Teacher Education: A Canadian Response to a British Innovation

John T. Haysom
saint mary's university

A. W. Harris
university of western ontario

H. Dene Webber
university of western ontario

Ce programme de formation des futurs professeurs de science est le premier programme de cette nature à avoir été mis en oeuvre en Grande-Bretagne.

La présente étude comprend deux parties: la description du programme et l'utilité de ce programme pour les communautés pédagogiques du Canada.

En première partie, on traite de la philosophie du programme, de ses méthodes, de son contenu, de son élaboration. On y décrit avec soin les resources humaines et matérielles qu'on utilise. Le développement professionnel des futurs enseignants est axé sur la formation pédagogique plutôt que sur la formation scientifique: on leur offre un grand nombre d'expériences qui, tout en ne négligeant pas leurs intérêts propres, vont susciter leur développement intellectuel.

En deuxième partie, on évalue l'impact de ce programme sur les pédagogues canadiens. On y fait la description de l'expérience tentée par la Faculté des sciences et celle des sciences de l'éducation de l'Université Western. On y présente de même les résultats d'une étude qui a évalué le matériel pédagogique qu'on a utilisé dans des écoles du Canada: on y relève les problèmes soulevés par l'emploi du matériel et on fait part des observations qu'ont faites les professeurs de science de l'Ontario.

"Looks promising to this point, however, I need a little more information to comment critically."

"Excellent potential! I would love to delve further into the materials to see what I could adapt to my own needs."

These were some of the reactions of participants, at the Annual Conference of the Canadian Society for the Study of Education at the University of Alberta in 1975, to presentations of the materials produced by the Science Teacher Education Project. The first part of this paper consists of a synopsis of the presentations made and the second part examines the potential of the materials in Canada.

THE SCIENCE TEACHER EDUCATION PROJECT (STEP)

STEP was the first major curriculum development project to be concerned with teacher education in Britain. It was sponsored by the Nuffield Foundation. On the surface it attempts to make a contribution to improving the quality of "training" given to science teachers, but in fact its range of application is much wider. It is essentially concerned with helping the young teacher to perceive and understand his role in the classroom and with helping him to develop some of the skills he needs. For example, the topics covered are common to many courses in professional studies. They include: Aims and Objectives, The Pupils' Thinking, Teacher Pupil Interaction, Methods and Techniques, Curriculum Design, and Language (in Science Lessons).

What stimulated this development?

In the late 1960's there was substantial criticism of teacher education. Some thought that it was thoroughly out of date, and the practices employed resembled those used in the schools at the beginning of the century. For instance, Clegg, at the Third International Curriculum Conference, held in 1967, said, "Yet the irony of so much training is that the trainers try to convey fire-lighting techniques by themselves using pot-filling methods, and moreover their victims are all too often fully aware of this contradiction and inconsistency." (1) Clegg was not the only critic. Morrison and MacIntyre (2) pointed to yet another of the many shortcomings: "The problem is that theoretical courses are not about teaching and that methods courses which are about teaching have no theoretical foundation."

A large number of tutors, lecturers, and professors in the colleges and university departments of education were also embarrassingly aware of such shortcomings. Many had participated in the wave of curriculum development in the sixties and wanted to apply the principles of curriculum development and educational theory to the task of "training" teachers. Doubtless the trustees of the Nuffield Foundation, which had likewise played a major role in curriculum development, similarly felt that the seventies should begin with an investment in the teachers themselves. The time was ripe for innovation.

What happened then?

The project began its 4-year programs in January 1970. Tutors from all over Britain were sent a circular letter inviting them to send in specific suggestions as to what they thought were valuable learning experiences for student teachers. Over two hundred suggestions were received and these were sorted into thirteen different topics. The individual suggestions within topics were developed and added to by small writing teams so that each unit became the basis for about one hour of student activity. On average, each topic contained about eight units. During the following three years

over two hundred tutors were involved in a nationwide formative evaluation of the units, prior to their publication in 1974. The involvement of tutors from the majority of colleges and universities in Britain concerned with training secondary school teachers was always considered an important aspect of the project. This style of curriculum development, characterized by extensive social interaction, emphasizes the process as much as the product.

What are the features of the Project?

