

Thoughts on Surveying Curriculum

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This article originated as a response to a request by Mr. F. J. S. Pearce, chairman of the Special Committee on Education, for suggestions regarding a curriculum for a university course in surveying. After I had given it some thought I realized that it would be purely academic to discuss a curriculum by itself without relating it to other, often more important elements of the whole program of study which ought to be considered together with it. The curriculum is obviously the basic constituent of a program but its final success depends on several other essential ingredients. Therefore, before I go into the details of proposing a curriculum I would like to devote a few lines to discussing the program as a whole.

Three Ingredients

Based on my experience in education I would recognize three basic ingredients that strongly influence the degree of success in an operation of producing university graduates in a given field of study: **students, teaching staff and professional body** associated with the field. A proper contribution and close interaction among **all** these three ingredients is necessary for a healthy operation. A malfunctioning in one of these components can threaten the success of the whole operation. As an example, we are all aware of the situation on this Continent where we have a few examples of university programs in surveying, none of which in my opinion could be termed fully successful, although some can boast excellent academic staffs and receive a strong support from professional communities. The weak ingredient has been, in most cases, the small number of students.

It is quite obvious that a successful program must attract a reasonable **number of students** and with a reasonable cross-section of intelligence. The decision of a student to choose a given course of study depends largely on his "image" of the related profession. This image may come in various shades of grey corresponding to the amounts of information or misinformation he has about the field. In a successful program the profession should take the responsibility for enticing the best young people to enter it and utilize the best methods known to do it.

Uninspiring Method

The decision of the student to enrol in a particular course of study is no guarantee that he will end up, if he is academically successful, in the ensuing professional practice, or, even if he did, that he will be properly prepared for it. This, of course,

depends to a great degree on his **teachers** and the **material** taught. I would give support to the opinion expressed at a recent conference on surveying education which blamed the lack of interest in surveying at the universities on the conservative and uninspiring way in which this subject has been taught for decades.

Another important factor influencing the outcome is the reception that the young graduate gets when he begins to look for a job within the sphere of his qualifications. We must be quite sure, therefore, before we start any new program of studies in a field where there is no professional heritage at that level that a real and definite need **exists** for a specially trained university graduate and, if we are that sure, we must then do our best to **help** the young professional get started in that field until the field becomes saturated to the point that a natural flow of supply and demand is established.

Must Be Attractive

As far as the curriculum of a surveying program is concerned, I believe, that it must be attractive to the present and the near future generations of students. This is not to say that the curriculum should be designed just for student interest. A curriculum must, of course, perform a function of satisfying the educational requirements of a profession and safeguarding the interest of the public at large. What I want to say is that in its relation to life a successful curriculum must not be suffering from the "generation gap", i.e. it must be contemporary in relation to the concerns of the young people of today.

The work of the surveyor in the early days satisfied the craving of the young man of those times for exploration, exploitation, conquest. How does the work of the surveyor of today satisfy the almost diametrically opposite concerns of today's young man about the equality of his environment, conservation, social justice? You may ask, what has this to do with the curriculum in surveying? I believe that awareness of this phenomenon can contribute greatly to the success of a surveying curriculum; moreover, I think that these areas of concern represent a challenge to the type of surveyor I would want to help educate.

Narrow Scope

Again, I feel that the weakness of the present curricula in surveying to attract students has to be attributed to the narrowness of the scope of study offered. This may, in part, be explained by the fact that the majority of staff teaching advanced

courses in surveying in Canada and the United States have been brought up and educated in Continental Europe where they can get away with that scope of studies, because the university programs and the profession of surveying are well established along with the other professions and the lack of students has not been a serious problem.

Here in Canada we have had a different past situation and have different present needs. The program should therefore be tailored to suit our conditions and not merely transplanted from another continent. The danger with a transplant is that it may be rejected rather than accepted by the Canadian student.

Should Have Broad Base

In view of the above, I feel that a modern curriculum in surveying should be broadly based while at the same time capable of meeting the educational requirements of the professional land surveyor, after some practical experience by the aspirant. The scientific basis of the surveying specialist, whether or not the program is located in a science, engineering or any other faculty, should include the following subjects:

(6) **Mathematics (calculus, algebra, geometry, some differential geometry, numerical analysis, statistics, and computer programming)**

(2) **Physics**

(2) **Earth sciences (geology, geophysics, geography)**

(1) **Biology (botany, dendrology)**

The numbers in brackets in front of the subjects indicate approximate relative weights among the subjects. Most of this background material will be covered in the first year or two of a four year program. The remaining 2-3 years should be devoted to specialization in surveying. I would recognize two groups of subjects comprising the specialization part of the curriculum: (a) **traditional surveying subjects** and (b) **related subjects**. Each group would be given about **equal time** in the program.

A. Traditional surveying subjects:

(2) **Basic surveying methods**

(3) **Geodetic surveying (including astronomy)**

(2) **Engineering applications of surveying**

(2) **Legal surveying**

(1) **Map projections and cartography**

(2) **Statistical adjustment of data**

(5) **Photogrammetry**

The weighting of the individual subjects

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veyors Act 1968-69 as a good business procedure. Council resolved that the Treasurer continue to be bonded in an amount of \$1,000.

