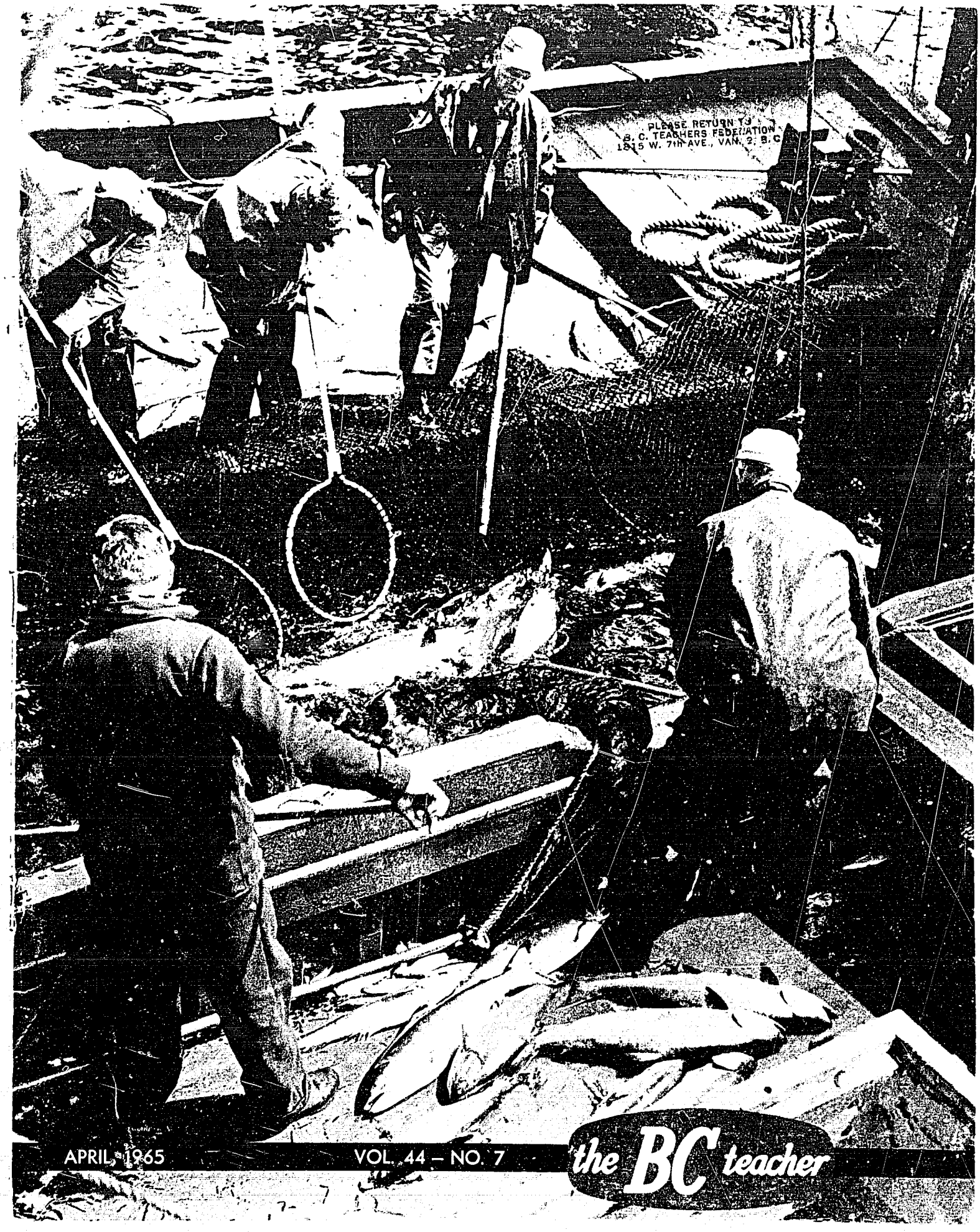

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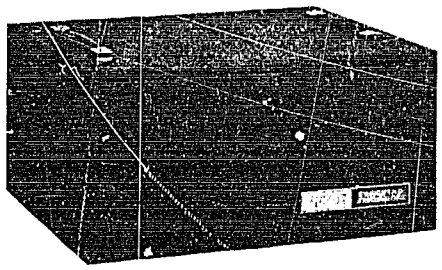

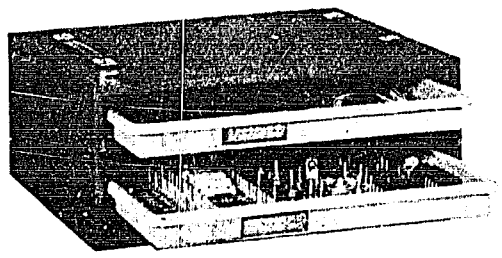

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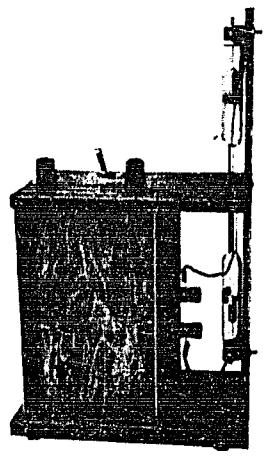

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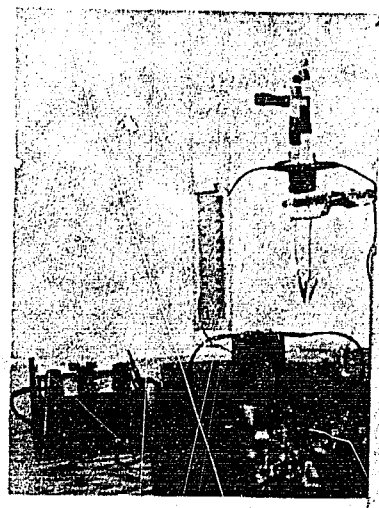

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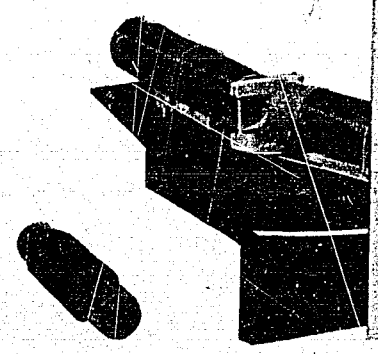

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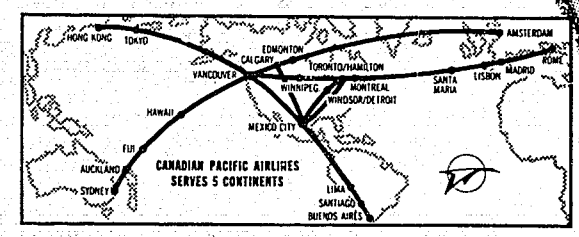

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Applications are invited to fill positions on the staff of the Grande Prairie City Public Schools beginning September 1, 1965 in the following categories—

Senior High and Junior College

At the high school level and possibly the Junior College level by September, 1965 on a combined basis for the next two or three years; at the Junior College level for the following years.

At least one instructor is required for each of the following first-year university courses: History (European), French, Psychology, Sociology, Organic Chemistry, Inorganic Chemistry, Zoology, Botany, Educational Psychology, Educational Administration, Educational Foundations, Physical Education. For the first few years the Junior College instructor would teach related high school courses.

Applicants must hold a master's degree in the subject of instruction at the Junior College level. Bursaries for completion of the master's program are possible. A teacher's certificate is required for teaching high school courses.

Present salary scale pays up to $8900.00 plus proposed special allowance to Junior College instructors.

Senior High School

In addition to the above subject areas, teachers in the following areas are required — Librarian, Business Education, Industrial Arts, Drafting, Machine Shop, Food Services, Counselling.

Junior High School

Industrial Arts, Librarian, Oral French, English, Social Studies, Mathematics, Science.

Elementary Schools

All grades. Specialists in remedial reading and speech training.

Teachers new to the profession may do an internship in May and June. Forward applications to:

F. M. RIDDLE
Superintendent of Schools
Grande Prairie School District #2357
10213 - 99 Street
Grande Prairie, Alberta

BCTF NON-CREDIT COURSES

Offered by the Professional Growth Through In-service Education Committee, in co-operation with the University of B.C., the University of Victoria, and local School Boards.

1. ELEMENTARY LANGUAGE ARTS
At UBC
Mrs. A. Mercer (formerly consultant, Copp Clark Company)
July 5-9, inclusive (with emphasis on Grade 2).
Mrs. G. Dewar (Intermediate Supervisor, Vancouver)
July 12-16, inclusive (with emphasis on Grade 4).
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $20 for each course

At Victoria
Mrs. A. Mercer
July 12-16, inclusive (with emphasis on Grade 2).
Mrs. G. Dewar
July 19-23, inclusive (with emphasis on Grade 4).
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $20 for each course.
Approximately half the time in each course will be spent in lectures by either Mrs. Mercer or Mrs. Dewar; the balance of the course will consist of small group workshop sessions.

2. SECONDARY MATHEMATICS
At UBC Mathematics 10
Mr. George Sparling, Delbrook Senior Secondary School, North Vancouver.
July 5-16, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

At UBC Mathematics 11
Mr. Jack Lydiard, John Oliver Secondary School, Vancouver.
July 19-30, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

Note: There will also be a course offered by the University of Victoria (Mr. E. B. Horne, Instructor). Details available from the University of Victoria.

3. SECONDARY SCIENCE
At Victoria Science 8
Mr. P. A. Boldt, Vice-Principal, Lansdowne Junior Secondary School, Victoria.
July 19-23, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $20.

Physics 12
Mr. D. E. Stenton, Department of Physics, University of Victoria, (Assisted by Mr. A. G. Creelman, North Vancouver Senior Secondary School).
July 26-August 6, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

Chemistry 11
Mr. W. J. McConnell, Burnaby Central Senior Secondary School.
August 9-20, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

In the Lower Mainland Chemistry 11
(site to be announced later)
Mr. W. J. McConnell, Burnaby Central Senior Secondary School.
August 23-September 3, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

Physics 12
Mr. N. H. Glover, Burnaby South Senior Secondary School.
August 23-September 3, inclusive.
9:00 a.m. to 12:00 noon and 1:00 p.m. to 3:00 p.m.
Fee: $35.

4. FIELD STUDY SEMINAR (SOCIAL STUDIES AND SCIENCE)
At Courtenay Senior Secondary School
Professor E. E. Owen, University of Victoria, and others.
August 25-September 1, inclusive.
Emphasis on the teaching of social studies and science using the resources of a local area.
Fee: $35.

5. OTHER COURSES
All details are not yet definite, but we plan to offer courses in ELEMENTARY ARITHMETIC, SECONDARY ENGLISH (Modern Poetry, Composition and The Novel, in separate courses), the BISHOP METHOD OF CLOTHING CONSTRUCTION (separate courses for beginners and advanced), INDUSTRIAL POWER, GENERAL BUSINESS, BUSINESS MACHINES, OCCUPATIONAL PROGRAM and for "POOL" OR DISTRICT LIBRARIANS. It is expected to hold a workshop for BEGINNING PRINCIPALS AND VICE-PRINCIPALS. It is also possible that a course may be held for SUPERVISORS AND DIRECTORS OF INSTRUCTION. Further information on these will be given in **The B.C. Teacher** for May-June.

Registration will be limited in most of these courses. Teachers interested in more information about any of the above courses, or in registering for them, should write to the

B.C. TEACHERS' FEDERATION
1815 West 7th Avenue,
Vancouver 9, B.C.

Articles contained herein reflect the views of the authors and do not necessarily express official policy of the British Columbia Teachers' Federation.

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Our Cover Picture

This month our cover features another important facet of the industrial life of British Columbia — commercial fishing. Our picture, netting salmon near Sooke, was supplied by the Photographic Branch of the Provincial Department of Recreation and Conservation. The article on page 294 was supplied by the Information Branch of the Federal Department of Fisheries.

the Editor comments

Another Special Issue

THIS MONTH MARKS the fifth time we have devoted an issue to a particular subject area. Although this issue deals primarily with science, we have selected the articles to appeal to as many readers as possible. We are indebted to Dick Piercy and John Allan, of the B.C. Science Teachers' Association, for their assistance in selecting the articles to be included.

Frank Wilson's 'A Matter of Opinion' feature ('The Highbrows Must Go') in our February issue produced more written reactions than anything we have ever published before. Some of the letters appear in this issue. In addition, this month's 'Opinion' feature is a reply to Mr. Wilson by Jack Shadbolt, the well-known Vancouver artist.

The annual summary of teachers' salary schedules has been included this month as an insert. We hope this information will be of interest and value to many of our readers.

We think our science issue is a worthy successor to our previous specials. We hope you will think so, too.□

Guest Editorial

Should Cramming Sessions Be Outlawed?

R. A. PIERCY, President,
B.C. Science Teachers' Association

I NOTE THAT the Vancouver School Board and the North Shore School Boards are planning to set up cramming sessions in their respective areas for the Departmental examinations. Obviously the function of these courses is to enable pupils who attend the courses to get higher marks than they normally would attain. This gives rise to several questions, which as far as I am concerned are not answered but which, perhaps, should be studied further. Some of the questions are:

1. *If the teachers are competent, why should the pupils be aided by cramming sessions*? When are the pupils going to learn to stand on their own feet? I understand that notes, worksheets, etc., are given to the pupil. Isn't the pupil capable of making his own notes or using his worksheets during the regular term?

2. *Is the cram course educationally sound?* While we will never get rid of cramming, can we support the idea that we should take a student and give him the bare essentials of a course and say 'learn these and you will pass'? What happens when the pupil then makes just a passing grade on the exam; is he to assume that he is competent to go on to the next higher course? I think that it could be argued that a pupil who did not take the cram course and who got a mark slightly under that of a cram-course student would have a better background in the course than the cram-course pupil.

Should the teachers direct all of their teaching to The Exam? Cram courses for getting pupils through the exams seems to indicate this.

3. *Will he fail—if he cannot afford or has not the opportunity to take a cram course*? I understand that the Department of Education does not have an absolute standard (or a given core content) that must be mastered by all those who wish to pass the course. If that be true, then those taking the cram course and getting higher marks, will in effect be lowering the score of those who did not have the opportunity to take the cram course. Pupils in the rural areas already have sufficient disadvantages compared to those in cities, e.g., buses, teachers taking great numbers of courses, etc., that I feel that cramming courses for the sake of getting through is not a valid reason for introducing them. I doubt that cram courses make better students.□

Photo courtesy *West Coast Advocate*

Alberni is the only school district in Canada experimenting with the Process Approach to Science developed by the American Association for the Advancement of Science. Experiments instruct students in the scientific approach to the generation of organized knowledge.

Alberni Tries a Unique Experiment

W. B. BOLDT

THERE IS JOY IN THE SEARCH for knowledge; there is excitement in learning about the workings of the physical universe and the biological world; there is intellectual power in the scientist's ways of asking questions and seeking answers to them. The first task, the central purpose of science education in the elementary school, is to awaken in the child a sense of this joy and excitement and of the intellectual power of science.

In 1962, the Commission on Science Education was established by the American Association for the Advancement of Science (AAAS). The Commission includes scientists recognized for their achievement in scientific research, school administrators, science education specialists, and teachers in the schools. Among the responsibilities assumed by the Commission are:

(1) to maintain a continuous review of work on improvement in science instruction, Grades K-9;

(2) to develop interest within the scientific community and recruit scientists to work on the development of elementary and junior high school science materials;

(3) to assist with evaluation of materials prepared;

(4) to provide interpretation and help in the selection and use of any new science materials.

Activities completed or in process include preparation of a statement of purposes and objectives of

Mr. Boldt is a member of the Science Department, Faculty of Education, UBC.

science instruction for Grades K-9, review of relevant research in science education, preparation of a content-process chart for early grades, establishing an information center on recent developments in elementary science, and a study of the entire science curriculum.

The Commission has also initiated the preparation of a set of science materials. Parts One through Four of *Science—A Process Approach*, developed by the AAAS, provide instruction in science in skills basic to further learning. These processes are called Observation, Communication, Prediction, and Inference. The child is introduced to a variety of content in acquiring these skills. The subject matter includes topics on plants and animals, rocks, weather, solutions, and the motions of objects. The content he learns is not systematically related to particular scientific disciplines, but is considered to be derived from more-or-less familiar objects and phenomena in the world around him. The hope is that, by the end of the third grade, the child who has been instructed by means of these exercises has acquired a number of important fundamental process skills, a good many basic scientific concepts, and some organized knowledge about the natural world.

The exercises for the intermediate grades promote the retention and refinement of process skills by continuing to provide for a 'process' emphasis in instruction. At this level the sequence builds upon the simpler competencies to fashion instructional exercises which are at once more complex, more comprehensive, and more nearly like the kinds of activities engaged in by a scientist when solving a problem. These experiences instruct students in the scientific approach to the generation of organized knowledge. The various exercises deal with such integrated activities as formulating hypotheses, making operational definitions, controlling and manipulating variables, experimenting, formulating models, and interpreting data. At the intermediate level, the continuing emphasis on process permits a deeper and more systematic emphasis on content. An attempt is made to select content which is broadly representative of all the scientific disciplines

Instructional materials include directions for the teacher and exercises for the student. The exercises are arranged in an orderly progression of learning experiences, and are drawn from a variety of science fields. The objectives, the student performance expected by the time each exercise is completed, are clearly specified. To ensure that these objectives have been attained, an associated appraisal exercise is provided.

The second experimental edition, now being tried

In the Process Approach children are introduced to a variety of content in acquiring the skills of observation, communication, prediction and inference.

Photo courtesy *West Coast Advocate*

in Alberni, was prepared by a group of writers who came from 17 states to meet at Stanford University for eight weeks during the summer of 1961. Among the 44 members of the writing group were college and university people representing the major science fields (including mathematics, psychology, and science education), representatives of industrial research, science consultants, elementary school administrators and teachers. The first experimental edition was tried out by 110 teachers in ten centers located in all parts of the country during the school year 1963-64. The 1964 summer writing team revised materials in Parts One through Four, making full use of recommendations of tryout-teachers. The 1964 team also wrote new materials for tryout in Grades 4 and 5, and background information in a guide for the tryout-teachers.

Among the fourteen or more tryout-centers for the second experimental edition is the Alberni School District, the only center in Canada. Canadian schools are not supported financially for such a venture as American schools are. For this and other reasons, such an undertaking required, as someone recently stated, both 'goals and guts.' It is an excellent example of the results obtainable when enthusiastic teachers and a co-operative school board work and plan together as a team.

The Alberni project was organized under the supervision of A. Robinson, principal of the Calgary Elementary School, and R. A. Lyons, Director of Elementary Instruction for the district. The major consultant, representing the AAAS, is Mr. Jorgensen of the Faculty of Education at the University of British Columbia. The planning activities included consultation with the writing team at Starford University, direct observation of classroom procedures in tryout-centers in Seattle, study of the materials, and periodic group-discussion meetings. Preparations were completed early in January, and classroom instruction is now under way.