In developing the units the writing teams all followed the same guidelines: they put an emphasis on the student's professional development as a teacher rather than on his academic development; they gave the units a theoretical orientation whenever possible so as to help build bridges with the student's education studies; they avoided presenting views assertively so as to encourage the student to explore the teaching situation for himself; they put an emphasis on the student learning rather than on the tutor teaching, and consequently the student is active in all of the units (forming an understanding, practising skills, and developing his perception of himself as a teacher); they were aware of the importance of motivating the student, and consequently the units were designed to be appealing to the student; they wanted to expose students to the widest variety of learning experiences so that each would (incidentally) have his horizons extended; they wanted to take full advantage of resource materials, such as sound tape-recordings, slides, pupils' writings, videotape-recordings, film, filmloops, case studies; they kept the units short (average length about 1 hour) and made each self-contained so as to offer the user flexibility in incorporating them into his own courses.

After two field trials, the units were published in a loose-leaf volume entitled *Activities and Experiences: A Bank of Ideas for Use in Professional Courses.* In the following examples, giving brief descriptions of four units, student teacher activity is evident as a dominant feature.

Example 1. "Identifying with the Pupil"

The student teachers tackle a number of novel problems requiring different intellectual skills and making different emotional demands, e.g., exercises requiring careful observation, logical thought, creativity, persistence and so on. They are put in the position of a learner practising the modes of thinking scientists use. In this way it is intended that they should experience what it *feels* like to be a pupil and thus view teaching methods as pupil activities — activities in which the learners practise the skills the teacher hopes they will develop. In plenary session they are invited to review their experience.

It is unlikely that some of the objectives of this simulation exercise, particularly those in the affective domain which are concerned with helping the student teacher to experience what it feels like to be in the pupil's shoes, could have been achieved in a more traditional way.

Example 2. "Critical Incidents"
In small groups, students examine a number of descriptions of actual classroom incidents, related to matters of control, with a view to discovering effective solutions to the problems they pose. They compare and contrast their solutions in such a way as to reveal some of the theoretical assumptions on which each is based.

This was probably the most popular unit, and 96% of the tutors using it were impressed by the way their student teachers were motivated. Problems of discipline and control are a source of anxiety to many young teachers, and one might anticipate that the reason for the success of this unit was that upon these problems were tackled. However, the trial indicated that the student teachers considered the following to be the three major reasons that the activity appealed them: they sorted out or expressed their own ideas and opinions, they liked co-operating with others, and they enjoyed the social element.

Example 3. "What is Practical Work For?"
The student teachers' perception of the possible outcomes of practical work is sharpened by completing part of the questionnaire used by Kerr in his report "Practical Work in School Science". Then, in groups, the students discuss the value of organising practical work in each of the four distinct ways portrayed in a case study.

This unit appeared in the trials to have a particularly high diagnostic value. Tutors frequently referred to the insights they obtained about their student teachers, feedback about their knowledge of objectives, about their views on what constitutes a "good" lesson, or about their tendencies to be subject-centred.

Example 4. "Classifying Educational Objectives"
The student teachers are introduced to Bloom's 'Taxonomy of Educational Objectives' through an auto-instructional linear programme. It has been recorded on tape so as to enable the tutor to use it in a language laboratory. Because it is likely that the student has not encountered programmed learning in a language laboratory, the tape starts with a short sequence of frames introducing this method.

This tape is the only example of programmed instruction retained after the trials. The novelty and appreciation of some of the features of programmed learning appealed to some and the mechanics appalled others. ("I didn't like being shut off in a booth, listening to the tape".)

In summary, there are good reasons for concluding that student teacher activity is important in teacher education:
1. A wider range of objectives is logically more likely to be achieved.
2. Experience gained in the project suggested that student teachers are better motivated when they are active. Concurrent research indicated that the importance of social motivation was frequently underestimated by tutors. And of course, for social motivation to operate, various types of

group work, which encourages interaction, are necessary. The project's research on student-teacher motivation is reported by Haysom and Sutton (4;3[h], chap. 5).

3. When the students are active, the receptive tutor is likely to gain more insight and feedback about their progress.

4. Variety of activity commends itself because of the incidental learning it may generate (if the medium is indeed the message). It is clearly important that colleges and departments of education should keep pace with sound educational practice.

