2
PERCEPTIONS OF THE PROBLEM: THE QUESTIONNAIRE OF THE CAUSE OF THE PROBLEM

The cause of the problem	Professors		University College Students		High School Teachers		High School Students		Total		Most Important Problem	
	n = 15		n = 66		n = 7		n = 30		n = 118			
	f	%	f	%	f	%	f	%	f	%	f	%
a.1 Professors expect the students to work harder and to accomplish more in university (poor academic preparation)	6	40	33	50	3	43	16	53	58	49	-	-
a.2 Many students are not academically prepared for university.	8	53	37	56	1	14	-	-	46	39	-	-
b. Many students are not prepared for critical thinking.	10	67	20	30	3	43	15	50	48	41	30	25
c. Most students have not learned how to work independently.	12	80	34	51	4	57	14	47	64	54	36	31
d. There is too large a gap between high school science courses and university level science courses.	2	13	29	44	1	14	-	-	32	27	-	-
e. Most students have left the environment of their homes for a completely new world.	5	33	30	45	4	57	24	80	63	53	28	24
f. High school culture and university culture are completely different, socially and academically.	6	40	29	44	3	43	21	70	59	50	24	20
g. The method of teaching and grading in university is different from high school.	4	27	37	56	2	29	8	27	51	43	-	-
h. High schools use textbooks and material which may be outdated, while universities use current publications (books, articles) and material.	2	13	22	33	1	14	-	-	23	19	-	-
											118	100

f = frequency with which people in this group identified this problem.
% = Percent of times people in this group identified the problem

the environment. Professors insist that no gap in subject matter exists between high school science and university science courses. The gap they argue is in the level of understanding. Also, professors believe that real science teaching (with the exception of math) is almost nonexistent before levels 11 and 12 of high school. If this was rectified, they assume that student grade performance in science 11 and 12 would be substantially affected. However, they assume that in a smaller school, teaching science is left to an individual teacher with a poor background in science teaching, therefore, a problem could be posed. They feel that some teachers may not be following the curriculum correctly; or that students did not learn or remember the subject matter, and therefore need to relearn some science concepts at the university.

University freshmen perceive a large gap between some high school and college science courses but not in others. They stated that most high school courses are elementary in content compared to university science courses. They also claimed that high school science courses are centered around facts, while in university,

science courses are centered around theories and ideas as well as facts. They concluded that, while there is little challenge in high school science courses, there is a great deal of challenge in university science courses.

There is a wide agreement among those interviewed that most students have left the environment of their home and their high school for a new world. Of course, some freshmen still live at home, but all had left their high school environment and friends. In addition there had been a re-direction of life goals. All agreed that the change from a structured, parent-disciplined life to a self-disciplined university life was difficult in every phase, except social.

Most professors and freshmen claim that change of environment, new expectations, and unlimited freedom were the biggest problems. Freshmen and professors said the students who were able to leave their high school friends behind (those who are not continuing their education), especially those who were party-

goers, had great difficulty and either had to change their habits or face failure. Although students know they have to study more, somehow they cannot accept the reality of actually doing so. Professors believe that it sometimes takes students a year or more to overcome this problem.

Textbooks, materials, and science teaching. Generally, the use of textbooks was not seen to be a problem. University students reported that university texts appeared more challenging and that often material at the university was more up-to-date, but neither university professors nor high school teachers saw texts as a problem. A common thread was felt to exist between university and high school textbooks.

The problem that did surface was in the area of teaching where a variety of concerns were mentioned. University students reported that in high school they were often taught that what was printed in the text was the truth, only to find it being challenged or changed by the time they reached the university. Students also reported that professors were often very disorganized in their teaching and that they rarely stated what their purposes were. Professors, too, pointed out that they had had no educational training in how to teach. The large class size at the university was also seen to be an ongoing problem among student, but professors claimed that students adapt to large classes after about two weeks.

The Fundamental Problem and its Possible Solution

The third purpose of the study was to explore in depth the fundamental basis of the problem. To do this, we conducted a qualitative analysis of both the questionnaire data and the results from the interviews and juxtaposed the emerging themes against selected literature. This analysis led first to the notion that the fundamental problem was essentially a function of different cultures. To understand the problem of transition from high school to university is to understand and appreciate the existence of two different sub-cultures. Second, we contend that the problem of transition is exacerbated by inadequate attention to teaching, both in the high school and the university. Third, if solutions are to be found to the problem they will come through improved teaching, better counselling and improved collaboration. These three are discussed in this section.

DIFFERENT CULTURES

In a broad sense, the term culture is used by social scientists when they seek to explore the structure of knowledge, skills, customs and beliefs of some group in society (Stenhouse, 1975). Culture is what counts with a group. In one sense it shapes the group, in another sense culture is shaped by the group. It is that complex set of beliefs, values and expectations that a group takes for granted. As Sarason (1971) pointed out, group and cultural norms are important to understand the behavior of individuals within a group. Society is made up of a number of sub-groups, each possessing a type of sub-culture.