The primary purpose of a tryout-center is to provide the Commission with 'on the spot' observer reports on the success or failure of the materials. Included in the feedback to be provided by the group, is the following data:

1. *Time Data.* Instructional and planning time.
2. *Activity Omission.* Omission of activities for various reasons.
3. *Additions to Exercises.* Additions found necessary.
4. *Opinion of Exercise Placement.* Grade placement of individual exercises.
5. *Student Performance Data.* An attempt is to be made to distinguish exercises emphasizing verbal performance from those emphasizing non-verbal performance. Activities which children were unable to perform are also identified.
6. *Comment on the Written Materials.* Included in these comments are successful or unsuccessful procedures, activities, explanations or justification; and those which describe the specific form of a proposed change.
7. *Reaction of the Class.*
8. *Anecdotes.* Interesting events, conversations, work or statements of an original or startling character are reported.
9. *Mobility Data.* Mobility of students in and out of the experimental classes are also recorded.

It is important to understand that the project is experimental. Although a great deal of time and effort went into the preparation of the materials, only by actual classroom trial can the value of each exercise and the sequence be determined. The teachers in this program are a vital part of a large research team whose efforts are devoted to the production of the best possible elementary science program.

Listed below are the basic materials included in this program, and sources of information for further study.

Materials: *Science—A Process Approach* Trial edition in six parts, for use up to Grade 5; AAAS Miscellaneous Publications, 63-10, 63-11, 63-12, and 63-13; *Science Teaching in Elementary and Junior High Schools*, Science 133, 2019 (1961); *Science Education News*, October, 1963.

Further information: Dr. Arthur Livermore, Deputy Director of Education, American Assn. for the Advancement of Science, 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.□

Science Experts Meet In Manila

Representatives from fourteen nations discussed the development of effective science education at the WCOTP Asian Regional Meeting of Experts and Specialists in the Teaching of Science held in Manila December 5 - 12. The meeting was sponsored jointly by WCOTP and the Philippine Public School Teachers Association (PPSTA).

The conference marked the first subject-oriented meeting held under WCOTP sponsorship, as well as the first time that a complete national meeting and an international meeting were co-ordinated, with the two groups sharing speakers and social activities. The Philippine Association of Science Teachers, a WCOTP associate member, held its third biennial convention as a parallel conference. Philippine members listened to the lectures and general discussions, and then met in separate study groups to discuss the points and problems raised in direct relation to the Philippine situation.

Most teachers talk too much charges the writer. He wants less lecturing by teachers and more

Scientific Inquiry in the Classroom

D. CRAIG GILLESPIE

MOST TEACHERS TALK too much! Perhaps this is because they associate 'teaching' with 'telling.' Walk along the corridors of any contemporary elementary or secondary school. What sounds are heard? The imperious drone of teachers' voices prevails. In fact, it is considered virtually impossible to 'teach a good lesson' unless the pupils remain silent.

Under these conditions most students sit with their minds and 'behinds' chained to their chairs—the passive receptors of the 'facts' of their elders. But, with the 'facts' of modern science enjoying an estimated half-life of ten years, emphasis upon mere memorization of factual material appears a ridiculous waste of time! Man is a reasoning animal. It therefore seems wiser to develop within him traits of reasoning which are less subject to disintegration than 'facts.'

Students need a repertoire of factual material from which to reason. Modern techniques of programmed instruction have shown that such facts can be presented more effectively and efficiently by programmed means than by conventional didactic methods. If factual material can be presented by programming, then time should become available in class for the development of reason. The tasks of science education may therefore be reduced to the selection of 'basic facts,' presented in such a way as to develop the reasoning powers of students.

Students Must Ask Questions

In the senior grades much improvement is being made in the curricula of mathematics, physics, chemistry and biology. The contents of these programs are excellent. However, a critic may well ask if the modes of presentation and testing are keeping pace with the contents. How many teachers of 'new' courses are preparing dittoed sheets of material to be learned (memorized)? How many teachers are offering open-book examinations? How many teachers of the 'new' programs are lecturing at the same old pace?

If vocalizing is a major fault of teachers, how can it be overcome? The answer is obvious. Teachers must learn to talk less. Students must be led into problem situations from which they can extricate themselves only by questioning based upon logic and reason. Consider the following extreme example. The content of the lesson is relatively unimportant; the technique is vital!

° ° °

A lecture-desk is outfitted with a coil of copper wire, a voltmeter connected across its ends, and an ammeter in the line which is supplied by a variable source of D.C. (the conventional set-up for demonstrating Ohm's law).

After roll the class is brought to order by a pencil-tap on one of the instruments, the apparatus is indicated by a wave of the hand and silence reigns. A second wave of the hand about a minute later prompts one bewildered student to ask,

'Have you lost your voice?'

An affirmative reply is indicated by a nod of the head. A few moments later a second question demands.

'Do you want us to ask questions about that stuff on the desk?'

Another affirmative nod.

A series of short and indignant questions, each acknowledged only by a nod, brings forth the fact that only questions which can be answered by a

definite 'yes' or 'no' will be entertained.

Questions begin to flow at a rapid rate.

'Is that a voltmeter?'

No answer.

'Is the instrument to your left a voltmeter?'

An affirmative nod.

'Is the other meter an ammeter?'

An affirmative nod.

'Where is the voltmeter connected?'

No answer.

Note: Students are NOT permitted a close look at the apparatus! (Pedagogical sacrilege?)

Eventually, as the nature of the circuit becomes clear and the questioning tapers off, the switch is momentarily closed and deflections are observed on the meters. A new power input is selected (a fact established by more questions), and the switch again closed to reveal new meter readings.

'Are we supposed to record these readings?'

An affirmative nod.

'What were the first ones?'

No answer.

This lack of recall by the teacher precipitates a vigorous across-the-aisle scramble for information. The results are NOT tabulated on the board! (Sacrilege compounded?)

After six or seven sets of readings are obtained, a student asks,

'Is there supposed to be a relationship between the voltmeter and ammeter readings?'

An affirmative nod.

'Are they directly proportional?'

Another affirmative nod.

At this point the instructor takes up the chalk and writes '$V \propto I$' on the board. This act is immediately followed by the query,

'If $V \propto I$, then does not $V = kI$?'

An affirmative nod.

A long pause follows this last admission until someone suggests,

'Do we want it in the form $\frac{V}{I} = k$?'

An affirmative nod.

This equation is then written on the board, followed by the word 'Ohm.'

'Is this some kind of a law?'

'Is it Ohm's law?'

Two affirmative nods of the instructor's head end the lesson.

° ° °

During the entire lesson the instructor spoke not a word and permitted no close look at the apparatus. (No opportunity to 'play' with the equipment obliges pupils to devise more systematic and intellectual means to obtain the data they need.) The blackboard was used for less than ten seconds. Instead, the minds of students were used! (Sacrilege?)

The writer claims neither uniqueness nor originality in this type of presentation. Much of the incentive for this attempt came from the work of Dr. Richard Suchman of the University of Illinois at Urbana.[1] Suchman and his followers call their technique 'Inquiry Training.'

The author teaches at Lester Pearson Senior Secondary School, New Westminster.

Suchman has developed a series of short motion picture films of simple physics demonstrations. These films are designed for children of the intermediate grades. The purpose of these films is to present problems of causality. These films bear no titles. One of the most successful films 'demonstrates' the action of a compound-metal bar under changing temperatures. Grade 5 students can successfully ascertain that the bar is made of two metals 'stuck' together. They also discover that the two metals respond differently to heat, thus causing the bar to bend.

After viewing a film, pupils are invited to ask questions. Only questions that seek data are permitted, and these must be answered by a 'yes' or a 'no.' The purpose here is to learn more about how students think by encouraging them to talk more. These proceedings are often tape-recorded.

The 'yes' or 'no' format forces the student to hypothesize to obtain information, that is, each question must be preceded by some thought. Questioning of this type eliminates teacher-structured answers. Pupils are left in control of the discovery process.

In many instances the second lesson on a topic may consist of a play-back of the tape-recording. This lesson is structured by the teacher into wide-open questioning and discussion. For example:

'What did Ralph have in mind when he asked that question?'

'What would be a more exact form of Stanley's question?'

Inquiry Training does not strive to have each student reach a full and 'right' understanding of each topic. (Can any teaching assure this understanding?) Instead, each child is encouraged to reason to the limit of his ability. Once again, the 'reasoning' is more important than the 'fact.'

P. W. Bridgman states that 'science is doing the most with our minds, no holds barred.'[2] Dr. Benge Atlee regards science as a pedagogical corpse in an educational graveyard where students learn only the inscriptions on the tombstones.[3]

The path for science teachers lies between these two definitions of science. Indications are that the roles of teachers and students may have to be recast. In these new roles the students will question vocally. Teachers must learn to listen!□

References

1 J. R. Suchman, 'Inquiry Training: Building Skills for Autonomous Discovery,' The Merrill-Palmer Quarterly (July, 1961).
2 Los Angeles County Superintendent of Schools Office, 'Curriculum Exchange,' (Feb. 1963), Vol. 5, No. 5, p. 3
3 Benge Atlee 'What's Wrong With Our Schools,' *Macleans*, (Nov. 2, 1964), Vol. 77, No. 21, p. 45.

The winner of a Shell Merit Fellowship enjoyed and profited from

A Summer at Stanford

THOMAS T. DENNETT

A SUMMER IN SUNNY CALIFORNIA was a particularly attractive thought on the gray November day when I mailed my application form to Stanford. Further daydreams were suspended during Christmas exams and the holiday season. Then, on another gray day in February, routine was interrupted by a special delivery letter which stated: 'It is my pleasure to announce that you have been awarded a Shell Merit Fellowship at Stanford University.' We had already decided that this would be a family affair, so while I awaited further details of courses, our two children looked forward to a trip to Disneyland which we planned at the end of the summer.

The spring term went quickly and on June 15 our heavily-loaded car headed south in search of sunshine, which met us at Crescent City and was to be our constant companion all summer. Arriving at Escondido Village, the married student residences, we settled into a modern two bedroom apartment.

The next day, at the first meeting of the Shell Fellows, I met 49 teachers from the states west of the Mississippi and from the western provinces. Geoffrey Rice-Jones from Crescent Beach was the other teacher representing B.C. Dr. Paul Richman welcomed us on behalf of Dr. Paul de Hart Hurd who was not able to lead the seminar because of illness. We were disappointed that we were unable to meet this outstanding leader in science education; however his capable staff spared no effort to ensure the success of our summer.

In a brief orientation talk we were informed we would be registering as regular summer quarter students. This meant that each Fellow would carry four courses, the maximum for a summer quarter, and would receive regular university credits. Registration procedure was described to us in detail, timetables and maps issued and questions answered, including: 'What time is breakfast?' 'How do we get passes for the swimming pool?' and 'Where can I rent a bike?' (Stanford is a bicycle campus.) Then we were dismissed with the caution, 'Keep the Hoover Tower in sight and you won't get lost.'

The Shell Merit Fellowship Program is part of the Shell Company's Foundation Grants to Education, which include research grants, merit residencies for United States Fellows, merit scholarships, merit fifth year scholarships and other donations to education which were in excess of seven million dollars for the year 1963-64. The goals of the Shell Merit Seminars are, in part:

1. To provide an opportunity for the Shell Merit Fellows to enhance their academic education in chemistry, physics, and mathematics, with particular attention to recent theory and new concepts.
2. To acquaint Shell Merit Fellows with the methods and achievements of scientific and mathematical research in the theoretical, experimental, and applied fields.
3. To study the 'new' curriculum developments in high school science and mathematics sponsored by professional scientific and mathematical societies.
4. To develop the background needed by science teachers to enable them to teach the 'new' high school science and mathematics courses.
5. To acquaint the Shell Merit Fellows personally with a large number of practising scientists and mathematicians who may serve as models in guiding high school students toward careers in science and mathematics.

The Fellowship provides tuition, room and board, traveling expenses and a stipend to cover other out-of-pocket expenses. In this way the Shell Fellow has an opportunity to attend a summer quarter at an outstanding university without undue expense to himself.

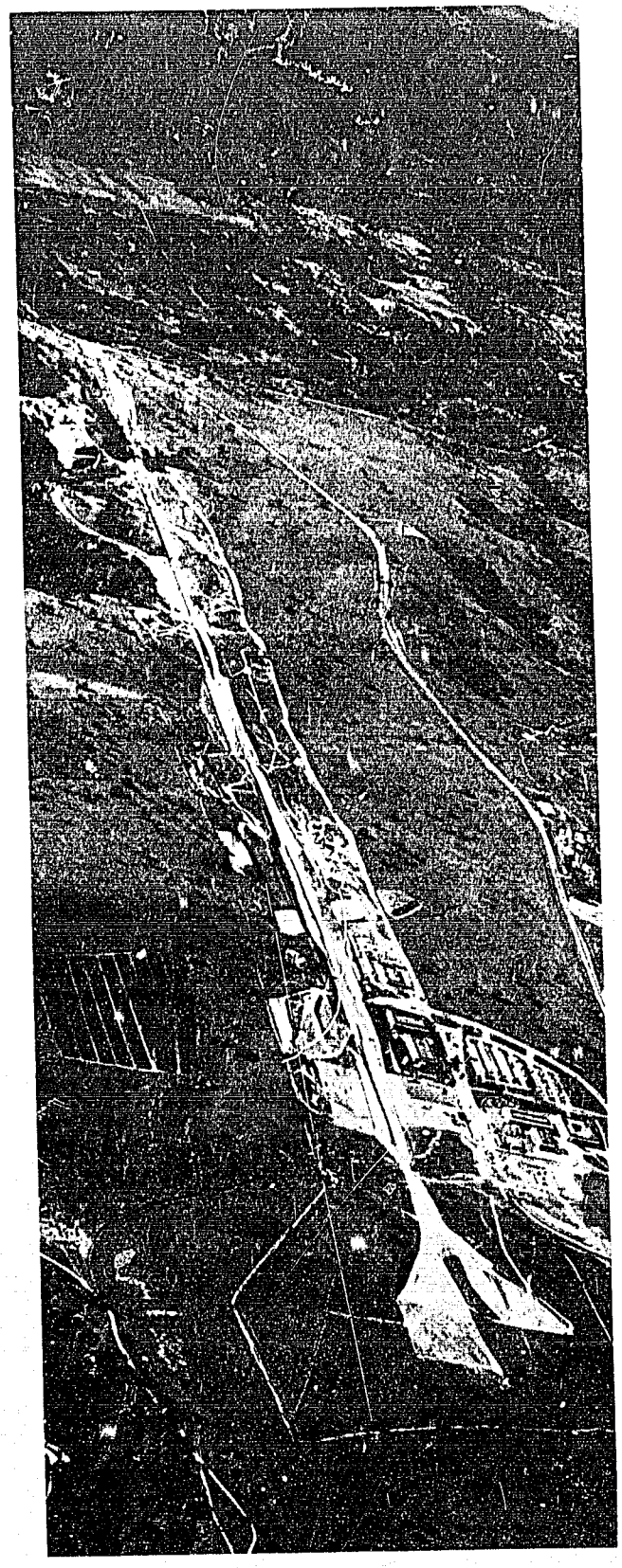
The 1964 program at Stanford was eight weeks long; the time spent in classes, between 4½ and 6½ hours a day. The unique opportunity of the program was the seminars. From eleven to twelve Monday to Thursday we met with outstanding speakers from research and industry for a presentation of the topic of the day. The Fellows and the speaker would then lunch together and reassemble in the lounge for a period of questions and discussion. The quality of

the speakers was outstanding. In most cases they presented their subject in such a way that it could be easily followed by teachers without specialized background. Dr. J. van Overbeek spoke on plant growth hormones. Dr. van Overbeek had been on the original research team in Holland which had discovered plant hormones and had been instrumental in setting up research in this field in the U.S. Dr. Gerald L. Pearson, co-inventor of the solar battery, discussed those batteries. Dr. Arthur D. Howard, Head of the Department of Geology at Stanford, gave a seminar on earthquakes. This was of particular local interest because many of his illustrative slides had been taken within a few miles of the Stanford Campus. Dr. von Russel Eshleman talked about radar astronomy and helped to satisfy our curiosity about the large radio telescope which can be clearly seen on the hills behind the University.

Visits to Industry Featured

The Friday field trips were eagerly anticipated. The first, to the Shell Development Center at Emeryville, began with a 30-mile bus trip to San Francisco, over the Bay Bridge to Oakland and ended at Emeryville in time for lunch. At lunch we were divided into groups of four to six, each group hosted by a scientist or engineer from the center. This enabled us to become familiar with the purpose and scope of the organization. After lunch we toured the computing center and had explained to us the use of computers in a large research operation. Then we were shown the library, and learned that most of the librarians have degrees in natural science as well as in librarianship. The library conducts literature searches for research projects and also such detective work as patent searches for new products and searches to protect existing patents from infringement. The testing of new plastic materials in various types of moulding machines intrigued many of the group. Seeing combs, polypropylene bottles and refrigerator liners made was fascinating and a generous distribution of samples sent many teachers home with souven'rs to show their classes.

On a succeeding Friday we went to Ames Research Center, National Aeronautics and Space Administration. Here we felt like Alice in Wonderland. We saw some of the largest wind tunnels in the world, used for testing aircraft and space vehicles. A strange-looking full scale model of a vertical take-off aircraft stood beside a large space vehicle awaiting tests. Research in atmospheric re-entry forms a large and important part of the center's activity. Pieces of John Glenn's capsule provided us with an example of the effect of re-entry heat on materials. We toured machine shops, where parts of space vehicles and



Aerial view of the two-mile-long Stanford Linear Accelerator located on Stanford land.

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experimental aircraft were being constructed, as well as scale models of capsules and satellites.

Research in the life sciences at Ames Center involves basic work in the physiological and behavioral sciences. Areas of major concern are the effects of terrestrial and extraterrestrial environments on living organisms; studies in exobiology dealing with the prediction, detection and study of extraterrestrial life; and research in human factor aspects of the relationships between man and machines. In the life science center we saw basic equipment used to carry on these studies, including the huge space flight simulators in which the effect upon a pilot of the combined stresses of acceleration and vibration are being studied. After two or three hours of such space-oriented adventures it was a back-to-earth jolt to find our drivers looking glumly at our two busses. They had run down the batteries while keeping the air conditioning on for us. This situation afforded us the rare privilege of pushing a large highway bus to get it started.

Our visit to the two-mile-long Stanford Linear Accelerator came at an opportune time. The project, started in 1962, had reached a stage where the general outline of the completed development could be seen, and much of the equipment which will be underground when completed had not yet been covered. The meaning of the project was effectively described to us before the tour by Mr. Douglas Dupen, of the Technical Information Office of SLAC. Mr. Dupen holds degrees in physics and in speech, and his competence in both fields was evident in his presentation to us. Essentially the accelerator will allow more detailed examination of the structure of the atom. It will be able to examine and create any of the more than thirty different particles which have been found in the nucleus. The electron beam is scheduled to be turned on in April 1966 and the accelerator will be in full operation by April 1967. It was particularly interesting to learn that this is an instrument of learning with no military purposes or applications. Scientists from all over the world will be invited to work with it. Use of the accelerator will be determined by a committee of leading scientists, who will choose the most promising experiments.