In the early stages of the project the need for resource materials was greatly underestimated. It was as if the interrelation of resource materials and student activity had not been fully appreciated. It became increasingly apparent, however, that resources had a vital role to play in stimulating and sustaining activity, and that the production of such material is at the heart of modern curriculum development. Surprisingly, only a few of the multitude of texts on curriculum theory make this point. STEP responded to the need by producing and making use of a wide variety of films, videotapes, filmloops, slides, audiotapes, and the simplest resources of all, "bits of printed paper." These bits of printed paper were gathered together and published by McGraw-Hill in 1974. *Activities and Experiences* includes worksheets, discussion documents, data sheets, lists of critical incidents, and so on, on which normal copyright has been waived so as to enable tutors to duplicate the resources for use with their students. *Meadowbank School,* which portrays life in a "typical" school, contains 20 case studies, each highlighting a different educational problem. *Through the Eyes of the Pupil* contains a collated selection of pupils' work and writing. *Readings in Science Education* contains a wide range of provocative and informative articles taken from newspapers, journals, etc. Other publications of the project are:

(a) *Theory into Practice.* A companion volume to *Activities and Experiences,* providing activities in school for student teachers. It contains 30 observation exercises and other short studies. It is likely to be of special interest to teachers who supervise students in practice.

(b) *Film Review.* Content descriptions of films (mainly British) and tutors' comments on ways of using them. These are films about teaching method, not about the content of science.

(c) *The Art of the Science Teacher.* A book for teachers and student teachers surveying the main aspects of professional studies.

A CANADIAN RESPONSE

There has been considerable interest in STEP internationally and more particularly in Australia, Israel, Malaysia, Kenya. In Australia and Israel, local extensions of the project have been very active for over a year (ASTEP and ISTEP). Stimulated by the nature of the materials and the ideas they

contain, these extensions have drawn together large groups of educators with a view to selecting suitable existing units, modifying potentially suitable units, devising new units, and field-testing these locally.

In Canada a similar process has begun. A serious consideration of the STEP materials was undertaken by the Science Department, Faculty of Education, University of Western Ontario (London, Ontario) during the 1974/75 academic year and is being continued during the 1976/77 academic year. A more extensive study of the materials in Canada was encouraged on two fronts. A meeting of science educators of all Ontario university faculties of education to familiarize them with the STEP materials was held at the University of Western Ontario in May 1975. A presentation was also given at the Annual Conference of the Canadian Society for the Study of Education at the University of Alberta in June 1975.

The STEP materials have been used in the Science Department, Faculty of Education, University of Western Ontario, in the pre-service program, the in-service Type A summer program, and the 2-week PEMSTEP[1] orientation program. Forty-two of the 97 units in *Activities and Experiences* have been attempted without modification. The units were generally well received in all programs. They were, however, best received and most effective in the in-service and PEMSTEP orientation programs.

An evaluation of the strengths and weaknesses of the materials in an impressionistic/perceptive way was carried out over a period of two years with 75 students. An opinion survey was used in which each of the topics tried was assessed on a 5-point scale. Data were collected during informal individual student interviews. The results of the evaluation indicated a consistently positive student reaction to the materials and to the overall program. A summary of the results of the topic assessment and the assessment of the overall program is given in table 1.

As a result of our experience with the STEP materials, it soon became obvious that the major problem one encounters in using these materials in our environment is that of time. The majority of the units require more than one hour to complete. In our system, it is necessary to carry a unit over two or three days to complete it; thus, much of the impact is lost. A solution will have to be found to this problem, if we are to use these materials extensively. In Britain, curriculum and instruction professors (tutors) meet their students for a block of time (2–4 hours) on one or two afternoons a week. All of the STEP units are easily completed in these time periods, and the impact is maximum.