The data gathered in this study supports the existence of two

cultures, one in high school and one in the university. The high school environment is a more sheltered family-like atmosphere where science is taught not only for purposes of university and college preparation but also for those for whom university is not an option. The content of science courses is, at times, secondary to the social and vocational needs of students. Teachers were often content with providing students with basic science information recognizing these other needs of the students. The home, too, contributes toward a different cultural ethos in the high school since high schools are normally more connected to the community through some home and school organization.

The university setting, on the other hand, provides a less structured atmosphere for students. Science is now taught for different purposes than at the high school. Students who were used to ongoing evaluation now find themselves forced to deal with one or two examinations to determine their performance in a course. First year science courses sometimes take on the role of screening devices to select students for further study. The cultural differences extend beyond the academic realm to those of a more social nature. The supportive nature of the high school has now been replaced by a sometimes isolated existence and a requirement that students work more independently.

One of the implications of a cultural perspective is the recognition that it is usually most difficult operating within a group unless one understands the cultural norms of that group. It should come as no surprise, then, that for many students a year is required to adjust adequately to the new college/university setting. We suggest that this problem of transition from high school to the university is essentially a problem of cultural transition.

THE WAY SCIENCE IS TAUGHT

The meaning of science that is conveyed to students both at the high school and the university comes through teaching. The interviews we conducted suggested that the way science is being taught contributes substantially to the problems students have in making the transition from high school to the university. It appeared that inconsistent messages about the meaning of science were being conveyed and that at neither level was science being taught as an educative process, or as having a revisionary character. A full discussion of this issue is beyond the scope of this paper. To illustrate our argument, we comment on the meaning of science that was being conveyed to students and why that meaning exacerbates the problem of transition.

High school teachers saw themselves as providing students with the fundamentals of science. What this appeared to mean was the presentation of information about science that the teachers saw as being truthful. As one student pointed out, "we were taught the information in the text as though it were the gospel". The teaching of such information was important for another reason — final examinations. In effect, a fairly dogmatic, inculcative curriculum was being taught which Schwab (1962) has described as a 'rhetoric of conclusions'.

At the university, the teaching was also driven primarily by examinations. In fact, many first year courses were seen by students as screening devices aimed at weeding out poor students

and selecting outstanding ones for graduate study. But students complained that what had been taught at the high school was often not applicable to university science which was not highly fact-oriented but more theoretical. Students expressed confusion that the facts learned in high school were now being cast in a different light and often seen as inaccurate.

Thus, students often see science teaching as dogma and as a rhetoric of conclusion at both levels. The need to pass final exams and to prepare for further work drive this approach. The difficulty with such a dogmatic, inculcative approach was identified by Schwab (1975) who says, "If we dogmatically select one of several bodies of theory in a given field and dogmatically teach this as the truth about its subject matter, we shall create division and failure of communication among our citizens " (pp. 266-267). It was our conclusion that the high school and the university were teaching different forms of scientific dogma without relating them to the overall revisionary character of science and the value that such knowledge had to the educative process. Thus, where university science should have been an opportunity to gain breadth and understanding in the educative sense, it was simply another body of knowledge to memorize in order to pass yet another examination.

RECOMMENDATIONS

Those interviewed were asked to offer their recommendations for solving the problem. We also reviewed our own conclusions and results with the aim of identifying solutions. It became evident that easy solutions to the transitional problems did not exist. As we pointed out earlier, the high school and the university have different cultural norms, and those are not about to change. Thus in some form or other the problem is here to stay.

However, there are a number of ways the impact of the transition can be eased for students. Teachers, university people, counsellors and students themselves can all play a role. We discuss three starting points: teaching, counselling, and collaboration.

Improved teaching. One of the starting points for easing the transition from high school to university lies in efforts being made at both levels to improve the quality of teaching. As we pointed out in an earlier section, the view of science that is being presented at the moment is a dogmatic, inculcative approach where students are being taught the fundamentals of science in preparation for further study. The argument behind this approach, knowledge as a basis for understanding, is on the one hand sound. On the other, it is quite problematic because it promotes neither educational nor scientific understanding. Students do not appear to understand the meaning of what they have learned in science in a broad educational sense. Neither are they being made aware of the revisionary nature of science and the system within which the concepts they have learned had been developed. Rather, they are being presented with selected aspects of scientific dogma at the high school and university levels and often being told at the university that their high school science was wrong. Such an approach to science teaching aggravates the transition from high school to university.