Visits to three high schools in the Palo Alto area enabled us to see and hear of some of the most recent developments in science teaching. At Menlo-Atherton High School we heard of the Menlo-Atherton Scientific Society, where students carry on such projects as Measuring the Effect of Magnetic Fields on Plasmodium Streaming, Comparison of Food Substances Retention Times in Mice using Carbon 14, and the Effects of Ultrasonics on Destroying Internally Intact Cells. This is probably the only high school in North America, which has its own electron microscope, an older model donated by the Stanford Research Institute in recognition of this school's outstanding program in the biological sciences. At Cubberly High School we saw a tape console where each student could listen to a pre-recorded quiz, answer by pushing his choice of buttons, and at the end of the quiz have his score recorded on a dial on the teacher's desk. We toured laboratory facilities and talked to teachers who were using CHEM Study Chemistry, BSCS Biology and PSSC Physics approaches.

Miss Lois Higashi of Hawaii and the author (left) are shown with a member of the Ames staff inspecting a space flight simulator.

Moving on to Homestead High, a large new school, we signed the guest register in an imposing lobby. We were then addressed by the principal in a lecture room seating about 150 equipped with overhead projection equipment, tape deck, and TV console for demonstration or for picking up outside broadcasts. At this school the students are on individual timetables with flexible scheduling. The computer was just working on its fourth attempt at timetabling and with luck the principal hoped to come up with a timetable by nine o'clock that night. He was planning to leave for his holidays the next morning. To a British Columbian, perhaps the most unusual feature of school architecture was the lack of inside halls. Most classrooms open out on the campus and attached to the schools are outdoor lunch areas. To a teacher used to a province-wide curriculum, the amount of freedom in curriculum planning was astounding. Not only might two schools in the same city give different chemistry programs but two teachers in the same school might teach quite different chemistry courses to students of the same grade. I was also impressed with the amount of money available for the training of American science teachers. Most had attended at least one National Science Foundation Summer Institute and many had obtained their Master's degree with NSF support. We were also informed of grants available to individual classroom teachers for research in education.

Other summer experiences included living near San Francisco during the Republican convention, the opportunity to explore San Francisco on a number of weekends, a Hawaiian luau arranged by the Fellows from Hawaii, attendance at a tea for foreign students, where the charming wife of a Greek student asked, 'Does every American have a swimming pool in his back yard?' We were able to attend the Stanford Shakespeare Festival and a campus concert in which Arthur Fiedler conducted the San Francisco Symphony in his rendition of the Beatles' 'I Want to Hold Your Hand,' much to the delight of my nine-year-old son.

Like all good things, the summer came to an end. Exams were written, the apartment cleaned, the trip to Disneyland successfully and enjoyably completed, and we arrived home with many memories of our summer at Stanford, as well as new materials and ideas.

The opportunity provided by the Shell Merit Fellowship is one which any science or mathematics teacher would find profitable and enjoyable. The Fellows for 1965 have already been chosen, but teachers who are interested should watch closely for next year's brochure, which should reach the schools in September.□

Elementary Science—the Lost Frontier

C. R. MOSS

SOME TIME AGO I WATCHED a well informed and enthusiastic Grade 6 teacher give a good science lesson on the simple box camera as part of a unit on light. The class was fascinated by the teacher's demonstration of how a simple camera could be made using a shoe box, a hand lens and a wax-paper screen. The class clearly understood the need to make the length of the shoe box equal to the focal length of the lens and understood how to find the focal length of a convex lens. The teacher concluded his lesson by suggesting that the members of the class might like to make a simple camera themselves and invited any who did so to bring their cameras along for display. A later visit to the class revealed a science corner well

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stocked with simple cameras of varying sizes, shapes and effectiveness. Great ingenuity had been shown by some pupils in obtaining lenses—not always, I suspected, with parental approval!

Some weeks later, a chance visit to a Grade 8 science class revealed a lesson in progress on, oddly enough, the box camera.

As I left the Grade 8 classroom, I realized that what I had observed there and in the Grade 6 room revealed dramatically one of the fundamental weaknesses in our present science program. The repetition involved in these two lessons is all too common and leads one to wonder whether any articulation exists between the elementary and the secondary stages of our science programs. The questions arise: (1) Do junior secondary science teachers expect their pupils entering Grade 8 to have a clearly defined background of scientific knowledge and attitudes? or (2) Do they prefer to assume that their pupils have no science background? I firmly believe that our overall science program will not produce optimum results until these questions have been answered. Restated in more fundamental terms, I believe that the issue facing elementary and junior secondary science teachers and those responsible for the science curriculum is, 'What is the role of the elementary school in the total science program?'

Should the elementary science program aim at preparing pupils for the secondary stage or is elementary science an end in itself?

In view of the momentous changes which have occurred since the science section of our Elementary Program of Studies was produced, and the rapidly increasing influence which science is having on our lives, I suggest that teachers are justified in questioning not only the stated aims of our elementary science program but also the traditional textbook-centered approach to elementary science which continues to be used in far too many classrooms.

Pupils Should Get 'Feel' for Science

A possible weakness in the aims of our present elementary science program is revealed in an article written by Miss Helen Hale, President of the National Science Teachers' Association.[1] In an attempt to find what junior and senior high-school teachers expect of the elementary science program, Miss Hale posed the question to twenty secondary science teachers. Her analysis of the replies showed that, 'There was one striking factor common to the twenty replies—the elementary school should give pupils a "feel" for science. High-school teachers expect you to communicate the excitement of science to boys and girls, to make them eager to accept the challenge of the problems posed by science, to help them to begin to see what science can do and what it cannot do for our society, to sense the importance of science and technology in their daily lives. In short, they hope that you will give an emotional tone to an area which was once considered to be coldly rational.'

A perusal of the B.C. Elementary Science Program shows no reference to aims of this kind. Could it be that in our present elementary science program we have lost sight of the expectations of the secondary science teachers? I think so.

The present trend at the secondary level toward an individualized discovery approach to science places new responsibilities, I suggest, on the elementary science program. If the new secondary science programs such as PSSC Physics, CHEM Study and BSCS are to succeed, the elementary schools must prepare their pupils for the individual practical experimental work which is involved in these new secondary science programs. The pupils entering Grade 8 should have been trained to use science equipment; they should be familiar with the scientific method of solving problems—in its elementary form; they should have a background of knowledge gained, where possible, through their own guided discoveries and, above all, they should be excited and enthusiastic about science. Such aims present a challenge to the teachers of elementary science. To conduct science lessons in which children 'do' rather than watch and 'find out' instead of being told, is not going to be easy. Perhaps the time has come for specialization in elementary science. Perhaps also the time has come for the provision of adequate science teaching facilities in the elementary schools.

Britain and U.S. Making Changes

It is interesting to note that in the U.S. and Britain the traditional aims and methods of elementary science teaching (short though this tradition may be) have been questioned and found inadequate. In the U.S. a major effort is being made to redefine the aims of elementary science and to devise new curricula and methods to achieve these aims. The work of the Elementary Science Study group based in Watertown, Massachusetts, for example, is already well advanced and several new science units, based on a practical pupil discovery approach, are being tested in 250 classrooms in the U.S. and two B.C. districts this year.

In Britain, the development of new elementary science teaching techniques is being carried out with the financial support of the Nuffield Trust, with at least one County Educational Committee, Leicestershire, using a new practical pupil discovery approach in its elementary schools.

The time has come, I think, for a re-examination of the aims and methods of *our* elementary science program, for as far as most elementary schools are concerned, the 'frontiers of science' still lie within the confines of a 'science kit' box and between the covers of an outdated textbook.□

1 *The Instructor*, science supplement, January, 1964.

An Artsman Looks at Science

(with tongue in cheek)

Dear Sir:

I wonder if your announcement that the April issue of *The B.C. Teacher* is to be devoted to science will cause any bellicose Artsmen to raise an anti-chemical stink in hopes of reviving the Arts and Science Battle. But I hope you will understand quite clearly that this is not *my* intention in writing to you, since I have never, though I'm putatively an Artsman, been one to become embroiled in the Great Debate. As a matter of fact, the closest I've ever come to expressing a specific opinion on the matter was several years ago when I stood on neutral lawn at UBC and cheered silently while the Levy twins in their hugely gentle way defended the South Portico of the Agriculture building against an onslaught of Sciencemen who were abroad on their annual fall harvest of the weaker faculties. It was a memorable sight: with disdainful ease Jack and Leo brushed aside wave after wave of the attacking Redshirts, sweeping them off the steps and into the shrubbery that grew alongside the portico that was under attack.

Your announcement of the science issue, coupled with this memory of the Levy defence, has set me to wondering why I have never had any special interest in attacking science, other, of course, than from reasons of natural cowardice. The truth is, I suspect, that like many other Artsmen — whether they will admit it or not—I feel like something of an outcast in this Age of Science, rather like a lover of Tennyson at a convention of Beat Poets. I think that many of us Artsmen suffer feelings of guilty regret when we face the fact that we have contributed nothing to the development of such modern marvels as the 1500 mph jet, the colored telephone, and frozen soup. I have become convinced in recent years that the 'Whew and Cry' that accompanies the advance of science is compounded of a 'Whew' of amazement from the general public, and a 'Cry' of despair from Artsmen who grieve that they have had no part in it all, at all.

As I said, I *think* I speak for many Artsmen in this matter, though I may be describing a merely personal failing. Probably long ago I harbored within the shallow waters of my ambition a yearning to be a Scienceman. As a matter of fact, I was convinced some years ago that it was only a matter of time before I would catch scientific fire and rediscover the laws of gravity, or assume enough scientific gravity to rediscover fire. But somehow the vision faded, and not even the annual production of SO_2 from our school's chem lab is a stink that I have any part in inspiring. To my shame, I doubt if I could any longer explain why it is that pink litmus paper makes some acids feel blue. In any case, if Artsmen in general do not yearn for the power and prestige of science, how can we account for the fact that so many English teachers like to speak of the *science* of language, and the *technics* of a poem? And how else can we explain why so many composition teachers like to call a class's collection of paragraphs and essays a *lab book*?

Moreover, I doubt very much if the antithesis is true. Are there Sciencemen who speak of the *poetry* of atomic fission, or the *grammar* of a chemical reac-

tion? I doubt it very much, and even if there are, I'd just as soon not to be told about it. And I don't suppose we would ever find a true Scienceman yearning to teach English, although I understand that some of them are forced to do so in their probationary years, since it is a well-established practical truth that all teachers are English teachers, if the shortage is severe enough. Actually I should qualify this statement about Sciencemen not wanting to teach English by admitting that I do know of one graduate in science who after a few years of teaching his college majors, voluntarily transferred to English. But even this apostasy is explainable. This chap was a graduate in the biological sciences, and the shift from biology to Wordsworth and the Lake Poets is not as far-stretching as it might at first seem. Strangely enough, even though this Chilliwack chap is now one of the best English teachers in the province, I have never heard him call a collection of student writing a *lab book*. I guess he knows the difference.

If we have to find an explanation for this nostalgia on the part of Artsmen, I suppose it lies in the fact that most of us had to take *some* Science before we learned that we belonged in Arts. (I realize that Sciencemen have to take *some* Arts, but this just confuses my argument, and I'd prefer to disregard it, if you don't mind.) Because of the requirements of the freshman curriculum, I myself, for example, can lay claim to considerable half-knowledge in chemistry and physics. Actually, UBC records would show that I have something more than half-knowledge, since I got 51 percent in chemistry and 52 percent in physics, although it just may have been the other way around; time has dimmed my exact recall of which of the two I excelled in. So even though many Sciencemen take pleasure in belittling the value of the humanities, I turn from this cheek to confess that some of my most educational experiences took place in my science courses, especially in the Chem 100 lab at UBC. Chemistry taught me about the beauty and unexpectedness of the world. The fact that potassium permanganate, a *purple* substance, will turn a *brown* pair of trousers streaky *orange*, if it is dropped on them without warning, impressed me as being an aesthetic experience that no one could predict. This same contingency also revealed to me something of the inevitable mystery that pervades the world, even the world of science. For neither the fussed-up lab assistant nor my lab partner (both of whom now have PhD's in Chemistry) could explain this colorful metamorphosis. In spite of his failure on this one occasion, I realize that I was especially lucky to have had this particular chap as a lab partner. Not only was he precocious in chemistry—I think he sometimes understood what we were mixing—but he needed help with his English themes. The Arts and Science Battle we waged between us was generally in a state of truce.

Unfortunately I was not so lucky in my choice of partner in the physics lab. Smith was his name, and even then he showed signs of being destined for great things in the insurance business, and has in recent years made a mint. Despite the considerable difference in our current economic situations, I have long intended to invite Smith to revisit with me the scene of our joint confusion in the physics lab. I am curious to see whether our combined experiences of the past twenty years will have equipped us to cope with the experiments that baffled us then. In particular, I would like another run at Fletcher's Trolley. Once again Smith and I could dip that little paint brush in yellow ink, attach it by an elastic band to Fletcher's Trolley, set the brush wagging, and then, with horrible seriousness, send the Trolley rolling down its inclined plane, the little brush drawing harmonic arcs (or something) as it went. If we tried this again, would we find—as I even then suspected—that the real purpose of the experiment was to keep untalented chaps like Smith and myself away from the more expensive equipment, and out from under the feet of (we would be looking for that elastic band) the bright boys who doubtless by now all have PhD's in Physics. But even Fletcher's Trolley was not a complete loss. I learned that yellow ink splashed on brown trousers scrapes off much more easily than potassium permanganate, which, in fact, scrapes off not at all, but leaves in time a nasty hiatus where there had once been trouser.

I don't really suppose that Smith and I will ever come together again in the name of Science. Yet, whenever I am out on the campus, I try to take a nostalgic walk through the old Science building, where, in simpler days, the labs for both chemistry and physics were located. I find it almost pleasant to walk along those red-tiled corridors (impervious, I am sure, to droppings of potassium permanganate), and to smell again the acrid but clever stink that lingers there. But it is also a relief to get outside again into an Artsman's proper air. As I leave the Science building, I must admit that I look across towards Agriculture, hoping, I suppose, to see the Levy brothers out there on the South Portico restating their strong case against science.

This brings me back to where I started, and I realize, sir, that I haven't yet told you why I am writing. Actually, all I had in mind when I began was the desire to wish you Good Luck and Good English in your Science Issue. But maybe I could just add to this the small hope that in this issue you include, if you possibly can, an article that would explain clearly what would happen if someone, in the interests of science, sent Fletcher's Trolley full throttle down its inclined plane into a beaker of potassium permanganate.

Yours respectfully,
ALAN DAWE.

We tend to be smug about the scientific advances of this century and to ridicule the sup titions of the ancients. But what are our children doing in the science classroom of today? Studying science without experimenting makes no more sense than taking physical education without exercising.

The Ghost of Aristotle

JOHN F. HALL

We partake of the great 'world-spirit' when we breathe. This 'world-spirit' is changed into 'natural spirit' in our liver and is distributed by its branches, the veins. 'Vital spirit' is then produced in the heart and carried to the brain, where it becomes 'animal spirit,' to be then distributed by the nerves.

IF PUBLIC SCHOOLS HAD EXISTED in the Middle Ages we might well imagine children copying the above paragraph into their notebooks. For a thousand years the writings of Aristotle and Galen were considered ultimate authorities in biology, for who would question books written by such scholarly men, even though neither Aristotle nor Galen had ever performed or witnessed a human dissection. Eventually, men such as Vesalius and Harvey had the courage to look at the circulatory system for themselves. Lo and behold, the great books were wrong! The blood gets air from the lungs, is pumped by the heart, not the liver, and circulates around the body! The existence of circulation was shown by many crystal-clear experiments. Yet, most of the intelligent people of the time could not even believe the evidence of their own eyes because of a blind adherence to the writings of Aristotle and Galen.

We sometimes tend to be smug about the scientific advances of the twentieth century and to ridicule the peculiar-sounding superstitions of the ancients. But what really are our children doing in the science classroom of today? Are they looking, analyzing, and finding things out for themselves, as Vesalius, Pasteur and Koch once did? Or are they memorizing and quoting textbooks—the ultimate authorities of the twentieth century—the ghosts of Aristotle and Galen in our classrooms?

Many of the 'scientific truths' of even five or ten years ago have now been shown to be false or hopelessly inadequate—for example, our conception of the number and nature of human chromosomes, the function of the thymus gland, bird migration and hibernation, to name just a few. Yet many children are still memorizing erroneous ideas from outmoded texts, as if they were the gospel truth.

Suppose that Pasteur and Koch had been content to quote and memorize the textbooks of the day instead of experimenting with microbes. What would have been the effects on the history of mankind? Noxious humors and miasmas from the night air cause disease! It's in the book!

This, of course, does not mean that there is anything wrong with reading books on science. Certainly, children should read a good many more books in science—from a variety of viewpoints. But books must be read critically and in conjunction with experimentation. One might say, 'This is fine for scientists, but we're teaching children.' Why shouldn't children act like scientists in the classroom, just as they act like artists when they draw or paint? Studying science without experimentation makes no more sense than taking physical education without exercising.

At this point the already overworked classroom teacher may throw up her hands in despair. 'Certainly, it's important for children to do more experimentation in science, but we have no laboratories in Grade 5, precious little equipment, and far too many children in a small room.' These things are, of course, true, and it would seem that the average classroom teacher in B.C. needs a good deal more help in teaching science. In fact, the time has arrived to agitate loudly for change. To give the children of the province a chance to really do science instead of just reading about

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scientists, the following courses of action would seem appropriate:

(1) Provide at least one science laboratory in larger elementary and junior secondary schools, and at least work areas in smaller schools.

(2) Provide resource teachers or consultants to help the regular classroom teacher organize materials and set up a laboratory program.

(3) Require at least one lab course in the natural sciences (Biology, Physics, Chemistry, or Ed. 309) for minimum teacher certification.

(4) Provide more in-service training courses in laboratory techniques and field studies. These courses should carry credit toward certification.

(5) Provide a variety of books to serve as texts in place of one rather outmoded text, which often has little relevance to conditions in B.C. For example, children in B.C. should certainly be studying insects important in this province instead of the cotton boll weevil.

The usual reasons given for inactivity are: (1) it would be too expensive, and (2) the administration, the trustees, the Department of Education, the Government, etc., would never support it. A good elementary or junior secondary school science laboratory does not require a lot of expensive equipment. It is possible to get a good deal of mileage from a small amount of money, provided the interest and determination are present, and there is careful, yet imaginative, planning. Why is money often spent for equipment and facilities in such areas as music, physical education, commerce, industrial arts, etc., but not in science? Undoubtedly, this is because of a failure to recognize that science is essentially an *activity*. We must be cognizant of this fact and strive harder to convince people in positions of authority. The lesson of history is all too clear. We cannot deny the influence of independent thinkers and investigators on past civilizations. But, how many Harveys and Pasteurs will be needed in the twenty-first century? Will we survive at all if men are unable to observe and find things out for themselves? If we think at all about the proper function of the school, it becomes clear that we must spend more time and money on science facilities and activities for the children of British Columbia.□

Science Fiction

GRACE E. FUNK

SCIENCE FICTION, SPECULATIVE FICTION, science fantasy —however you spell it, no scientist can ignore it; many scientists write it; all students of science should read it.