Though the members of the science faculty are impressed with the work, enthused with the approach to teacher education and the ideas presented, some feel that the English flavor is another disadvantage to the use of the materials. There is the feeling that for the materials to be useful, they must be put into a Canadian context. In short, they feel that we should develop our own version of the STEP units for use in our system. On the other hand,

Table 1/Student Evaluation of STEP Materials

Topic	Number of Units in Each Topic	Mean Topic Rating
Aims and Objectives	6	3.5
The Nature of Science and Scientific Inquiry	3	4.2
The Pupil's Thinking	3	3.7
Language in Science Lessons	2	4.0
Teacher-Pupil Interaction	3	4.0
Methods and Techniques	5	4.0
Resources for Learning	3	3.0
Adapting to the Pupil	1	4.0
Feedback to Teacher and Pupil	6	3.8
Curriculum Design	4	4.3
Safety	5	3.6
Laboratory Design and Management	0	—
Social Context of Science Teaching	1	5.0
Mean overall program rating	3.9	

in PEMSTEP, our experience has been that the materials do not support this argument. The units serve to familiarize students with another educational system, provide a basis for comparison with their own system, and work very well in our educational program in their present form. It may be well for us not to become too national or provincial in our approach.

The usefulness of the various components of the program as viewed by our faculty and students is summarized in table 2.

The reaction of the science educators from faculties of education of Ontario universities to the STEP materials, at their meeting in May 1975, was positive. There was unanimous agreement that the materials provided an invaluable bank of ideas for use in the education of teachers; however, it was felt that some modification and adaptation to the Canadian (Ontario) scene was necessary for the materials to have maximum usefulness. They could provide, nonetheless, a nucleus of activities for our use that we as a group could add to over a period of time by pooling ideas based upon our own experiences. The articles provided in *The Art of the Science Teacher* (3*f*) and *Readings in Science Education* (3*g*) were not considered to be particularly appropriate to our educational environment.

The group was intrigued with the basic idea that influenced the work, and were anxious to consider it further – with reference to the possibility that the materials produced might contribute to a redefinition of "method" work and indirectly to a re-examination of the whole structure of professional courses. The division of teachers' professional studies into theoretical studies (philosophy, sociology, psychology, and history) on the one hand and courses about teaching methods on the other has long been criticized. In the extreme case, the theoretical studies are rejected by students as irrelevant, and methods courses degenerate into advice on how to teach,

Table 2/Student and Faculty Evaluative Comments on the Usefulness of the Components of the Program

Component	Evaluative Comments
Activities and Experiences	Well received in all programs by students and faculty. Provide an invaluable bank of ideas for use in the in-faculty phase of the teacher education program.
Meadowbank School (Case Studies) *Through the Eyes of the Pupil* (Pupil Writings)	Both provide support material related to Units in *Activities and Experiences.* Materials are pertinent and relevant to the school scene. They are well accepted by students and effective in achieving the specified objectives.
The Art of the Science Teacher *Readings in Science Education*	Used as support material. Articles included are excellent and provide a wealth of background material.
Audio-visual Material	Developed to serve as integral parts of a number of Units in *Activities and Experiences.* All are generally well done and prove useful in Unit development and presentation. *Audiotapes* involving teacher–pupil interaction are of very poor quality. They cannot be used at all effectively because background noise makes them almost inaudible. The audiotapes should be redone and a single topic put on each side of a 15-minute tape rather than putting all of the material on four long tapes with as many as eight topics on one tape. *Videotapes and films* have not been used. Videotapes cannot be used on our videotape recorders. The films are not readily available in Canada.
Theory into Practice	Bridging the gap between work in the university and work in the school has been a perennial problem. *Theory into Practice* provides an interesting solution and at the University of Western Ontario an associate teachers' handbook has been produced for use in the schools. The handbook includes numerous *Theory into Practice* activities. Some of these are unmodified STEP activities while others are activities that have been developed in our faculty over the past year. Workshop sessions are planned early in September to familiarize associate teachers and students with the activities and the objectives of the program and to instruct them in their use prior to their trial in the schools.

without providing any understanding of why some teaching techniques succeed and some fail. A conscious effort was made in the development of the STEP activities to show, wherever possible, how theoretical matters bear on actual classroom practice. As a result, courses in teaching methods may relate closely to general theoretical courses. The emphasis is on general

teaching methods rather than on specific ones, and content is not a prime consideration. This emphasis on the student teachers' professional development rather than on his academic development as a scientist may prove to be contentious. One faculty member commented, "The dilemma of teaching science content versus science methods is still being debated in many parts of Canada. Specialization is very strong here and something to be contended with."