0/Reg.109/70 — Regulations under The Registry Act — The Secretary advised Council that the Provincial Cabinet on March 5, 1970, approved 0/Reg.109/70, being amendments to the regulations under the Registry Act, and that same would be advertised in the Ontario Gazette on March 14, 1970. As the Secretary had not received a copy of this regulation, he was unable to give Council any further information.

79th Annual Meeting — Ottawa, 1971 — Council resolved that the 79th Annual Meeting of the Association of Ontario Land Surveyors be held in Ottawa, in February, 1971.

Other New Business — The Chairman of Council took this opportunity to ask the Council members to think of directions for the Standing Committees of Council to be discussed at the next meeting, and also give some thought to objectives for the Association in 1970. This would be a priority item to be considered at 9.00 a.m. on April 7, 1970, the next meeting of Council. The Chairman also directed that the Secretary send a special letter of invitation to the Chairmen of the Regional Groups to attend Council meetings, if they so desire.

Board of Examiners' Report — March Examinations 1970 — The Secretary, as a member of the Board of Examiners, reported to Council that the March Examinations of the Association were currently

Appointment of Chairmen of Standing and Special Committees of Council — Council resolved that Chairmen of Standing and Special Committees for 1970 be appointed as follows:

Standing Committees — Aerial Surveys & Mapping
Biography & Repository
Certification Board
Control Surveys
Discipline
Drainage
Entertainment
Finance
Land Surveying
Legislation
Liaison
Mining
Nominating
Publications
Public Relations
Salary Studies
Survey Notes & Records Index
Town Planning

Special Committees — Award
Bursaries & Scholarships
Complaints
Executive Committee
Geodetic Science Program
Surveyors Manual

and that the members of the Executive Committee be Messrs. J. C. Kirkup, E. W. Petzold, and K. H. McConnell.

Curriculum

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is only approximate and relative within the group and should not be compared with the weights given to basic sciences. Thus, e.g. weight 5 given to Photogrammetry has no relation to weight 6 given to Mathematics. The actual credit units attached to each subject would have to be worked out according to the credit system of particular school or faculty and an attempt to include them would be premature at this time.

B. Related subjects:

Elements of Civil Engineering
Urban and regional planning
Photo interpretation

- * **Remote sensing of environment**
- * **Inventory and mapping of natural resources (forest, agricultural, mineral, water, air resources)**
- * **Land use and conservation**
- * **Study of Northern Canada**
Business management
Law
Accounting
Computer graphics and data banks

The subjects denoted by the asterisks are new subjects that I am proposing.

being held in the former Metropolitan Toronto Council Chamber, 67 Adelaide St. E., Toronto, from March 2 to 13, 1970. He reported to Council for their information only that 70 students were sitting for the Intermediate Examinations, 46 students for Part I of the Final Examinations and approximately 28 for Part II of the Final Examinations.

J. D. Barber
A. A. Outram
E. W. Petzold
H. A. K. Shipman
D. T. Humphries
W. J. Settingington
W. H. Moffatt
J. C. Kirkup
J. E. Hietala
S. S. Mercer
A. F. Allman
M. R. W. Maher
F. J. S. Pearce
A. F. Allman
E. Biason
K. Biro
D. F. Yates
L. G. Woods

F. J. S. Pearce
B. J. Haynes
A. F. Allman
D. T. Humphries
F. J. S. Pearce
M. Hewett

More Prominent Role

I would like the surveyor of the future to play a more prominent role in these fields. Only some of these subjects would be compulsory, such as e.g. the first three, the fifth and sixth; the remaining could be offered as electives (electives form a group of subjects from which the student chooses only a certain number to meet his credit requirements). The relative weights are not given, since I have not as yet attempted to outline the material content to myself. Many of the subjects in this group are really just **subject ideas**. Although some of them appear very exciting to me, their offering will depend largely on the availability of competent staff to teach them. A large university with a diversity of fields and staff has an obvious advantage here.

Greater Student Interest

In conclusion I would like to stress that the above proposed curriculum through its heavy proportion (equal time) of group B subjects represents a considerable departure from a few surveying curricula available in Canada and the United States. This is intentional. After all, as I mentioned before, none of the existing curricula have been fully successful. This curriculum is designed with one main purpose in mind: to broaden the scope and role of professional surveying and thus create greater student interest. One may criticize the broadening of the curriculum on the account that many of the graduates might be diverted to other fields, remote from surveying. This could well happen but it should only help the cause of the surveying profession in the long run. It would be, for instance, quite desirable if some of the first graduates became teachers in high schools where they could seed the ideas about the role of surveying.

Greater Contribution

Another reason for the emphasis on the subjects in group B is that, in my view, a professional surveyor should be able to contribute more to the society than just his capability to measure and subdivide the earth surface. He must be able to realize not only the technical and legal aspects of his work but he must also understand and appreciate its economic, social and esthetic implications.

Finally, I have been referring to the curriculum as a curriculum in surveying. There are various names associated with the existing courses such as surveying engineering, geodetic science, geometronics, land surveying, etc. The last three are too narrow by definition and would be quite unsuitable for the curriculum that I am proposing. The first implies a base in an engineering faculty. I would like to suggest the name **surveying science**.

***The views expressed herein are those of the author and should not be interpreted as reflecting the thinking of the University.**