Just what is s/f? First of all—good writing in many forms: the best in recent short stories, mature and thoughtful novels, delightfully irreverent verse, chilling or hilarious vignettes. Next, good science—a s/f writer must be well ahead in his chosen field. If he isn't, his fans will soon bring him up to date. He takes the latest discoveries and most recent theories and pushes them a short step, a long leap, a free flight further on. Since there is no limit to man's imagination, there is no limit to the speculations of writers about whither today's science may lead us. Frederik Pohl defines s/f as 'a work investigating the causes and consequences.' S/f gives us the breathtaking 'what if?' that opens our students' eyes to the implications and possibilities of the facts they are studying.

Mrs. Funk teaches at Rutland Secondary School in the Kelowna School District.

Why read s/f? To encourage our students to speculate on that 'what if?' What if 'cold sleep' could be perfected, could we survive a trip on an indefinite number of years, like Andre Norton's heroes, and reach the stars? Would we go mad with loneliness and find ourselves obsolete when we arrived, like Jim, Blake and Renfrew of Van Vogt's *Far Centaurus*? Would we experience death and resurrection, like the victims of the idiot robot described by Isaac Asimov himself? What if human evolution is incomplete, or is triggered in new directions by hard radiation or over-population, so that the new generation is not like its parents? What if the network of electrical impulses we call consciousness can exist without a matrix of cells? What if there is a beauty beyond the stars? The writers of s/f give not an answer, but a multitude of further questions, firefly sparks in the dark.

What of man? Will man master his machines or be mastered by them? Eric Frank Russell deftly combines *Men, Martians and Machines* in an exceedingly funny journey of extraterrestrial exploration, while

Murray Leinster, on the same theme, keeps his *Planet Explorer* most definitely, dominantly human. Clever machines abound, of course, from robots which have long outlasted their creators to 'thinking machines' intelligent enough to go crazy.

S/f helps to explore the relationship of the scientist to his science. Eager young scientists holding a hope of mankind's freedom, can identify with crippled Lars in Norton's *The Stars are Ours.* Adventure-minded youngsters who look chiefly for useful applications of science will find them in Heinlein's stories of space travel, *Rolling Stones* or *Tunnel in the Sky.* Even reluctant, romantically-inclined female adolescents who find science (perish the thought) dull and uninteresting would find it hard to resist the tender strangeness of Zenna Henderson's stories of *The People.*

Science has a long history; so has s/f. Without going back to Merlin or magic, just reading the earlier classics by Jules Verne or H. G. Wells, Conan Doyle's *Lost World* or Kipling's *As Easy as A B C* will give a perspective on the changes science has wrought in men's thinking far more quickly than attempting to evaluate histories of science.

S/f gives the writer and us as readers a chance to look well at ourselves and our own times, by getting outside them, either physically, as in space travel books, or mentally by looking through the eyes of another creature or another culture. Satire is the weapon of the critic of his time, and s/f writers use it freely, sometimes humorously, as in Frederic Brown's *The Puppet Show;* sometimes savagely, as in J. G. Ballard's *The Insane Ones;* sometimes calmly, from an historical perspective, as in Heinlein's *Starship Troopers.*

S/f, by the way, is *not* prophecy, but sometimes it comes true. Physicist Arthur C. Clarke's *Master of Space* was s/f when he wrote it in 1951; now it is just fiction. The opening events in astronomer Hoyle's *Black Cloud* (1957) were re-enacted with chilling accuracy only last year.

Who writes s/f? Novelists, poets, mystery writers, humorists, scientists, journalists, sometimes all combined in one man. Even western and sports writer Frank O'Rourke has been seduced into slipping in a sly spoof called *Instant Gold.* Of all those mentioned, and scores more, Isaac Asimov is the name to set against all others. Students who are familiar with Dr. Asimov as an astronomer (*Kingdom of the Sun*) or a biochemist (*Biochemistry and Human Metabolism*) can appreciate the same keen mind laying down the three laws of Robotics (*I Robot*), and finding the logical loopholes in them (*The Naked Sun*).

Finding loopholes in any writer's logic or science is one way to look at s/f; a more creative attitude will get the mind (your mind, your students' minds, anybody's mind) out of its grooves and let it go free on the ultimate nature of time, with John Wyndham (*The Chronoclasm*); or causality, with Kornbluth's *Dominoes,* wherein a man attempting to evade the future, causes that very future he succeeds in evading. What is the nature of space? Is there another side to the sky, as Arthur C. Clarke asks? Or is three-dimensional space like a Moebius strip, only one-sided?

Presently our student-reader will find himself considering the nature of man, his destiny and identity, in Clarke's *Childhood's End* or Mildred Clingerman's horrible little identity switch *The Wild Wood.* At which point the scientist becomes the philosopher, and it is time to leave him to his speculations.□

Course Improvement Projects in Science

Information provided by the Science Department, Faculty of Education, UBC

THE INCREASING IMPORTANCE of science to our nation and the world creates pressing educational demands. Literacy in science is becoming essential for all citizens who wish to comprehend the world they live and work in and to participate in the increasing number of local and national decisions, some of gravest import, that require an understanding of science. Further, more and more students must be attracted to scientific and technical pursuits, and these students must be prepared to work with increasingly sophisticated ideas and techniques.

Very practical considerations compel us to give attention to the strengthening of science education. But there is another aspect of the matter—the principle held by those taking part in the reform of science education that more emphasis should be given to disciplined, creative, intellectual activity as a noble enterprise and to intellectual activity as a worthy end in itself. There is a desire to allow each student to experience some of the excitement, beauty, and intellectual satisfaction that scientific pursuits afford.

In the last few years, mathematicians, scientists, engineers and educators have taken up these new educational challenges with great vigor. Working together, and aided

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Our Cover Story

Commercial Fishing in B.C.

THE BOUNTIFUL RESOURCES of the sea have been of great historic and economic importance to Canada's Pacific Coast. The pattern of settlement, by both natives and colonists, was influenced markedly by the availability of fish for food.

Although the existence of a major marine resource was well-known, the commercial fishery developed quite slowly. The first salmon saltery was not established until 1863, while the first cannery went into operation in 1870. Once a start was made, however, things moved rapidly. By 1890 there were 34 canneries and 25 years later there were 94.

Major changes have occurred in the fishing industry and a separate article would be desirable to trace these trends.

Today, British Columbia fishermen land about 600 million pounds of fish annually. While the volume of landings has remained relatively consistent, the value of production rose fairly steadily after 1950 and reached a peak of $98 million in 1958. The average annual value of production during the period 1960-63 was $79 million. When it is considered that the total annual Canadian commercial catch is about two billion pounds, with a marketed value of about $250 million, it can be seen that the commercial fisheries of British Columbia contribute significantly to the economic status of the Canadian fishing industry. British Columbia leads the other provinces in the production value of fish and fish products.

Salmon First In Importance.

Salmon stand first in importance among the species caught off the British Columbia coast and are the chief factor in placing the province in top position. Five principal species of salmon are caught: sockeye, spring, coho, pink and chum. The marketed value of the catch has been increasing steadily and averages about $50 million. Most of the catch, which averages about 150 million pounds annually, is used for canning. British Columbia canned salmon is famous all over the world. The heaviest pack on record was in 1941 when 2,248,870 cases (48-pound cases) were produced by the canneries for that year.

This record was almost reached in 1958 when 1,900,000 cases of canned salmon were produced. An increasing quantity of salmon each year finds its way to the fresh and frozen markets in the United States and Canada, while smaller quantities are used for mild curing, smoking and pickling.

Except for the period of December and January, which is generally a closed season, some salmon fishing is in progress in British Columbia throughout the year. But it is in the summer and autumn months that operations are at their height and the fish are taken in huge quantities as they swarm into the mouths of rivers to begin their spawning runs.

One of the most important salmon nurseries in British Columbia is the Fraser River system. The Fraser is particularly noted for its great runs of sockeye salmon which are protected by special conservation measures of the International Pacific Salmon Fisheries Commission. Since the sockeye runs pass through both Canadian and United States coastal waters in the Strait of Juan de Fuca as they approach the river mouth, these fish are shared by the fishermen of both countries and an international treaty provides for the operation of the Commission to prevent overfishing.

Other Species

Great quantities of herring are taken annually in the waters of British Columbia. In fact, herring accounts for about 60% of all British Columbia fish landings. The bulk of the catch is processed into meal and oil and the 5-year average value of production for the years 1959-63 amounted to $8.1 million. Thus herring leads other fish in total weight of landings and is about equal to halibut in monetary value of production.

British Columbia is close to one of the greatest halibut fishing gounds in the world. Some of the principal grounds are off the west coast of Vancouver Island, some off the Queen Charlotte Islands, some in Hecate Strait, in Dixon Entrance. Others, farther away but commercially accessible to British Columbia

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Since the following Salary Summary was printed agreements have been completed in Vernon and Penticton. Details are available from the BCTF office.

Summary of

Salary Scales

April 1965

Summary of British Columbia Salary Schedules (1965)

Special Note: All school districts have P.T.M.S. Plan "A" unless otherwise noted.
Number of teachers shown for each district is full-time staff in September 1964 (courtesy BCSTA)

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
1.	Fernie	71	EB	3950	6150	10 × 200	% of max. for cert. held per teacher, incl. prin.	E in secondary $300 plus $25 per year of experience to $600.
			EA	4450	6750	10 × 230	Elem.: first 2 teachers, 8%; 2% (8); 1% (over 10).	$75 per 3 units Summer School up to $150.
			PC B.Ed.	5050	7650	10 × 260	Sec.: first 3 teachers 12%; 1½% (5); 1% (8); ½% (over 16).	EC paid EB0.
			PC	4950	7400	10 × 245	Vice-prin. (sec.); ½ based on own scale max.	Full credit for Commonwealth experience.
			PB	5650	8850	10 × 300, 1 × 200		IA with Journeyman's papers plus a teaching certificate, paid scale + 3 increments to maximum.
			PA	6000	9500	10 × 320, 1 × 300		
			PA Mas.	6000	9840	12 × 320		
2.	Cranbrook	113	EC	3000	3700	2 × 150	% of max. sal., EA (El.), PA (Sec.). 3% (5), 2% (5), 1% (10), ½% (over 20).	Teachers certificated EB after 1962, restricted to EB 7.
			EB	3875	6075	10 × 220	Vice-prin.: ½.	For credits beyond EB permanent: Winter Session or Correspondence, tuition paid; Summer School, $50 per unit.
			EA	4500	6900	10 × 240		On appointment credit for EB, EA and PC limited to 3 increments; last increment granted after Summer School.
			PC B.Ed.	5100	7700	10 × 260		
			PC	4900	7200	10 × 230		
			PB	5600	8800	10 × 300, 1 × 200		
			PA	6000	9400	10 × 310, 1 × 300		
3.	Kimberley	101	EB	4000	6200	10 × 220	Elem.: 15% to 35% of EA max.	E certificated teachers $50 per unit for credit course.
			EA	4520	6820	10 × 230	Sec.: 17% to 35% of PB max.	E over 50% in secondary with 6 units of credit since July 1, 1964, PC scale for ensuing two years.
			PC B.Ed.	5100	7700	10 × 260	Plus amount of base scale final incr.	Full credit for experience recognized by Department.
			PC	4900	7300	10 × 240	Vice-prin.: approx. ½.	$250 for one room rural schools.
			PB	5630	8820	4 × 300, 1 × 290 5 × 300, 1 × 200		
			PA	6000	9500	10 × 320, 1 × 300		
4.	Windermere	48	EC	3400			Schools of four or more teachers $500 (El.), $700 (El.-Sec. and Sec.).	E over 50% in secondary; PC less $200 (EB), $100 (EA).
			EB	4150	6350	5 × 250, 5 × 190	Plus $100 per teacher, excluding principal.	IA or HE specialists, PC scale.
			EA	4650	6950	5 × 250, 5 × 210	Two increments of $200.	Permanent 2nd Class paid EC scale.
			PC	5150	7550	5 × 300, 5 × 180	Vice-prin.: ½	One room school $300 plus two increments at $50.
			PB	5750	8950	5 × 400, 5 × 240		
			PA	6150	9750	5 × 400, 5 × 320		
			PA Mas.	6300	9900	5 × 400, 5 × 320		
5.	Creston	89	EC	3400	4200	5 × 160	Elem.: above 4 teachers $700 - $2200 based upon enrolment.	Summer School: $50 per unit to higher certification for permanent staff EC, EB, EA only.
			EB	4000	6200	10 × 220	Three incr. $1000-$2700.	PB certification plus 15 acceptable units in relative fields or education courses toward Master's degree, PA for three years.
			EA	4500	6800	10 × 230	Sec.: $1500-$3200 based upon enrolment.	Permanent 2nd Class paid EB.
			PC B.Ed.	5100	7700	10 × 260	Three incr. for large school (over 600 pupils) to $3700.	Full credit for Commonwealth experience on permanent appointment.
			PC	4900	7300	10 × 240	Plus supplementary allowance of $1 per pupil.	
			PB	5600	8800	10 × 320	Vice-prin.: ½.	
			PA	6000	9500	10 × 350		
			PA Mas.	6250	9900	10 × 365		

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
6.	Kootenay Lake	21	EC	3080	4000	5 × 184	Elem.-Sec.: Admin.: $300.	E over 50% in sec. $300.
			EB	3300	6050	6 × 230, 5 × 174	Superv.: $100 (10), $50 (over 10).	Full credit for Commonwealth exp.
			EA	4250	6650	6 × 245, 5 × 186	Three incr. of $50.	$100 for one-rm. schools.
			PC B.Ed.	4750	7600	6 × 285, 5 × 228	After 4 years, one incr. after PB or PA max., two incr. for Master.	
			PC	4700	7400	6 × 270, 5 × 216	Vice-prin.: ½ admin., superv. and $50 increments.	
			PB	5250	8650	6 × 340, 5 × 272		
			PA	5800	9450	6 × 370, 5 × 286		
7.	Nelson	152	EC	3080	4000	5 × 184	% of max. sal., PC (El.), PB (Jr. Sec.), PA (other Sec.).	E in sec. taking further training, PC scale; otherwise $300.
			EB	3800	6050	6 × 230, 5 × 174	3% (5), 2% (5), 1% (10), ½% (over 20), to max. of 40%.	Full credit for outside experience up to 5 years for secondary, then half credit.
			EA	4250	6650	6 × 245, 5 × 186	Incr. of 3% after max.	
			PC B.Ed.	4750	7600	6 × 285, 5 × 228	Vice-prin.: ½.	
			PC	4700	7400	6 × 270, 5 × 216		
			PB	5250	8650	6 × 340, 5 × 272		
			PA	5800	9450	6 × 370, 5 × 286		
8.	Slocan	42	EC	3450	4330	4 × 220	% of max. sal., EB (El. and Sup.), PA (Sec.).	E transferred to secondary paid PC.
	(Based on Arbitration Award in Trail)		EB	4100	6250	10 × 215	3% per teacher, incl. principal if teaching 4 periods daily.	Master's scale: if teaching own subject, or holder of Master of Education degree with completed postgraduate work in subject which he is teaching, or qualified counsellor.
			EA	4550	6850	10 × 230		
			PC B.Ed.	5220	7820	10 × 260		Summer School: $50 per unit to maximum of $300 for teachers below PB.
			PC	4990	7490	10 × 250		
			PB	5700	8930	6 × 320, 5 × 262		Full credit for outside experience to 4 years, then half credit.
			PA	6050	9650	6 × 360, 5 × 288		
			PA Mas.	6360	9960	10 × 320, 1 × 400		
9.	Castlegar	104	EC	3100	3700	4 × 150	Elem.: up to 10 rooms.	E in secondary: PC less $300 (EC), $200 (EB), $100 (EA).
			EB	4000	6050	10 × 205	7% + 1% per teacher of EA max.	Full credit for Commonwealth exper. to 8 years.
			EA	4300	6650	10 × 235	Increments $100 in 2nd, 3rd, 4th yrs.	
			PC	4800	7500	10 × 245, 1 × 250	Over 10 rooms.	
			PB	5450	8750	12 × 275	13% + 1% per teacher of EA max.	
			PA	5800	9450	11 × 300, 1 × 350	Increments $200 in 2nd, 3rd, 4th yrs.	
			PA Mas.	6200	9800	12 × 300	Sec.: 10% + 1% per teacher of PB max.	
							Increments $250 in 2nd, 3rd, 4th yrs.	
							Vice-prin.: ½ of allowance and increments.	
10.	Arrow Lakes	31	EC	3130	3930	4 × 200		E in sec., PC scale.
			EB	3960	6060	10 × 210		
			EA	4350	6700	10 × 235		
			PC	4850	7600	10 × 275		
			PB	5450	8750	11 × 300		
			PA	5850	9450	12 × 300		
11.	Trail	249	EB	4000	6150	10 × 215		E 50% in Secondary $300.
			EA	4440	6740	10 × 230		Master's scale: if teaching own subject, or qualified counsellor.
	(Arbitration Award)		PC B.Ed.	5100	7700	10 × 260		
			PC	4865	7365	10 × 250		
			PB	5560	8790	10 × 295, 1 × 280		
			PA	5900	9500	12 × 300		
			PA Mas.	6200	9800	12 × 300		

12. Grand Forks (based on Arbitration Award in Trail)	48	EB EA PC B.Ed. PC PB PA PA Mas.	4000 4440 5100 4865 5560 5900 6200	6150 6740 7700 7365 8790 9500 9800	10 X 215 10 X 230 10 X 260 10 X 250 10 X 295, 1 X 280 12 X 300 12 X 300		E in secondary $350. Permanent 2nd Class employed as of Dec. 31, 1964, paid $4400. Full credit for experience recognized by the Department.
13. Kettle Valley	31	EC EB EA PC PB PA	3300 3925 4365 4935 5460 5820	3900 6125 6840 7685 8700 9720	5 X 120 11 X 200 11 X 225 11 X 250 12 X 250 13 X 300	Elem. (above 10 rooms): 20% to 30% of EB max. Sec.: Below 250 pupils: 10% to 20% of PB max. Above 250 pupils: 15% to 25% of PB max. Increments: two at 5%.	EC cert. granted after 1964 limited to EC minimum. E over 50% in sec., two increments.
14. Southern Okanagan	85	EC EB EA PC PB PA	3210 3720 4240 4700 5250 5670	3835 5840 6520 7500 8500 9250	5 X 125 8 X 190, 3 X 200 3 X 200, 8 X 210 6 X 250, 5 X 260 11 X 270, 1 X 280 2 X 290, 10 X 30)	% of PB max. salary. Admin., per division up to 15: 1.7% El. or Superior; 2.05% Elem.-Sec. or Jr. High; 2.35% Jr. Sr., or Sr. Sec. Superv.: ½% per teacher. Extra 2% if SA or over. Vice-prin.: ½.	E in secondary taking further training, PC scale less $1200 (EC), $700 (EB), $200 (EA). University degree plus teaching certificate allowed 3 or 4 years' experience for years in full time session.
15. Penticton (Arbitration Award)	159	Arbitrated award; as of March 26, agreement lacking on supplementary and definitive clauses.					
16. Keremeos (Arbitration Award)	27	EC EB EA PC PB PA	3150 3850 4300 4770 5300 5740	3750 5940 6500 7300 8490 9150	5 X 120 11 X 190 11 X 200 11 X 230 11 X 290 11 X 310	% of max. sal., EB or EA (El.), PB or PA (Sec.). Elem.: first 3 rooms: 6%; 3% (4), 2% (3). Sec.: under 250 pupils 15%; 250-400, 20%; 401-600, 24%; over 600, 29%. Two incr. of 3% to 5%. Vice-prin.: ½ allowance for sec. under 250.	EB in sec. $400; EA $500.
17. Princeton (Arbitration Award)	34	EC EB EA PC PB PA	3350 3910 4350 4850 5450 5900	3950 6000 6660 7490 8530 9310	4 X 150 11 X 190 11 X 210 11 X 240 11 X 280 11 X 310	Elem.-Sec.: $2500. Increments: 3 at $400. Vice-prin.: ½.	Medical plan other than PT-MS. School board pays ½. E in secondary $300. $75 per 3 units to higher cert. $200 for one-room school.
18. Golden	50	EC EB EA PC PB PA	3800 4050 4655 5200 5750 6300	5850 6720 7855 8720 9540	8 X 225 9 X 230 9 X 295 9 X 330 9 X 360	Elem.: 109-249 pupils, $1000. Up to 399 pupils, $1500. Over 400 pupils, $2000. El.-Sec.: Under 200 pupils, $1500. Over 200 pupils, $2000. Sec.: $2500. Two incr. of $250. Vice-prin.: ½ allowance, one incr. of $200.	E 50% in secondary, PC scale less $600 (EC), $400 (EB), $200 (EA). Elementary certificated teachers, $100 each 3 unit course, $50 each 1½ unit course to higher certification. Full credit for Commonwealth and U.S. experience. $150 for one-room elementary schools.