As a consequence of the May 1975 meeting, it was decided that each faculty member would over the next year prepare and submit at least two activities and/or experiences that he or she had used successfully in his or her teacher education program, for distribution to all faculties for their consideration and use. The STEP format was to be used and references and readings were to be included in the submissions. This work is being continued.

If one can judge from comments made by educators attending the Canadian Society for the Study of Education Conference held at the University of Alberta in June 1975, they too, were impressed by the STEP materials, and serious consideration is being given to their utilization. A synthesis of the comments received at this meeting clearly describe the reaction to the program. A summary is given in table 3.

Table 3/Educators' Comments on the STEP Materials

1	The materials are not only unitized to provide flexibility but also the approach suggested within the units is non-prescriptive.
2	The units have a theoretical orientation which seemingly has a greater appeal in Canada than in Britain.
3	There is a growing interest in competency-based education in Canada. In Britain, it is viewed with suspicion. The Science Teacher Education Project steers a middle course. There is as much concern for the student as a person as there is with the student as a teacher.
4	The project views teaching as an art rather than a science, both in the approaches it advocates and the loosely specified objectives it pursues.
5	Many are wary and hesitant about the points of conflict that arise between North American and British philosophies. The program lacks structure. North Americans like teacher-proof curricula and are a bit cautious of programs which expect a tutor to select or arrange for himself. More structure is expected in North America.
6	A comprehensive attempt should be made to organize ideas and activities for science education.

It seems that this is a propitious time for innovation to take place in teacher education in Canada. The activities already described in Ontario bear witness to this. The STEP materials may well provide the vehicle required. The materials are very diverse. They provide both teacher and student with a variety of activities and a wealth of information useful in

the professional development of teachers. The project offers a good deal to think about. It is to be hoped that we in Canada will be able to make use of these materials, in some form, in the development of our programs.

NOTES

John T. Haysom was previously Joint Coordinator of the Science Teacher Education Project.

1. Physical Education Mathematics Science Teacher Education Project: a teacher education program for students in physical education, mathematics, and science offered by the University of Western Ontario. The program involves three phases of training: (a) a 2-week orientation prior to an extended teaching practice experience, (b) a 4-month teaching practice experience, (c) a 4-month faculty experience relating theory and practice.

REFERENCES

1. Clegg, Sir Alec, reported by MacLure, J. S. *Curriculum innovation in practice: Canada, England and Wales, United States.* H.M.S.O., 1968.

2. Morrison, A., & MacIntyre, D. *Teachers and teaching.* Penguin, 1969.

3. Publications of the Science Teacher Education Project. Maidenhead, Eng.: McGraw-Hill, 1974.
(*a*) *Activities and experiences: A bank of ideas for use in professional courses.*
(*b*) Haysom, J. T., & Sutton, C. R. (Eds.). *Theory into practice: Activities in school for student teachers.*
(*c*) Schofield, R. (Ed.). *Meadowbank School: Case studies in education.*
(*d*) Carre, C., & Head, J. (Eds.). *Through the eyes of the pupil: A collection of pupils' writings.*
(*e*) Graham, M. (Ed.). *Film review: Films for use in professional courses.*
(*f*) Sutton, C. R., & Haysom, J. T. (Eds.). *The art of the science teacher.*
(*g*) Jenkins, E. W., & Whitfield, R. C. (Eds.). *Readings in science education.*
(*h*) Haysom, J. T., & Sutton, C. R. *Innovation in teacher education.*

4. Haysom, J. T., & Sutton, C. R., Motivation: A neglected component in models for curriculum development. *Curriculum Theory Network*, 1974, *4*(1), 23–35.

5. Northfield, J. (Ed.) *ASTEP, a project in teacher education.* Monash University, Australia, 1976.

John T. Haysom is Professor of Education at Saint Mary's University, Halifax, N.S., B3H 3C3.

A. W. Harris is Professor Emeritus, Department of Mathematics, Faculty of Education, University of Western Ontario, London, Ontario, N6G 1G7.

H. Dene Webber is Professor of Science Education at the University of Western Ontario, Faculty of Education, London, Ontario, N6G 1G7.