The aim of teaching science should be to help students acquire

knowledge, ideas, and skills; encourage values and ways of thinking; learn the means of expressing themselves as well as ways of learning and educating themselves. A starting point for improvement would be for teachers of high school science and first year university science to include in their instruction the meaning that knowledge holds in thinking about issues in science and society and the transitory and syntactical nature of such knowledge. Such understanding of the nature of scientific knowledge may then promote at each stage of science teaching a deeper understanding of science itself.

The data we obtained from our study indicates that at present teaching at neither level seeks to accomplish this. The development of critical thinking is a case in point. This ability is regarded as an important aspect of science instruction. But most university freshmen cannot formulate new questions, generate ideas and principles from information, restate a given scientific problem in a new context, or apply knowledge to a new problem (e.g., Schwartz & Oesterle, 1982; Gaudin, 1984). Rather, they rely on the ability to memorize and recall facts during college courses (e.g., Schlenker & Perry, 1983). But in our study, interestingly enough, even though both professors and teachers placed the lack of critical thinking high as a problem in the transition from high school to university, both denied any responsibility for teaching it to students. Professors feel that critical thinking should be taught in high school, while high school teachers see their job as teaching students the fundamentals of science rather than critical thinking.

Our data suggested that other aspects of teaching could also be improved both at the school and the university level. Certainly, teaching and what is taught, are crucial starting points for alleviating the problems of transition from high school to university.

Better counselling. From our data it appeared that high school counsellors and academic advisors were very poor sources of information. As such, they probably did more to aggravate the problem of transition rather than help solve it. A study reported by Boyer (1986) supports our findings. In a survey across the United States, he found that counsellors ranked well behind parents in terms of influencing students in selecting a college and even ranked behind friends. In that survey it was reported that counsellors had very little knowledge about colleges or universities not close to their own school.

We suggest two areas where improved counselling could alleviate problems of transition. First, counsellors should become more attuned to the cultural differences between high school and university science. As we said earlier, real cultural differences exist and often an awareness of those differences by students is a first step. Evidence suggests that counsellors are of little help here. But they could, for example, advise students on how to overcome the isolation often experienced in their first year of university, i.e. by forming support groups among peers.

Second, high school counsellors should become more knowledgeable about the differences that exist between colleges and universities and in some cases between different subjects in science. In the province of British Columbia, Canada, it is frequently the case that the knowledge of many counsellors does

not encompass more than their alma mater, nor the subjects they studied when at universities. Substantial differences exist between different science departments; counsellors should be aware of these. Our data also showed that different subjects engendered different problems in transition. Students who entered chemistry in first year university, for example, experienced very different problems from those taking biology as a first year course. Counsellors should be knowledgeable of such differences. Our data suggests that they are not.

Collaboration. Another obvious window of opportunity to alleviate the problems of transition from high school to university lies in collaboration between teachers at the high school and university levels. The issues related to improving teaching can hardly be resolved without collaborative efforts between high school teachers and university professors. However, such collaboration will be totally unproductive if it does not occur on a level playing field. That is, the university professor should not be held up as the epitome of good teaching simply because of his or her expert knowledge in a specialized field. Similarly, high school teachers must not play the 'anti-ivory tower' game they are so accustomed to doing. Rather, collaboration should recognize the inevitable and necessary cultural differences at the high school and university levels and the important contribution that each makes to the education of our young people.

One productive example of the collaboration between high school teachers and university professors was provided by teams from Texas Tech University and Lubbock Independent School Districts in Texas State, U.S.A. These two institutions developed a collaborative project called "Bridging the Gap Between A Public School System and a University". In this relationship, instructors from the university were made available as a classroom resource to individual teachers in the Lubbock public school system and classroom teachers from the public schools made guest appearances in the professor's undergraduate class (Ishler & Leslie, 1987). In this sort of exchange teachers can become aware of what knowledge is to be expected from their students when they enter university can be made aware of the real background of their freshman students.

The Government of British Columbia, Canada has implemented a similar though more restricted program. This new program "Scientists In The School", is designed to generate greater awareness in school children of the important role that science and technology play in the economy and in society. In providing role model in the form of interested professors, the program also aims to impart enthusiasm for science and encourage students to pursue careers in related fields.

Of one thing we can be certain. Problems in science do exist for our young people as they make the transition from high school to university. These problems are wasteful of human energy and also discourage many young people from continuing science as a career. Improved teaching, better counselling, and more collaboration among stakeholders can alleviate these problems. The results will be well worth our efforts.