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
19.	Revelstoke	66	EC	3350			Elem.: 10-35% of EB maximum.	E in sec. PC scale.
			EB	3800	5950	10 × 215	Sec.: 15-35% of PB maximum.	$90 for 3 units to higher cert.
			EA	4300	6650	10 × 235	Increments: two at 5%.	Credit for outside experience up to 6 years.
	(Arbitration Award)		PC	4850	7550	10 × 270	Vice-prin.: 10-15% of his basic salary.	$200 for one-room school.
			PB	5400	8550	10 × 315		
			PA	6000	9400	10 × 340		
20.	Salmon Arm	125	EC	3000	3600	5 × 120	Elem.: 10-33% of EA max.	E in sec. taking further training, next higher scale.
			EB	3750	5895	11 × 195	Elem.-Jr.: 13% of PA max.	Perm. 2nd Class paid EB to 7th step.
			EA	4200	6550	10 × 215, 1 × 200	Elem.-Sr.: 20% or 25% of PA max.	PC, PB, or PA in el.-sec. schools teaching 50% sec., one increment.
			PC	4700	7500	10 × 255, 1 × 250	Jr.-Sr.: 30% of PA max.	On appointment, full credit for outside exp. up to 4 years, and half credit beyond. After 1 year in district, full credit.
			PB	5250	8550	11 × 300	Sr.-Sec.: 34% of PA max.	
			PA	5750	9300	10 × 325, 1 × 300	Vice-prin.: ½.	
21.	Armstrong-Spallumcheen	34	EC	3180	3855	5 × 133	Elem.: $1670.	$25 per unit to maximum of $150 to higher certification.
			EB	3810	5900	11 × 190	Sec.: $1800.	Permanent 2nd Class paid EB to 7th step.
			EA	4275	6555	9 × 210, 2 × 195	Vice-prin.: ½.	
			PC	4735	7375	12 × 220		
			PB	5210	8490	10 × 275, 2 × 265		
			PA	5680	9180	10 × 290, 2 × 300		
22.	Vernon	180						
	(Arbitration Award)		Arbitrated award; as of March 26, agreement lacking on supplementary and definitive clauses.					
23.	Kelowna	269	EC	3200	3825	5 × 125		
			EB	3780	5975	11 × 195		
			EA	4250	6560	11 × 210		
	(Arbitration Award)		PC	4725	7420	11 × 245		
			PB	5250	8550	11 × 300		
			PA	5780	9245	11 × 315		
24.	Kamloops	320	EC	3300			Elem.: 13% EA max.+1% per teacher.	Permanent EC with 5 years' experience paid EB plus 5 increments.
			EB	3750	6050	10 × 230	Sec.: 12% PB max.+1% per teacher.	$25 per unit above EB or EA toward PC.
			EA	4280	6730	10 × 245	Elem.-Sr.: 16% PB max.+1% per tchr.	Full credit for Commonwealth experience.
			PC	4800	7920	12 × 260	Increments: Three at $225.	Up to $300 in Grade 1 with 3 years' primary experience.
	(Arbitration Award)		PB	5350	8905	11 × 295, 1 × 310	Vice-prin.: ½ allowance, three increments at $175.	$200 for one-room schools.
			PA	5800	9600	11 × 300, 2 × 250		
25.	Barriere	25	EC	3300			Elem.: 13% of EA max. + 1% per teacher supervised.	E in sec. PC scale.
			EB	3750	6050	10 × 230	Sec.: 12% of PB max. + 1% per teacher supervised.	Permanent 2nd Class paid EB to 7th step.
	(based on Arbitration Award in Kamloops)		EA	4280	6730	10 × 245	Three incrs. after scale maximum.	Full credit for Commonwealth experience.
			PC	4800	7920	12 × 260		$200 for one-room schools.
			PB	5350	8905	11 × 295, 1 × 310		
			PA	5800	9600	11 × 300, 1 × 500		

26. Birch Island (Arbitration Award)	31	EC EB EA PC PB PA	3450 3850 4380 4900 5450 5900	4050 6150 6855 8005 8990 9700	2 × 300 3 × 300, 7 × 200 3 × 300, 7 × 225 3 × 300, 9 × 235 3 × 400, 9 × 260 3 × 400, 10 × 260	% of principal's base salary: 6% elem., 9% sec., plus $125 per tchr. Increments — large school 3 @ $225; small school 3 @ $150 after max. Vice-prin.: ½.	E in secondary, PC scale to 6th step. $50 per unit to higher certification. Full credit for experience in Canada. $200 for one-room schools.
27. Williams Lake (based on provincial median scale)	157	EC EB EA PC PB PA	3300 3900 4320 4800 5300 5800	3960 5980 6660 7600 8720 9505	4 × 165 8 × 269 9 × 260 10 × 280 12 × 285 13 × 285	Elem.: above 4 teachers $975-$2175 based upon enrolment. Two increments to $1375-$2575. Sec.: $2100-$3500 based upon enrolment. Two increments to $2500-$4500.	E in sec. $200. $225 for one-room schools with 4 grades.
28. Quesnel	137	EC EB EA PC PB PA	3100 3900 4350 4850 5400 5800	4000 6000 6650 7800 8700 9400	4 × 225 8 × 233, 1 × 236 10 × 230 10 × 268, 1 × 270 12 × 275 12 × 276, 1 × 288	Elem.: stipulated amounts $950 to $1800. Sec.: stipulated amounts $2400 to $3500. Vice-prin.: ½ for three years then 2/3.	E in secondary, $300. $150 per 3 units to higher certification. Full credit for approved Canadian, the Commonwealth and U.S. experience. $10 per month for 6 grades in class. $125 for one-room schools. Group Life Insurance — 50%.
29. Lillooet	48	EC EB EA PC PB PA	3450 3800 4300 4800 5300 5800	3850 6100 6700 7800 8700 9505	2 × 200 10 × 230 10 × 240 12 × 250 10 × 280, 2 × 300 13 × 285	Admin.: 10% of superv. allowance. Supervision First year $100 (14), $60 (over 14). Second year $125 (14), $60 (over 14). Third year $150 (14), $60 (over 14). Vice-prin.: ½.	EC in sec., PC minimum. EB and EA, PC scale to max. for cert. held. S in el. by own choice, EA scale. $40 per unit above EB to PB. Full credit for outside experience.
30. South Cariboo	69	EC EB EA PC PB PA	3300 3750 4250 4750 5300 5800	6050 6650 7750 8700 9505	10 × 230 10 × 240 12 × 250 10 × 280, 2 × 300 13 × 285	Elem.: % of EB max. 6% + 2% per teacher. Sec.: % of PB max. 13% + 1% per teacher. Vice-prin.: ½.	$50 per unit for credits to higher certification. E in secondary taking further training $300. $100 plus free teacherage for one-room school.
31. Merritt	70	EC EB EA PC PB PA	3300 3750 4250 4800 5350 5900	6000 6650 7800 8800 9450	10 × 225 10 × 240 12 × 250 10 × 300, 2 × 225 10 × 310, 2 × 225	% of EA max. (Elem.) PB max. (Sec.) Elem.: 4% first two rooms, 2% (8) ½% (12). Sec.: 23%. Increments: Two at 1% to 5% (Elem.) 5% and 7% (Sec.) Vice-prin.: ½.	E in secondary PC scale. Full credit for Commonwealth experience. $150 for one-room ungraded schools.
32. Fraser Canyon (Arbitration Award)	65	EC EB EA PC PB PA	3350 3750 4200 4600 5300 6000	3800 5800 6450 7350 8600 9300	3 × 150 10 × 205 10 × 225 10 × 275 11 × 300 11 × 300	% of base salary. Admin.: 5½% El., 8½% Sec. and El.-Sec. Superv.: 2% (6), 1% (13), ½% (over 19). Vice-prin.: ½.	E in Jr.-Sr. High, $265. $30 per unit up to PB.
33. Chilliwack (Arbitration Award)	289	EC EB EA PC PB PA	3250 3800 4200 4725 5250 5750	3550 5800 6500 7475 8550 9290	2 × 150 10 × 200 10 × 230 11 × 250 12 × 275 12 × 295	Elem.: % of EB max. 3% (4), 2% (4), 1% (over 9). Increment: 1 at 3% (up to 9 teachers), 2 at 3% (over 9 teachers). Sec.: % of PB max. 2% (6), 1% (12), ¾% (over 18). Increments: 2 at 5% of PA maximum. Vice-prin.: ½.	E in secondary taking further training, PC scale. Special Class: $100 after 1 year's experience, $200 after 2 years' experience.

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
34.	Abbotsford	206	EC	3200	3600	2 × 200	% of scale maximum PC (Elem.) PB (Jr. Sec.) PA (Sr. Sec.) Admin.: 6% (Elem.), 10% (Jr. Sec.), 10% (Sr. Sec.). Superv.: Elem.: 2% (6), 1½% (6), ½% (over 12). Jr. Sec.: 1½% (8), 1% (16), ½% (over 24). Sr. Sec.: 1½% (8), 1% (16), ½% (over 24). Vice-prin.: ½.	E in secondary taking further training PC to 10th step. 4% PC maximum for one-room schools. $20 per unit further training, up to $120.
			EB	3800	5800	10 × 200		
			EA	4200	6500	10 × 230		
			PC	4725	7475	11 × 250		
	(Arbitration Award)		PB	5250	8610	12 × 280		
			PA	5750	9290	12 × 295		
35.	Langley	195	EC	3250	3650	2 × 200	Elem.: (500-701 pupils) $2000-$2400. Sec.: (to 400 pupils) $1900-$2500; (401-800 pupils) $3000-$3600; (801-1200 pupils) $4100-$4700. Increments: two equal increments between minimum and maximum. Vice-prin.: ½.	One-room school $150.
			EB	3850	5850	10 × 200		
			EA	4350	6500	10 × 215		
			PC	4800	7440	11 × 240		
	(Arbitration Award)		PB	5300	8615	13 × 255		
			PA	5800	9245	13 × 265		
			PA Mas.	6100	9545	13 × 265		
36.	Surrey	784	EC	3150	4200	4 × 100, 1 × 650	% of max. sal., PC (Elem.), PA (Sec.). Elem.: 22% (to 300 pupils), 26% (300-500 pupils), 30% (500-650), 33% (650-750), 36% (over 750). Jr. Sec.: 27% (to 450 pupils) + 2% per 100 pupils over 450 to max. of 35%. Sr. Sec.: 32% (to 450 pupils) + 2% per 100 pupils over 450 to 850. Above 850 pupils—51%. Vice-prin.: ½.	$200 for Special Class. 5th step of EC scale limited to permanent 2nd class certification on staff January 1, 1962.
			EB	3800	5950	10 × 215		
			EA	4200	6620	11 × 220		
	(Arbitration Award)		PC	4700	7700	12 × 250		
			PB	5300	8680	13 × 260		
			PA	5700	9480	14 × 270		
			PA Mas.	5800	9580	14 × 270		
37.	Delta	186	EB	3915	5985	10 × 207	Elem.: % of PB max. 8% (for first 2 teachers), 2% (for 3rd to 9th teacher), 3% (10th teacher), 1% (11th to 14th teacher), ½% (15th to 20th teacher). Max. allowance 32%. Sec.: % of PA max. 2% (for each of first 15 teachers), 8% (for each teacher in excess of 15). Vice-prin.: ½.	EB teachers certificated after 1962 restricted to EB 4. E in sec. $300.
			EA	4340	6540	10 × 220		
			PC	4790	7730	12 × 245		
	(Arbitration Award)		PB	5220	8756	13 × 272		
			PA	5635	9583	14 × 282		
			PA Mas.	5840	9788	14 × 282		
38.	Richmond	445	EC	3685			Sr. & Jr.- Sr. Sec. Enrollment El. Jr. Sec. 1- 400 1670 2200 2520 401- 600 1990 2520 2835 601- 800 2305 2835 3155 801-1000 3155 3475 1001-1200 3790 Incr. 2 at approx. $200. Vice-prin.: ½.	E in sec. paid PC scale.
			EB	3915	6005	10 × 209		
			EA	4340	6560	10 × 222		
	(Arbitration Award)		PC	4780	7744	12 × 247		
			PB	5210	8746	13 × 272		
			PA	5635	9583	14 × 282		
			PA Mas.	5840	9788	14 × 282		
39.	Vancouver	2596	EB	3937	6037	10 × 210	Stipulated amounts negotiated, but not calculated by any formula. Details available Federation office.	Medical Plan — School Board pays up to ½. EB teacher certificated after 1962 restricted to EB4. Elem. teachers on EB, EA, PC(B.Ed.) scales with 25 years' service $200, with 30 years' service $400. Elem. and Sec.—PB + 15 acceptable units paid PA.
			EA	4357	6557	10 × 220		
			PC B.Ed.	4777	7129	12 × 246		
	(Arbitration Award)		PC	4670	7400	13 × 210		
			PB	5200	8710	13 × 270		
			PA	5580	9500	14 × 280		
			PA Mas.	5780	9700	14 × 280		

D.F.S.

IS THIS CORRECT?

40. New Westminster (Arbitration Award)	234	EC EB EA PC B.Ed. PC PB PA	3000 3915 4340 4780 4630 5205 5630	 5985 6540 7720 7570 8715 9550	 10 × 207 10 × 220 12 × 245 12 × 245 13 × 270 14 × 280	Stipulated amounts. Negotiated, but not calculated by any formula. Details available Federation Office.	E teachers certificated after 1962 restricted to EB4.
41. Burnaby (Arbitration Award)	922	EB EA PC PB PA	3900 4350 4800 5275 5800	5556 6550 7740 8720 9720	8 × 207 10 × 220 12 × 245 13 × 265 14 × 280	Paid PB max. plus % of PB max. Admin.: 8% (El. to 12 rms.), 13% El., 20% Jr. H., 20% plus $700 Sr. H. $200 for Sr. Matric. Superv.: 3½% per 100 pupils. Less 10% if under PB cert.; plus 5% if 6 yrs. university. Vice-prin.: Admin.: 40% of prin's. (El.), 70% (Jr. H.), 85% (Sr. H.). Superv.: ½.	$150 + two annual incrs. of $150 for Special Class. Intermediate scales for qualifications beyond the certificate held.
42. Maple Ridge (Arbitration Award)	199	EC EB EA PC PB PA	3200 3800 4200 4725 5250 5750	3600 5800 6500 7475 8550 9290	2 × 200 10 × 200 10 × 230 11 × 250 12 × 275 12 × 295	% of max. sal., PC (Elem.) PA (Sec.). 3% (4), 2% (3), 1½% (3), 1% (16), ½% (over 26). 90% of above allowances during probation. Vice-prin.: ½.	$50 per 3 units for E certificated teachers. Maximum $150.
43. Coquitlam (Arbitration Award)	491	EC EB EA PC B.Ed. PC PB PA	3300 3900 4300 4800 4750 5250 5650	 6000 6500 7740 7690 8760 9570	 10 × 210 10 × 220 12 × 245 12 × 245 13 × 270 14 × 280	Percentages are calculated on the PB maximum salary. Elem.: 14% first 7 rooms, 1.5% each 2 rooms thereafter up to 18 rooms. Three incr. of 1.9% up to 9 rooms, 2.5% over 9 rooms. Jr. Sec.: 25% under 500 pupils, 26% over 500 pupils. Four incr. of 2.5%. Jr.-Sr. Sec.: 31% for smaller schools, 43.5% for largest school. $200 for Sr. Matric. Four incr. of 3.1%. Sec. principals paid PA max. Vice-prin.: ½.	$75 per 3 units to teachers of slow learner classes. IA: $75 per 2 years' journeyman experience to $400 or scale max.
44. North Vancouver	642	EB EA PC PB PA PA Mas.	3950 4350 4800 5250 5650 5850	6000 6660 7800 8960 9570 9770	5 × 210, 5 × 200 11 × 210 12 × 250 14 × 265 14 × 280 14 × 280	% of PA (Master's) max. Enrolment — El. — Jr.-Sec. — Sr.-Sec. 1- 200 — 14% — — — 201- 400 — 17% — 32% — 39% 401- 600 — 20% — 32% — 39% 601- 800 — 23% — 32% — 39% 801-1200 — 26% — 35% — 42% Increments: Two at 4% (small Elem. 1 at 4%). Vice-prin.: ½ Elem., 3/5 Sec.	Master's scale limited to teachers with 50% of teaching time in subject field. $250 for Special Class.
45. West Vancouver (Arbitration Award —secondary)	265	EB EA PC PB PA PA Mas.	3900 4300 4800 5215 5600 5800	5950 6610 7800 8760 9520 9720	8 × 200, 2 × 225 11 × 210 5 × 270, 6 × 275 13 × 265, 1 × 100 14 × 280 14 × 280	% of PA (Master's) max. Elem.: 18% (250 pupils) + 3% (each additional 100 pupils to 650). Sec.: 37% (to 400 pupils) + 4% (each additional 400 pupils). Increments: Two at 2% (Elem.), 3% (Sec.). Vice-prin.: 55% (El.), 60% (Sec.) of allowance and increments.	EA teachers certificated after 1962 restricted to EA 7. E + 20 years' experience aged 55 years or over receive $200 above maximum. PB + 20 yrs. exp. aged 55 years or over receive $250 above max. EB + 9 units EA scale (for two years). EA + 9 units PC scale (for two years). PC + 9 units PB scale (for two years). PB + 12 units towards Master's PA scale (for two years). SA/PA + 12 units towards Master's PA Master's scale (for two years).