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About The Authors

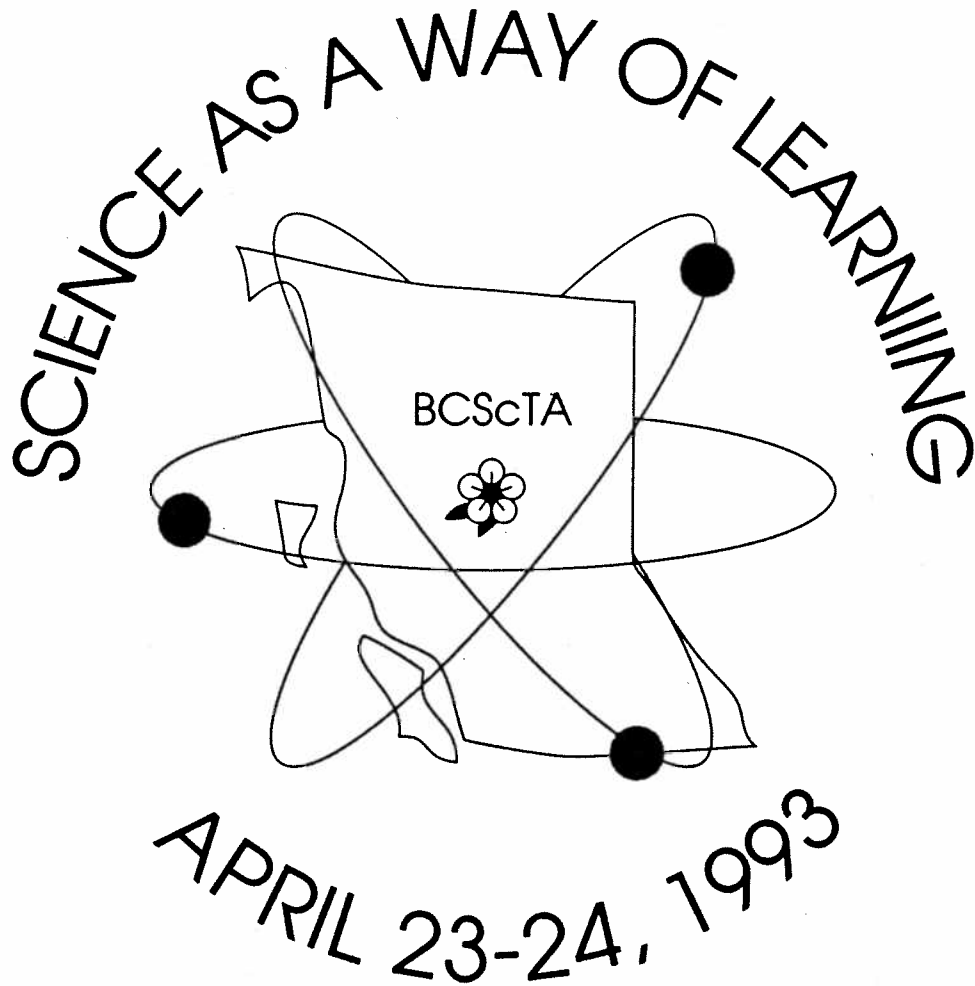
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Table 3
SURVEY RESULTS REGARDING THE CAUSE OF THE PROBLEM

The cause of the problem	Professors			University College Students			High School Teachers			High School Students			Total		
	n = 15			n = 66			n = 7			n = 30			n = 118		
	f	%	mp	f	%	mp	f	%	mp	f	%	mp	f	%	mp
1. Difficulty in handling new found freedom	16	80.00	2	39	54.93	1	6	50.00	3	12	34.39	2	73	52.90	1
2. The need of self discipline for	10	50.00	-	35	49.30	2	6	50.00	3	4	11.43	-	55	39.86	2
3. Inability to study effectively	15	75.00	3	35	49.30	2	3	25.00	-	2	5.71	-	55	39.86	2
4. Not knowing what is going on in the university among freshmen (poor communication between students and professors; high school and university)	2	10.00	-	30	42.25	-	7	58.33	2	-	-	-	39	28.26	5
5. University professors and counsellors know little of how to motivate freshman students	10	50.00	-	20	28.17	-	8	66.67	1	1	2.85	-	39	28.26	5
6. University is loosely structured in terms of teaching	8	40.00	-	18	25.35	-	3	25.00	-	7	20.00	3	36	26.08	6
7. Science courses in high school are elementary in content	13	65.00	-	33	46.48	3	2	16.67	-	1	2.86	-	49	35.51	4
8. High school graduates know little about the university before they come to it (poor high school counselling)	10	50.00	-	29	40.85	-	1	8.33	-	-	-	-	39	28.26	5
9. Poor communication skills; reading, writing and speaking, (resulting either from mental immaturity or inadequate teaching in high school)	17	85.00	1	3	4.22	-	-	-	-	-	-	-	20	14.49	7
10. The nature of the university, larger size and larger classrooms especially in the typical freshmen lecture classes	7	35.00	-	26	36.62	-	7	58.33	2	15	42.86	1	54	39.13	3

f = frequency mp = Mean Percent



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