DISTRICT No. Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
46. Sechelt	74	EC	3000			Elem.: $175 per teacher (9), $50 per teacher (over 9).	Permanent 2nd Class paid EB to 5th step.
		EB	4000	6000	10 × 200	Sec.: $225 per teacher (9), $50 per teacher (over 9).	Credit courses approved by Board, tuition fees paid.
		EA	4300	6800	10 × 250	Principals included in staff total.	Summer Session, $200 for teachers on EB maximum.
		PC	4750	7650	10 × 290	Increments: schools of four rooms or over, $100 for each of second, third and fourth years.	E over 50% in secondary taking further training, PC scale.
		PB	5250	8600	10 × 335	Vice-prin.: ½.	Full credit for Canadian, the Commonwealth and U.S. experience.
		PA	5650	9400	10 × 350, 1 × 250		Special Class 50% or more, $100.
		PA Mas.	5850	9600	10 × 350, 1 × 250		$225 for one-room schools.
47. Powell River	156	EC	3400	4100	4 × 175	% of PA median.	E in sec. $200. IA with 2 years as journeyman, $200.
		EB	4000	6200	10 × 220	Elem.: 3% (2), 2% (4), 1% (over 6 teachers).	$50 per unit Summer School to $200.
		EA	4400	6900	10 × 250	Sec.: Specific percentages for each school. Details available Federation office.	Full credit for Commonwealth and U.S. experience.
		PC	5000	7800	10 × 280	Increments: Three at $200 (half credit for Canadian experience outside the district.)	$300 for Special Class. $200 for Gr. 1 with 2 years' experience.
		PB	5550	8750	10 × 320	Vice-prin.: 60% allowance, full incrs.	$200 for one-room schools.
		PA	5900	9400	10 × 350		Board contribution to Group Life Insurance.
		PA Mas.	6100	9700	10 × 360		PB + 15 units, one extra increment.
48. Howe Sound	65	EC	3250			% of max. PC (elem.) PA (sec.).	E 50% in secondary taking further training $200.
		EB	4000	6115	9 × 235	2.5% (5), 1.25% (5), 1% (over 10).	Full credit for Canadian and the Commonwealth experience.
		EA	4450	6900	10 × 245	Principals included in staff total.	$225 for one-room schools.
		PC B.Ed.	5000	7800	10 × 280	Increments: schools of five teachers or more, 4 increments at $150.	
		PC	4850	7600	10 × 275		
		PB	5450	8650	10 × 320		
		PA	5900	9400	10 × 350		
49. Ocean Falls	54	EC	3600	4240	4 × 160	1¼% of PA max. per teacher.	E in secondary $400.
		EB	4100	6300	8 × 275	Incr. of 7% of principals' allowance after two years.	$50 per 3 units above permanent to higher certification.
		EA	4700	7175	9 × 275	Vice-prin.: ½ admin. and super. Incr. of 7% vice-prin. allowance after two years.	$175 to $250 for Summer School.
		PC	5300	8050	10 × 275		Full credit for approved Commonwealth experience.
		PB	5900	8925	11 × 275		$200 for one-room schools.
		PA	6500	9800	12 × 275		
50. Queen Charlotte	27	EC	3350	4150	4 × 200	10% of max. for cert. held plus 2% per teacher.	E in sec. $300.
		EB	4150	5990	8 × 230		$50 per unit Summer School.
		EA	4700	6950	9 × 250		$200 for one-room schools.
		PC	5200	7900	9 × 270		Travel allowance $100 to $125.
		PB	5700	8900	10 × 320		
		PA	6200	10050	11 × 350		
51. Portland Canal	4	EC	3650	3950	2 × 150		E in secondary taking further training PC scale.
		EB	4250	6200	5 × 230, 4 × 200		Permanent EC paid EB to sixth step.
		EA	4600	6800	5 × 230, 5 × 210		$50 per unit to higher certification.
		PC	5100	7700	5 × 270, 5 × 250		Moving allowance: one-way fare up to $400.
		PB	5600	8750	5 × 330, 6 × 250		Continuous Service Grant: $100 after two years + $50 each year to six.
		PA	6000	9600	12 × 300		

52. Prince Rupert	114	EC	3400	4040	4 × 160	% of $4500 (El.), $5800 (Sec.). 5% (10), 1% (5), ½% (over 15). Vice-prin.: ½.	E in secondary taking further training $300. Summer School: $50 per unit to $300. Commonwealth-trained: full credit for Commonwealth experience, others: full credit to 5 years. $100 for elementary, $200 for secondary, 1-room schools. Moving allowance: one-way fare up to $400. Board contribution to Group Life Insurance.
		EB	3950	5710	8 × 220		
		EA	4500	6660	9 × 240		
		PC	5000	7600	10 × 260		
		PB	5500	8690	11 × 290		
		PA	6000	9840	12 × 320		
53. Terrace	104	EC	3410	4090	4 × 170	Elem.: $150 plus $150 (7), $100 (3), $50 (10), $25 (over 20). Sec.: $250 plus $150 (3), $200 (3), $100 (9), $50 (5), $50 (over 20). Increments: Three at $150 (small el.), $175 (large el.), $175 (small sec.), $200 (large sec.). Vice-prin.: ½ of allowance, ½ of service increments.	E in secondary taking further training $300. $50 per unit Summer School to $300. 100% credit for Commonwealth experience for permanent staff, 50% outside. Moving allowance: single $50 maximum, married $300 maximum. Board contribution to Group Life Insurance.
		EB	4000	6000	10 × 200		
		EA	4500	6785	5 × 285, 4 × 215		
		PC	5000	7750	5 × 310, 5 × 240		
		PB	5500	8765	5 × 335, 6 × 265		
		PA	6000	9830	5 × 360, 7 × 290		
54. Smithers	57	EC	3060	3960	4 × 225	Elem.: $150 (10), $100 (over 10). Elem.-Jr. Sec.: $185 (10). Sec.: $200 (10), $100 (over 10). Vice-prin.: ½.	EC in sec. $300; EB $400; EA $500. For permanent staff: Elem.: $50 per credit to higher cert. up to $300. Sec.: $50 per 3 credits to $100.
		EB	3875	5795	4 × 250, 4 × 230		
		EA	4275	6545	4 × 275, 5 × 234		
		PC	4836	7581	4 × 300, 3 × 400, 3 × 115		
		PB	5300	8500	4 × 300, 3 × 400, 4 × 200		
		PA	5791	9241	4 × 300, 3 × 400, 6 × 175		
55. Burns Lake	50	EC	3100	4000	4 × 225	Elem.: $155 (10), $105 (over 10). Elem.-Jr. Sec.: $195 (10). Sec.: $210 (10), $105 (over 10). Vice-prin.: ½.	E in secondary paid PC scale. $50 per unit up to PA. $155 one-room school.
		EB	3900	6000	7 × 262, 1 × 266		
		EA	4350	6650	8 × 255, 1 × 260		
		PC	4850	7800	10 × 268, 1 × 270		
		PB	5400	8700	12 × 275		
		PA	5800	9400	12 × 276, 1 × 288		
56. Vanderhoof (Arbitration Award)	60	EC	3400			Elem.: $170 (10), $100 (over 10). Elem.-Jr.: $200 (10), $100 (over 10). Sec.: $225 (10), $100 (over 10). Vice-prin.: ½.	
		EB	4000	6000	8 × 250		
		EA	4350	6735	9 × 265		
		PC	4850	7820	11 × 270		
		PB	5400	8700	12 × 275		
		PA	5800	9400	12 × 300		
57. Prince George (Arbitration Award)	348	EC	3100	4000	4 × 225	Elem.: Admin.: 5% of basic salary. Superv.: $125 (10), $75 (10), $50 (over 20). Jr. & Sr. Sec.: Admin.: 10% of basic salary (Sr.), 7½% (Jr.). Superv.: $150 (10), $100 (10), $50 (over 20).	Summer Session: $50 per approved unit.
		EB	3900	6000	7 × 260, 1 × 280		
		EA	4350	6735	9 × 265		
		PC B.Ed.	4950	7920	11 × 270		
		PC	4850	7820	11 × 270		
		PB	5400	8700	11 × 280, 1 × 220		
		PA	5800	9400	12 × 300		
58. McBride	38	EC	3100	4000	4 × 225	Admin.: allowance per teacher including principal $150 (El.), $180 (Jr. Sec.), $200 (Sec.). Increments: Three at $100 (El.), $150 (Jr. Sec.), $200 (Sec.).	E in secondary: $100 (EC) $200 (EB) $300 (EA). $50 per unit up to PA. Full credit for Canadian, the Commonwealth and U.S.A. experience. Consecutive service: $100 per year for three years for permanent staff excluding principals. $200 one-room school.
		EB	3900	6000	7 × 260, 1 × 280		
		EA	4350	6650	8 × 255, 1 × 260		
		PC	4850	7800	10 × 268, 1 × 270		
		PB	5400	8700	12 × 275		
		PA	5200	9400	12 × 276, 1 × 288		

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
59.	Peace River South (Arbitration Award)	221	EC EB EA PC PB PA	4000 3950 4400 4950 5450 5950	5950 6675 7550 8600 9125	4 X 250, 5 X 200 4 X 250, 3 X 225, 3 X 200 4 X 275, 6 X 250 5 X 300, 6 X 275 6 X 300, 5 X 275	Under 10 divisions: $525 (4 rooms), $840 (6 rooms), $1312 (9 rooms). 2 incr. at $105. Over 10 divisions: Elem.: 20%-29% of PC max. Elem.-Jr.: 20%-30% of PB max. Elem.-Sec.: 25%-35% of PA max. Jr.-Sec.: 25%-35% of PA max. Sr.-Sec.: 30%-40% of PA max+$315. Increments: 3 annual ranging from $157 to $236. Vice-prin.: ½ admin., 2 incrs. ranging from $120 to $184.	Permanent EC paid EB2. One-room ungraded schools $225.
60.	Peace River North	136	EC EB EA PC PB PA	3300 4000 4500 5200 5600 6100	4100 6100 7000 8000 8900 9700	4 X 200 6 X 250, 3 X 200 10 X 250 10 X 280 11 X 300 12 X 300	Admin.: 5% of principal's base sal. (El.), 10% (Sec.). Superv.: $150 (10), $100 (over 10). Vice-prin.: ½.	E in secondary $200. Summer Session $50 per unit. Board contribution to Group Life Insurance. $25 month for one-room ungraded schools with 25 pupils.
61.	Greater Victoria (Arbitration Award)	966	EC EB EA PC PB PA	3150 3800 4200 4700 5250 5650	3890 6000 6550 7640 8760 9570	4 X 185 10 X 220 10 X 235 12 X 245 13 X 270 14 X 280	% of PA max. (% of PB max. if certificate is below PB) Teacher Entitlement — Elem. — Jr. Sec. — Sr. Sec. 1-25 — 15-22% — 27% — 33% 26-30 — 23% — 29% — 35% 31-35 — 24% — 31% — 37% 36-40 — 33% — 39% 41-45 — 35% — 41% 46-50 — 37% — 43% 51 and over — 39% — 45% 56 and over — 47% Increments: 3 after scale max. Vice-prin.: ½ allowances, ½ incrs.	E teachers certificated after 1963 restricted to EC0, EB EA7. IA and Vocat.: ½ credit for journeyman experience to 10 years. $150 for special class.
62.	Sooke (based on Arbitration Award in Victoria)	129	EC EB EA PC PB PA	3150 3800 4200 4700 5250 5650	3890 6000 6550 7640 8760 9570	4 X 185 10 X 220 10 X 235 12 X 245 13 X 270 14 X 280	Elem. — Sec. First 4 teachers — $800 — $1000 Next 5, ea. — 80 — 100 Over 9, ea. — 50 — 70 Increments: Three annual increments after permanent appointment. Vice-prin.: ½ allowances, ½ increments after two years.	Beginning teachers limited to EC0, EB4, EA7. E in secondary taking further training next higher scale. $75 per 3 units above EB. IA: ½ credit for journeyman experience up to 10 years. $250 for one-room schools.
63.	Saanich	143	EC EB EA PC PB PA	3200 3700 4200 4700 5200 5700	3440 6100 6600 7580 8560 9340	1 X 240 10 X 240 10 X 240 12 X 240 12 X 280 13 X 280	Elem.: 12% of PC max. + 1% for every 35 pupils. Sec.: 12% of PA min. + 1% of PA max. for every 30 pupils. Increments: Elem.: 3 in alternate years at $150 (3-5 rooms), $200 (6-8 rooms), $250 (over 8). Sec.: 3 in alternate years, 2X$300, 1X$350.	EB or EA in secondary: one increment above scale.
64.	Gulf Islands	26	EC EB EA PC PB PA	3200 3700 4200 4700 5200 5700	4000 6120 6620 7580 8645 9480	5 X 160 11 X 220 11 X 220 12 X 240 13 X 265 14 X 270		E in secondary taking further training PC scale. After 1 year, ½ raise to next higher certificate per 6 units. Educational leave after 3 years.

65. Cowichan (Arbitration Award)	170	EC	3200	3840	4 × 160	Admin.: % of basic salary 7½% (El), 10% (Jr.-Sec.), 12½% (Sr.-Sec.). Superv.: $100 per teacher (8), $50 (above 8). Increments: 3 after scale max. Vice-Prin.: ½.	E in secondary PC scale. $120 per 3 units after July 1, 1965. Group Life Insurance: 50%.
		EB	3750	6000	10 × 225		
		EA	4200	6600	10 × 240		
		PC	4700	7560	11 × 260		
		PB	5275	8635	12 × 280		
		PA	5750	9410	12 × 305		
		PA Mas.	5950	9610	12 × 305		
66. Lake Cowichan (based on Arbitration Award in Cowichan)	62	EC	3350	3990	4 × 160	Schools above 5 teachers: % of max. salary, EA (El.), PA (Sec.). 11% plus 1% per teacher. Five incr. of 1%. Vice-prin.: ½.	E in sec., 2 incr. above scale. E teachers certificated after 1962 restricted to EC0, EB4, EA7. $90 per three units after perm. certification. Payment limited to three years EB, EA; five years PC, PB. Outside experience equal to Dept. recognized credit plus one year for each year in the district to scale max.
		EB	3900	6150	10 × 225		
		EA	4350	6750	10 × 240		
		PC	4850	7710	11 × 260		
		PB	5425	8785	12 × 280		
		PA	5900	9560	12 × 305		
		PA Mas.	6100	9760	12 × 305		
67. Ladysmith (Arbitration Award)	83	EC	3320			Elem.: 8 or more teachers: 20% of PC max. plus 1% per teacher supervised. Sec.: 25% of PA max. plus ½% per teacher supervised. Vice-prin.: ½.	E in secondary: PC less $300 (EC), $200(EB), $100(EA) to $400 above scale maximum. Permanent 2nd class paid EB to 7th step. $75 to $100 per 3 units towards next certification. $250 for Special Class, $300 for Occupational Class. $200 for 2 grades in one division. Board contribution to Group Life Insurance.
		EB	3750	6050	10 × 230		
		EA	4240	6640	10 × 240		
		PC	4775	7475	10 × 270		
		PB	5300	8490	11 × 290		
		PA	5800	9265	11 × 315		
68. Nanaimo (Arbitration Award)	294	EC	3150	3890	4 × 185	Eight or more classrooms. Admin.: $600 (El.), $1000 (Sec.). Supervision: $100 (8), $50 (over 8). Increments: Four annual at $175. Vice-prin.: ½ admin. and superv. Four increments at $100.	E in sec. taking further training, next higher scale, otherwise $300. EB teachers certificated after September, 1964 restricted to EB4. Full credit for experience in Canada. $100 for one-room school.
		EB	3800	6000	10 × 220		
		EA	4200	6550	10 × 235		
		PC	4700	7640	12 × 245		
		PB	5250	8760	13 × 270		
		PA	5650	9570	14 × 280		
		PA Mas.	5850	9770	14 × 280		
69. Qualicum (Arbitration Award)	57	EC	3200	3900	4 × 175	Admin.: $250 (El.), $675 (El.-Jr. Sec.), $795 (El.-Sr. Sec.). Superv.: Elem.: $75 per teacher. Sec.: $100 (8), $50 (over 8). Increments: Sec. four at $150. Vice-prin.: ½ admin. and superv.	E in sec. $300. $90 per 3 units advanced study.
		EB	3800	6050	10 × 225		
		EA	4200	6550	10 × 235		
		PC	4725	7625	10 × 260, 2 × 150		
		PB	5250	8685	11 × 285, 2 × 150		
		PA	5700	9410	11 × 310, 2 × 150		
70. Alberni (Arbitration Award)	240	EC	3300	4000	4 × 175	% of max. sal., EA or prin's. scale, whichever higher (El.), PA (Sec.). Elem.: 4-9 tchrs., 12%; over 9, 18%; plus 1% per tchr. Jr. H.: 1-5 tchrs., 20%; over 5, 25%; plus ½% per tchr. Sr. H.: 30% plus ½% per tchr. Vice-prin.: approx. 50% (El.); approx. 55% (Sec.).	E in sec., taking further training, next higher scale. Full credit for Commonwealth experience for perm. staff.
		EB	3900	6100	10 × 220		
		EA	4350	6700	10 × 235		
		PC	4850	7655	11 × 255		
		PB	5350	8710	12 × 280		
		PA	5840	9500	12 × 305		

DISTRICT No.	Name	No. of Teachers	Category	Min.	Max.	Increments	Principals' Allowances, Larger Schools	Remarks
71.	Courtenay	182	EC	3200	3840	4 X 160	% of PB max. salary.	E teachers certificated after 1962 restricted to EC0, EB4, EA7.
			EB	3750	5950	10 X 220	Superv.: 3% (3), 2% (4), 1% (5), ½% (over 12).	
	(Arbitration Award)		EA	4200	6500	10 X 230	Admin.: El.: 20% of superv. Sec.: 45% of superv.	E in sec., scale position + $300.
			PC	4700	7505	11 X 255	Vice-prin.: ½.	$200 for 6 units advanced study or equivalent, after perm. appt.
			PB	5285	8645	12 X 280		
			PA	5750	9410	12 X 305		
72.	Campbell River	135	EC	3406	4075	3 X 223	Set amount for each school. (Details available from Federation Office.)	E in sec. taking further training $200.
			EB	3814	6103	10 X 228.90	Increments: (6 or more teachers) three annual at $200 (El.), $225 (El.-Sec.), $250 (Sec.).	
			EA	4277	6675	10 X 239.80		
			PC	4795	7611	11 X 256		
			PB	5367	8701	12 X 277.83		
			PA	5994	9960	13 X 305.08		
75.	Mission	108	EC	3200	3600	2 X 200	Elem.: Admin.: 5% of basic salary.	$100 per 3 units for E teachers with 7 or under years' experience. The 6 units prior to higher certification are excepted.
			EB	3800	5800	10 X 200	Superv.: % of PC max. 2% (6), 1% (6), ½% (over 12).	
	(Arbitration Award)		EA	4200	6500	10 X 230	Sec.: % of PA max. 3% (4), 2% (3), 1½% (3), 1% (10), ½% (over 20). 90% of above allowance paid first year, 95% second year, 100% succeeding years.	$200 for one-room school.
			PC	4725	7475	11 X 250		
			PB	5250	8610	12 X 280		
			PA	5700	9300	12 X 300	Vice-prin.: ½.	
76.	Agassiz	34	EC	3400	3700	2 X 150	$208 (8), $104 (over 8, principal excld.)	Those ineligible for EB permanent paid EB to 5th step.
			EB	3800	5800	10 X 200	Vice-prin.: ½.	$40 per unit advanced study.
			EA	4320	6520	10 X 220		$150 for one-room schools.
			PC	4850	7350	10 X 250		Board contribution to Group Life Insurance.
			PB	5365	8610	11 X 295		
			PA	5755	9355	12 X 300		
			PA Mas.	5955	9555	12 X 300		
77.	Summerland	47	EC	3360			20% to 30% of basic salary.	E in sec., next higher scale to max. for cert. held. Perm. 2nd Class paid EB to 7th step.
			EB	3730	5820	11 X 190	Vice-prin.: ½.	
			EA	4152	6495	11 X 213		
	(Arbitration Award)		PC	4725	7420	11 X 245		
			PB	5250	8550	11 X 300		
			PA	5775	9240	11 X 315		
78.	Enderby	35	EC	3200	3800	5 X 120	Elem.-Sec. (combined 401-600 pupils), 25% PB max., two increments of 5% PB max.	E in sec., next higher scale to one incr. under max. Perm. 2nd Class paid EB to 7th step.
			EB	3300	5900	10 X 210		
			EA	4300	6600	10 X 230		$75 per 3 units to higher cert. above EB, marks over 60%.
	(Arbitration Award)		PC	4800	7550	11 X 250	Vice-prin.: Elem.: 12½%-15% of EA max.	
			PB	5300	8600	11 X 300		$150 for one-room schools.
			PA	5800	9265	11 X 315	Sec.: 12½%-15% of PB max.	
79.	Ucluelet-Tofino	20	EC	3400	4200	4 X 200	Elem.: $180 per teacher (incldg. prin.).	E in secondary $200.
			EB	4100	6400	10 X 230	Sec.: $250 per teacher (incldg. prin.).	Permanent second Class paid EB to 5th step.
			EA	4600	6950	10 X 235		
	(Arbitration Award)		PC	5100	7850	11 X 250		Summer School $100 per 3 units.
			PB	5600	8840	12 X 270		
			PA	6000	9600	12 X 300		
80.	Kitimat	86	EC	3410	4090	4 X 170	% of PA max.	$50 per approved unit of Summer School.
			EB	4100	5900	4 X 260, 4 X 190	Elem.: 13% (up to 10 rooms), 18% (10-18 rooms), 23% (19 or over).	
			EA	4600	6935	5 X 295, 4 X 215	Sec.: 30%.	
	(Arbitration Award)		PC	5100	7850	5 X 310, 5 X 240	Increments: 2 at 2.75%.	
			PB	5600	8975	5 X 345, 6 X 275	Vice-prin.: Elem. ½; Sec. 3/5.	
			PA	6100	9930	5 X 360, 7 X 290		

81. Fort Nelson (Arbitration Award)	24	EC EB EA PC PB PA	3300 4000 4500 5200 5600 6100	4100 6100 7000 8000 8900 9700	4 × 200 6 × 250, 3 × 200 10 × 250 10 × 280 11 × 300 12 × 300	Elem.: (6 rooms) $900. Elem.-Sec.: $1700. Increments: 2 at $100.	Plus northern allowance of $500 to $600. E in secondary $400. $250 for one-room school.
82. Chilcotin	10	EC EB EA PC PB PA	As Williams Lake S.D. No. 27				
83. Portage Mountain	12	EC EB EA PC PB PA	3300 3900 4500 5000 5400 5700	4100 5200 6750 8000 8900 9700	4 × 200 5 × 200, 3 × 100 9 × 250 10 × 300 4 × 350, 7 × 300 5 × 400, 6 × 300, 1 × 200	Elem.-Sec.: $600 admin. plus $150 per teacher (10); $100 per teacher (over 10). Increments: 2 at $100. Vice-prin.: approx. ½.	Hudson Hope differential of $300 additional salary for teachers.
85. Vancouver Island North (replacing No. 73 Alert Bay and No. 74 Quatsino)	73	EC EB EA PC PB PA	3700 4300 4800 5300 5800 6200	4300 6400 7200 8000 8800 9500	3 × 200 5 × 300, 2 × 200 6 × 300, 3 × 200 7 × 300, 3 × 200 8 × 300, 3 × 200 9 × 300, 3 × 200	% of max. EB (Elem.) PB (Elem.-Sec.). 7% (1), 3% (1), 2% (8), 1% (each teacher over 10). Increments: 10% of allowance after two years. Vice-prin.: ½.	No reduction in salary for any teacher currently employed in District No. 73 or No. 74. E in Sec.—next higher scale of 75% of time in Sec. Lower percentage if less than 75% time in Sec. Full credit for Commonwealth experience. $50 per unit towards higher certificate. $300 for one-room school.
University Hill	23	EC EB EA PC PB PA	3000 3950 4300 4700 5200 5700	5960 6460 7700 8680 9600	6 × 205, 4 × 195 6 × 220, 4 × 210 6 × 255, 6 × 245 6 × 295, 6 × 285 6 × 330, 6 × 320	Elem.: PC 11 + $1700. Sec.: PA max. + $3200. Vice-prin.: approx. ½.	For teachers certificated after 1962, EB cut off at 4th step, EA at 7th. Last PC increment for B.Ed. only.
Tahsis	7	EB EA PC PB PA	4380 4710 5350 5680 6200	7380 7710 8860 9505 10070	8 × 375 8 × 375 9 × 390 9 × 425 9 × 430	14% of max. salary of cert. held. Increments: two after scale max.	E in secondary PC scale. $50 per unit to higher certification. Full credit for experience in Canada. $200 3rd year, $300 4th year, $400 5th year, $500 6th year. Travel allowance.

Commercial Fishing in B.C.

Continued from page 294

vessels, lie off Alaska. All told, these various areas yield more than 60% of the world's annual halibut catch. British Columbia fishermen share this rich fishery with United States vessels and an international commission regulates operations so that the grounds are not overfished. Before the establishment of this commission under a treaty between Canada and the United States, the halibut stocks were becoming depleted as a result of uncontrolled exploitation. Regulations of the commission have helped restore the stocks of halibut on the grounds to the point where large catches are again being made. In 1962, B.C. fishermen landed almost 35 million pounds at Canadian and United States ports with a record market value of nearly $12.5 million. Of those landings, 10 million pounds were delivered to United States ports by Canadian boats.

The trawl fishery for sole and grey and ling cod has been maintained at a fairly constant level over the past number of years and a small but efficient fleet of trawlers and draggers brings in steady supplies of soles and many other varieties of small flat fish. These species form the basis of a growing output of frozen fillets of fish.

The tuna fishery, which at one time during the late part of the 1940's was a major fishery in the province, has practically disappeared as far as the troll operation off Canada's west coast is concerned, although there are indications that an off-shore seine fishery might develop. However, quantities of imported tuna are canned in the off-season by canneries in British Columbia.

Shellfish

In recent years, shellfish have become of increasing importance to B.C. fishermen. Production figures show that during the period 1960-63, the marketed value of crab and shrimp averaged $1.5 million. Shrimp and crab are sold as shucked meat, either in the fresh or frozen state, or are canned. Most of the shrimp is taken by trawlers in the southern areas of British Columbia, while crabs are caught for the most part by traps.

In 1963, oyster production contributed $781,000 to the B.C. market total, while clams have shown wide fluctuation in marketings, ranging in value from $200,000 to $600,000 each year.

Meal and Oil Productions

The meal and industrial oil production in British Columbia has shown considerable variation from year to year as market prices have fluctuated and production has been affected by these returns. Only one company conducts a whaling operation in British Columbia. This company has its plant operation at the northern tip of Vancouver Island. □

Quotes and comments

VITO CIANCI

The Laugh of the Mouth

IN ONE OF IVOR BROWN'S BOOKS on words and language I came across this item:

'*Skole* was originally the Greek for leisure, but since the Greeks regarded education as a pleasant and easy way of spending time, the word was transferred from a period of agreeable activity to a period, and then to a place, of instruction. It must be surprising to school children today to learn that they are going to school for leisurely recreation.'

The laugh would come from the teachers, I think, and it would be a rueful one. The pursuit of leisurely and educational recreation is about the last thing in the world we teachers are concerned with.

Somehow I don't think the students would be as surprised as Brown indicates. A lot of them have come to this conclusion by themselves, and any observant teacher will be aware of the fact that many of his students are using the school as a minor sort of country club where they spend a number of hours a day in agreeable social intercourse with their fellow club members. I have in my own class at least two honest individuals who have told me that the only reason they continue in school is because it's more fun than looking for a job.

For the rest, as for the teachers, the idea of leisurely pursuit of education these days must appear as a wry joke.

It might be a profitable project for someone to take time out from the frenzied activities connected with curriculum changes and expanded programs to do a little study on the matter of the purpose of education.

I know all about the many such studies already done on this topic, but they don't really get at the root of the matter. What I have in mind is something along the lines suggested by this quotation from one of Clifton Fadiman's essays:

'Should a child be educated so that he may become a liberated human being, it being understood that there is a danger of his throwing a monkey wrench into the social machinery? Or should he be educated to become a self-adjusting part of the social machinery?'

If we accept the old Greek idea of a *skole*, then the former notion will be realized. This could be an interesting development.

If we substitute 'trained' for 'educated' in the latter part of the quotation, we describe fairly accurately what is going on now. Which do we want? □

a matter of Opinion

Neither Highbrows nor Lowbrows

A reply to Frank Wilson's article in our February issue

JACK SHADBOLT

FRANK WILSON'S ARTICLE 'The Highbrows Must Go,' appearing in the context of a teachers' magazine, reveals a fundamental confusion in educational aims today. Administrators, faced with the huge problem of providing every person with his democratic right to a basic education, have lost their sense of proportion. Surely an equally demanding obligation is to ensure somewhere a challenge to the mind that will effectively offset our society's tendency to become a vast, undifferentiated lump of conformity, the easy prey of brainwashers and propagandists whom Wilson wrongly thinks exist in art when, in fact, it is the arts that are providing the only serious confrontation.

In his understandable irritation at certain aspects of our culture thirst, Wilson thinks he is fighting a battle for democracy; in reality, however, his thinking only feeds popular prejudice. It does not open up a critical attitude but encourages intolerance of all that is above the level of easy and obvious delight. In the name of fighting dictated taste, he is dictating in the precise terms that Hitler once used or that breed Russia's suppression of idiosyncrasy.

How satisfying it is to bandy about epithets like 'highbrow' or 'egghead' as though it were a crime to use the greatest human achievement, imagination. Is Wilson then, by his own yardstick, a 'lowbrow'? We have far more to fear from lowbrowism than its reverse. A good example is the film version of 'My Fair Lady,' which, I agree, high and lowbrow alike enjoy. Some lowbrow, with his typical thirst to appeal to the greatest box-office and his typical aping of the highbrow, decided to substitute the elegance of Audrey Hepburn's aristocratic look for the naturalness of Julie Andrews, which any highbrow would have recognized as the most valuable part of the role, especially doing away with the artificial device of dubbing in a singer's voice for a non-singing actress. Lowbrows can be in high places and snobs in low places. The point of a democracy is that there are no high and lowbrows, so why not drop such terms? All we are actually discussing is the fact that some levels of art are more difficult to comprehend, at first, than others—not that one is art and the other non-art.

A folk ballad is easy but Schonberg is not. Robbie Burns presents no problems but who reads Milton (or, for that matter, that 'popular' artist, Shakespeare)? A poster is not difficult to comprehend because it is deliberately aimed at a specific appeal, but a private painting may deal with a more complex area of human experience. Mozart's 'Marriage of Figaro' certainly is marvellous and it is easy to get at; but does that rule out Chinese music as being also a great art, merely because we wouldn't understand it until we got used to it?

Wilson is fond of talking about the mythical 'they' who are trying to brainwash him into accepting what he really thinks is horrible. As far as I can see, everyone is free to choose. There is an infinite variety of things to choose from; one can take or leave. The world has never been so rich in the variety of interesting ideas in art, as in everything else, offered for the enjoyment of anyone who cares to investigate. What Wilson secretly resents, of course, is having to make up his own mind about which things he feels are important to his feeling in touch with the world. So instead of letting things work on him he dismisses them as 'silly games' and 'hopes they will go away' if he doesn't look. He enjoys his own tantrums like a petulant child. He yearns for the great past of 'the Greeks, the Romans, the Egyptians' who had fixed canons of beauty (and he ludicrously allows Picasso to speak for him who, of all artists he could choose, is most reviled as a highbrow).

I wonder if Wilson ever considered that the great mass of common citizens in those civilizations had no choice whatsoever in the art they were given, being mostly slaves and altogether brainwashed by church and state. Is that what Wilson wants? Would he nostalgically turn his back and undo democracy? He wants it both

The author, a well-known artist, teaches in Vancouver School of Art.

ways—to have the fixed values of 'beauty' all determined for him and yet retain his present-day, hard-won, democratic right to open his critical mouth. If he wants democracy, he has to take what goes with it—individualism and the obligations as well as the rights of free choice—not just his own but other people's, too. A great triumph of our era is the realization that there are as many kinds of art as there are kinds of people, all the way from hootenanies to pop art—and as human experience they are fascinating. Some people, as Adlai Stevenson said about some nations, 'have to be dragged kicking and screaming into the 20th century.'

Would Wilson object to the 'pure' mathematician? Who could be more highbrow or egghead? Yet we know that out of his seemingly incomprehensible doodling comes the computer or the better hi-fi set on which Wilson listens to George Gershwin.

I'm sure Wilson won't deny the computer a place. Yet he is the first to condemn a composer like John Cage for the natural interest of a highly intelligent mind in experimenting with the use of such machines in music. Is music fixed forever? Since our whole present world is gripped by a vast random complexity, is it not natural to explore this 'random' factor and use it as a form? Or do we sit and become the sour-tempered victims of it?

Good art is lasting says Wilson. Sure it is, by hindsight. But how did we know at the time what would last? Wilson is sure: he trots out examples like Gershwin's music or Andrew Wyeth's painting. Granting his premise, does that rule out non-objective abstraction, for example, which has permanently changed the face of art? After all, *Uncle Tom's Cabin* has lasted, but does anyone take it too seriously as art? The question really doesn't matter. Uncle Tom is a social fact, kept alive by events. But does this standard rule out Faulkner, who also treated the South, because his style is too difficult for the ordinary reader? Will he not also last and still move us when Uncle Tom just looks quaint?

Great art is courteous and considerate to its public by making formal arrangements of its material, according to Wilson. Does he recall that John Ruskin accused Whistler, at the time, of 'flinging a pot of paint in the public's face' and that Whistler is now a standard popular favorite while Ruskin is barely read? We see Whistler's 'form' by looking back. It was the same Ruskin who stated with such confidence that in Europe alone 'pure and precious ancient art exists, for there is none in America, none in Asia, none in Africa.'

Has Wilson ever asked himself who are the patrons today of the art he is most ready to call highbrow? Ninety percent of them are businessmen, industrialists and students. If these are all highbrows, the term has no meaning. He confuses, too, the popularizing distribution systems of art with the creators who produce it. Anyone rightly may object to the peddling of art and the consequent commercial establishment of snob appeals for advertising, but why blame these on the artists who are too concerned to get on with their work to care about obviously pleasing or not pleasing. They are the first to deplore the system but they alone can't fight the world.

Put the snob label where it belongs: it is the general public who, in a desperation for identity, resort to the unconscious snobbism of pulling everything they can't understand down to their level. One can respect the fear that prompts this reaction; but thank God we have individualists who resist it—who get on with quality at any cost. We need every single penetrating creator we can lay hands on if we are to avoid the dead-level, killing monotony of taste that Wilson's criteria would soon bring about.

And here Wilson creates more confusion by equating quality with the outward appearance of skill. In a world where machine technology everywhere proliferates the antiseptic notion of streamlined perfection, it is doubly important to challenge that canon of sterility—that because it merely looks difficult to achieve or because it comes efficiently packaged, it is therefore of value. As a matter of truth, modern technique in art is fabulously immaculate when it chooses to be, but is it not also significant to lay the stress on lyrical vitality — on aspects the machine cannot achieve, and to restore simplicity as a value? Our skill and cleverness alone have proved to be hollow mannerisms.

What all Wilson's fuss seems to be about is a few individual artists at the very tip of the iceberg of art that sticks above the general level, for there probably has never been a period when art is so much a part of the people as it is today. What about the millions of ways that art penetrates our everyday life—the design of our refrigerators, automobiles, our neckties, the attractive look of our magazines, the beautiful colors available in our well-designed clothes, comfortable houses to live in? Art is everywhere. But, as with all big organisms, it needs some experimental heart to keep pumping new concepts into the whole to prevent it from atrophy. The avante garde provides just that.

Don't let any artistic moron try to 'please' me. Every traveling salesman and television huckster tries to do that. Let him do the best he can as he sees it; I'll decide whether I want an artist's vision or not. And I don't want his vision watered down to be agreeable. That insults my intelligence.

And, incidentally, I would like to think that a publication called *The B.C. Teacher*, supposedly devoted to a standard of education, could be distinguished in appearance from any drab trade journal.

Or am I being highbrow? □

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new Books

C. D. NELSON, Book Review Editor.

Animal Photoperiodism, by Stanley D. Beck. Holt, Rinehart and Winston, New York. $1.40

Although it deals with a very narrow topic, this book would be valuable as a source book for the teacher or student of biology. Photoperiodism is defined and each major animal class is treated separately. The remainder of the book deals with biological clocks and the ecological and evolutionary significance of photoperiodism.—R. L. Tortorelli.

The Pye Book of Science. Ed. Maurice Rickards. Longacres Press and Pye Ltd., London. (Can. Agt. Ambassador Press, Toronto) Illus. $5.50

Interested in carbon dating of fossils, how to make a 'Hovercraft' or 'spare parts for humans'? These and many other exciting topics of science for today and tomorrow are in this 150-page volume. Written especially for modern youngsters and their parents, it gives a wide-angle view of the outstanding research and inventions of the last few years. With numerous photographs, diagrams and vignettes, this interesting book answers thousands of the questions asked by science students informed in the fields of modern technology. Read about the dictionary of 55,000 words that is no larger than a dinner plate or about a furnace that heats up to 3200° centigrade in less than one second. All this information can be yours in *The Pye Book of Science.*
—V. L. Chapman

Radiation, Genes and Man, by B. Wallace and Th. Dobzhansky. Holt, Rinehart and Winston, New York. $1.40

The biology teacher will find this a valuable source of material when dealing with genetics. Its ample illustrations and readable style make the book a good source of enrichment for the better biology student at the Grade 12 or 13 level.

The chapters are concerned mainly with the genetic damage to man resulting from radiation, heredity and mutations, population dynamics and the effect of radiation on the ecological structure of the human population.— R. L. Tortorelli

Matter and Energy — Notes for Teachers, by J. MacLachlan and K. G. McNeill. Clarke, Irwin, Toronto. $1.50

Notes for Teachers is a new handbook to accompany a senior physics text, *Matter and Energy,* by the same authors.

Teachers using the text will find the handbook useful since it contains: (a) 152 test items of multiple-choice nature, (b) A topical outline with 140 divisions, each sufficient for one lesson period. The lessons essential to an understanding of basic physics have been starred. For each topic the text pages, minimum homework assignments and supplementary assignments have been listed, (c) Lesson plans for the starred topics. These plans have the key points italicized and also contain supplementary material which a teacher can use as he sees fit.

The authors' statement of philosophy of teaching physics runs somewhat parallel to that of the promoters of the PSSC physics course. They point out that in science one does not 'get all the facts'; that a desirable outcome of the course would be an 'increasing competence in the process of enquiry.' To this end they have proposed that much experimental work be done.

Teachers using the text will find the handbook well worth its price.
—V. L. Chapman

Biological Sciences: an Inquiry into Life and *Student Laboratory Guide.* Harcourt, Brace and World, 1963. (Can. Agt. Longmans, Don Mills) No price given.

These companion volumes represent one of the three curricula prepared by the Biological Sciences Curriculum Study (BSCS) and supported by the National Science Foundation.

The two fundamental concepts in all three curricula are: (1) that since biological information increases fivefold each generation, one cannot 'cover' all the facts; hence it would be more profitable to emphasize the processes of investigation and the history of scientific ideas; (2) that for a student to understand and respect scientific processes, he must participate in their use.

The Yellow Version (as this course has been dubbed) is intended to present the whole field of biology without prejudice to any one part. To achieve this, three divisions were made, viz., Unity, Diversity and Continuity. Cells and their chemistry are studied under Unity, micro-organisms, plants, animals and their general behavior are considered under Diversity and genetics, inheritance, evolution and ecology are treated under Continuity.

The Laboratory Guide has a wealth of experiments (90 in all) which vary from the very simple to the very difficult. Teachers will find in these exercises a welcome relief from the ever-present copying of textbook diagrams for students will be faced with answering questions, making tables of data, recording the data and preparing diagrams.

The textbook is intended to be a supplementary source of information for the course. For this purpose it is probably one of the greatest compendiums of up-to-date biological information ever assembled for high school students. It should not be inferred, however, that the text will supplant the many good texts now available in the fields of botany, zoology, physiology, etc. In fact, it may be necessary for the student to consult outside sources of information, and it is desirable that he learn to do so.
—V. L. Chapman

Ours is the Earth, by Allan A. Sollers. Holt, Rinehart and Winston, 1963. $1.40

This book was written to provide a knowledge of how to take care of the earth so that it may continue to provide for its population. In so doing, it stresses the basic interdependence of the natural resources and includes discussion of water, soil, forests, rangelands, wildlife and minerals. In the final chapters present and future conservation practices are described and evaluated.—R. L. Tortorelli

Our Animal Resources, by Frederick L. Fitzpatrick. Holt, Rinehart and Winston, New York, 1963. $1.40

An excellent, informative text which deals with the animals and the use man makes of them. Scientifically, yet simply written for students of the junior secondary level, the book discusses in an interesting manner foods and materials derived from animals the world over. Good illustrations and diagrams help to explain the biological aspects of the simple animals. For the teacher of biology or agriculture it is an excellent source of useful material. It is also a valuable source of supplementary material for the student interested in the close relationship between animals and man.—R. L. Tortorelli

Satellite Tracking Facilities, by Shirley Thomas. Holt, Rinehart and Winston, New York, 1963. $1.40

This book gives a thorough account of the history and the operation of the satellite tracking facilities associated with the United States Space Program. It is an interesting book, although in places it may become somewhat confusing because of the many code names used. The explanations of how the systems work and why they were designed are good.
—R. L. Tortorelli

Transfer Opportunities

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Teachers presently employed in the British Columbia School system are invited to investigate the possibility of teaching on transfer with the Indian Affairs Branch while remaining on staff with their present board.

For Further Information:

Consult your local Superintendent of Schools or write to the nearest District Superintendent of Indian Schools:

1. **Mr. J. C. Lawrance,** Room 2, 326 Howe Street, Vancouver, B.C.
2. **Mr. V. Janzen,** Federal Building, 60 Front Street, Nanaimo, B.C.
3. **Mr. J. D. MacDonald,** Indian Agency, 317 Seymour Street, West, Kamloops, B.C.
4. **Mr. J. E. Ingot,** Box 912, Prince George, B.C.
5. **Dr. C. E. Johnson,** Federal Building, Prince Rupert, B.C.

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Vancouver, B.C.

across the Desk

Periodicals for Elementary Schools

Vancouver, B.C.

The Editor,
Dear Sir:

I noted the absence of two very basic and necessary references in your list of suggested periodicals for an elementary school (February, 1965) and therefore would recommend the following for inclusion:

1. *The Instructor*—$6.00 m (S-Je) F. A. Owen Publishing Company, Instructor Park, N.Y., U.S.A.

2. A reference in the area of physical education. Whereas this is likely the most poorly taught and ill-prepared subject in the elementary school curriculum, a basic reference for the elementary school teacher would seem indispensable. There are several possibilities in this area; however, I would strongly recommend the following as being the most appropriate source for elementary school teachers:

The Physical Educator – $3.00 (Mar-M-O-D) Phi Epsilon Kappa Fraternity, 3747 North Linwood Avenue, Indianapolis, Ind. 46218.

Yours very truly,
C. GARY PENNINGTON,
Assistant Professor,
Faculty of Education, UBC

A Link with Home

Ludford, Lincoln,
Lincs., England.

The Editor,
Dear Sir:

Just a note of thanks for *The B.C. Teacher* magazine which you send every month. I enjoy the contact with home and the worthwhile material in the magazine.

My English colleagues quite enjoy it too. I don't think they really believe it is a fit publication for teachers—it is much too well laid out! They content themselves with a newspaper publication.

They especially find the cover and story interesting.

Sincerely yours,
A. W. LEWIS
Kamloops, B.C.

How Do We Do It, Mr. Snowsell?

Brentwood Bay, B.C.

The Editor,
Dear Sir:

As I read through the list in your January issue of what a secondary teacher wants an elementary graduate to know, I began to wonder whether your contributor had ever taught in elementary school—and, if so, how long ago! It is at last beginning to dawn that elementary education is at least as important as secondary or university in laying the foundations of good character, good citizenship and good scholarship. Seven years are now spent by our young citizens in elementary, to which an eighth year may yet be added in the shape of kindergarten, yet elementary is truly the Cinderella of the three levels—not that I wish to represent secondary and university as the ugly sisters.

Perhaps space did not allow Mr. Snowsell to offer a word to elementary teachers as to how, in present circumstances, his desired outcomes may be achieved. Universities and secondary schools have been obtaining increasing handouts in the way of extra funds to help meet the demands of modern education, but so far little or nothing has been heard of for elementary. Grade 7, for example, might never have been relegated to elementary school insofar as any extra provision is concerned for these youngsters, library being just one instance.

A reduction from 40 to 37 pupils in the basic formula for teacher entitlement is the only concession so far experienced at the elementary level since the Chant Report, 1960. With overfull classrooms, and so many of these condemned to split grades in elementary, it is past time that educators came down out of the clouds to start over again at the ground level. Neither the outcomes, which we all desire, nor the additional teachers are likely to be forthcoming as things are.

Yours sincerely,
G. GARDNER.

On Saving School Time

Nanaimo, B.C.

The Editor,
Dear Sir:

As a new member of the BCTF I should like to congratulate the organization on a courageous, forward step—one which will surely reclaim minutes of valuable school time for teaching subjects relevant to our scientific age. I refer, of course, to last year's Resolution 12, recommending that religious exercises be discontinued in our schools. Such farsighted thinking opens up fascinating possibilities for the future.

Might I suggest that our next goal should be the elimination of the Easter vacation. The additional teaching hours saved here would

Continued on page 321

NOTICE

Our next issue will be May-June, and will be mailed June 3.

Across the Desk

Continued from page 319

be really significant. Besides, only a few students are aware of the importance of this old Christian observance and it is hardly democratic to favor them if, for instance, our Hindu pupils are deprived of their holidays.

The same argument, unfortunately, would not apply to the Christmas period, since this festival has changed in nature and become a consumer orgy, essential to our whole economy. Easter, after all, serves only the candy trade!

For those who require a spring break, a long weekend might be arranged in April to celebrate Founder's day. Each school board could select its own Founder to venerate, with Premier Bennett as an obvious and safe choice. Naturally, in Nanaimo, Easter would become 'Douglas Day.'

Another exciting resolution could call for the elimination of the classics from our curriculum. It is claimed that the Bible is great literature, but the book is archaic and irrelevant in our modern world. So are Shakespeare, Milton and other writers. Not only is their English out of date but they are so laced with Biblical references that one without the other is impossible to appreciate. Since most of the worth-while sayings from these works have been incorporated into general usage, a specific study of source material is just another waste of time.

Finally, I would congratulate our curriculum planners on leaving Jesus, Paul and other religious leaders out of our social studies. It is clearly their view that world history has been formed by such famous men as Khufu, Hannibal, Themistocles, Ashurbanipal and others, whose names are faithfully memorized by every Grade 7 student. The influence of Christ, Mohammed and Buddha has been masterfully covered up, and in due course we hope that our B.C. children will learn to discount their Christian heritage and see our culture as one based firmly on science and materialism.

Along with my fellow BCTF members I look forward to the time when the last vestige of religion is hounded from our schools. Then the day will start in an orderly manner by playing the current national anthem and repeating a brief chorus of loyalty to the economic system in vogue, and weekends, of course, will fall in the middle of the week so that children can boost our economy by unrestricted spending in the stores.

Resolution 12 is a stirring start. Onward and God speed!

Yours truly,
W. H. MCKAY.

New Perspectives and Leadership

Langley, B.C.

The Editor,
Dear Sir:

The John Arnett article in the February 27 issue of the *Vancouver Sun* has crystallized a couple of related issues in my thinking. The article suggests very strongly that the fresh perspectives on our educational system which resulted from Mr. Ovans' ILO stay in Europe made him very uneasy about the changing scene in B.C. I sincerely hope that his uneasiness is shared by many members of the BCTF.

Another area of remote concern to all teachers is the subject of sabbatical leave. If Mr. Ovans can create a counter-revolution with a seven-month leave of absence, I wonder about the consequences of providing ALL our professional staff with a like opportunity. Surely this staff has been chosen because of proven ability to aid the cause of education in B.C. Those of us who know them are aware of the absolute dedication that exists in all aspects of their work with all BCTF members. If we, as teachers, can with straight faces request sabbatical leave, I seriously suggest that these people deserve it far more than almost any teacher. The benefits that might result far outweigh the insignificant cost of such a program.

The staff of our BCTF headquarters are in a far better position to provide educational leadership than any teacher. The existing power structure gives undue authority to government-appointed experts. All I am suggesting is that we have the people who can provide a counter-balance. We may even force the government to provide for similar leave for its professional staff. By the end of this century our turn might come.

Sincerely,
JIM CLARK

Teachers — the Directors of Learning?

Victoria, B.C.

The Editor,
Dear Sir:

On Friday, February 26, the Victoria *Daily Times* carried on its second front page a report on our General Secretary's speech to 1000 teachers in convention at Sidney.

We could wish that concern regarding the vital issue so ably presented and so well reported had received front-page prominence. We should like to think, however, that *The B.C. Teacher* plans to carry the speech to its readers.

Mr. Ovans is quoted as saying: 'Teachers will be directors of learning, not the source.' Is it simply too preposterous to suggest that an invitation be extended to teachers to itemize, rather than to try to take time out to write articles upon, actual or imagined situations that would bring to specific and exciting focus Mr. Ovans' cogent statement?

Yours sincerely,
ERIC H. WHITTINGHAM

What is the Role of Art?

Vancouver, B.C.

The Editor,
Dear Sir:

Mr. Wilson's opinion of art is more a 'nobrow' than a 'lowbrow' view. This whole tedious argument simply deals in half-truths. To refute his many irresponsible statements would take a reply as lengthy as his 'opinion'—however

let us just look at the first paragraph.

'The time has come for the . . . "squares" to resume possession of the arts.'

Let us be honest, the 'lowbrows' never had possession of the arts. Cave drawings were magic symbols done for a select few. Religious art in the Renaissance was produced for rich and cultured patrons who could afford to commission the artist. The gap between lowbrow and highbrow is no better illustrated than when Ghiberti's bronze doors for the Baptistery in Florence were installed and celebrated by a holiday. This was a signal for the lowbrows to have a kind of Grey Cup celebration with little or no understanding of the artistic and religious event taking place.

The '"highbrows" have perverted the arts' . . . Do the highbrows encourage paintings on velvet or the square miles of poor realistic or abstract paintings that the lowbrow purchases in his confused attempts at status-seeking?

. . . 'arts . . . a source of pure enjoyment' . . . Were Goya's savage visual attacks on the corrupt State and Church a 'source of pure enjoyment,' or to use another of Mr. Wilson's criteria, 'a pleasurable end result'? Had Grosz no right to illustrate the viciousness of the Nazis or Hogarth the immorality of the age he lived in? Surely the duty of art is to try to organize and communicate all of mankind's rich and confusing experience. The role of art Mr. Wilson subscribes to is pollyannish and limiting.

No one would deny Wyeth his niche in the structure of art, but only an insensitive person would deny Picasso's integrity. Also the 'gracious, intelligible and serene qualities' which Mr. Wilson deems essential in art are as evident in an abstraction by Mondrian as they are in a portrait by Rembrandt.

The only difference between a so-called 'square' and a so-called 'highbrow' is usually education and a reservation put upon uninformed judgments. Perhaps if Mr. Wilson

took a few good courses in art history and art appreciation he could move his hairline up off his eyebrows.

Yours sincerely,
JAMES A. S. MACDONALD

Art is a Matter of Perception

The Editor,
Dear Sir:

I found the conclusions reached by Mr. Frank Wilson quite crushing (to an egghead?) after enjoying most of the article 'Highbrows Must Go.' I hope he means 'Snobs Must Go.' Isn't a highbrow a person with a greater stock-pile of cerebral matter than a lowbrow?

Our author seems to think art is mostly concerned with 'the mechanical functioning of the optic nerves.' He is a successful engineer, teacher and lawyer, evidently not attuned to the sometimes mysterious message of contemporary art, or sympathetic to the revolutionary eruptions of creative energy. He seems uncomfortable with anything but literal and sentimental images typical of the 19th century. What's so unusual about shock values in this day and age? The artist does not abandon meaningful subject matter—he mirrors his environment using new and unfamiliar methods of expression. He considers a painting *an object* in some instances, rather than a representation of something else. Artists I have known know well what they are doing, and support a philosophy of life which embraces sincerity and honesty.

George Doubt, New Westminster

Emerson said of revolution, 'The old and new stand side by side and can be compared.' The Victorians were fond of saying 'Beauty is in the eye of the beholder' and art is still a matter of perception, though beauty is not necessarily involved these days.

'All artists offer their riches in proportion to the quality of our concentration,' says David Watmough, *Sun* art critic.

Mr. Wilson's parochial expression of contempt is not the work of an erudite critic of the arts, *in my opinion.*

Yours truly,
'A TEACHER'S WIFE.'

A Compliment for Mr. Wilson

Vancouver, B.C.

The Editor,
Dear Sir:

Will you be good enough to forward the enclosed letter to Mr. Frank Wilson, author of 'The Highbrows Must Go'? I wish to compliment him on saying very well what somebody should have said long ago!

Compliments to you, too, on publishing this interesting article.

Yours sincerely,
L. E. MEADOWS.

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about People

Shell Merit Fellow 1965

Jack Block, head of the Science Department at Moody Secondary School, Port Moody, is one of ten Canadian secondary school teachers of science and mathematics to receive a Shell Merit Fellowship for the summer of 1965. He will attend Stanford University, where he will receive training in mathematics, chemistry, physics and educational techniques, as well as a first-hand knowledge of the application of science and mathematics in industry. Lectures by leading scientists and mathematicians, and weekly field trips to research laboratories and industrial plants, are included in the program.

An Enviable Record

A. P. Robertson, vice-principal of Qualicum Beach Secondary School, has been teaching for 44 years and for the last 40 of these years has not missed a day of school as a result of illness. He was away from work in February 1925 because of influenza, but has not missed a day since. He has been at Qualicum Beach Secondary School for 27 years.

North Vancouver Principal Goes to Chicago

K. George Pedersen, principal, Balmoral Junior Secondary School, North Vancouver, is the only Canadian among seven highly qualified young educators from a field of more than sixty candidates from the United States and Canada appointed as Staff Associates in the Graduate School and Department of Education at the University of Chicago. The two-year appointments provide an opportunity to combine advanced studies, leading to the Ph.D. degree, with the assumption of responsibilities for administration, conference planning, research, editorial work, and teacher education.

These Teachers Have Passed Away

Active Teachers	Last Taught In	Passed Away
James Dmitri Shynkar	Vancouver	January 17
Retired Teachers		
Archibald Campbell	Vancouver	January 19
William C. Wilson	Vancouver	February 22

for your Information

Workshop on Visual Perception Problems of Children

The Vancouver School Board has arranged to have Dr. Marianne Frostig, Executive Director, Frostig Center of Educational Therapy, Los Angeles, conduct a two-day workshop for teachers on October 15 and 16, 1965. The workshop will deal with the retraining of children who have problems in visual perception. Its purpose is to provide information to teachers regarding the nature, identification, diagnosis and remediation of problems of visual perception in children. Local participants will include Dr. Charlotte David, Dr. William Gaddes and Mrs. Dorothy Rizer.

Further details will be announced later.

Play-Writing Contest

The Manitoba Drama League proposes to celebrate the Centenary of Confederation by sponsoring a nation-wide play-writing competition (one-act plays). Prizes totalling $225 will be awarded the three best plays: first prize, $100; second prize, $75; third prize, $50.

The Manitoba Drama League proposes that only one-act plays written by Canadian playwrights be eligible for entry in the 1967 Drama Festival.

Further information and regulations governing the contest may be obtained from Mrs. A. O. Smith, Apt. 5, 321 Stradbrooke Ave., Winnipeg 13, Manitoba.

Geography Summer Session in Montreal

A six-week Day Summer Session in Geography (June 28-August 11) will be held at Sir George Williams University, Montreal. The session is planned to meet the needs of teachers, students majoring in Geography, and students proceeding to graduate work who wish to continue their studies during the summer. The program offers seven full and two half courses. Lectures are given 5 days a week for the six weeks. In addition to the lectures, Saturday field trips, regular luncheon meetings with guest speakers, special films will be offered. Dr. B. Zaborski, chairman of the Geography Department, University of Ottawa, will be Visiting Professor.

Three scholarships of $130 each are available to non-Quebec resident students. A letter of recommendation and a transcript should accompany applications, which must reach the University by May 1.

Further information may be obtained from Mr. Brian Slack, Director of the Day Summer Session, Office Rm. 582, Sir George Williams University, Drummond Street, Montreal 25.

Workshop for Teachers of Home Economics

The School of Home Economics, UBC, will offer a workshop on Concepts and Contents of Community Services Program in Secondary Schools from July 5 to 16. Registration is open to teachers of home economics who hold SB certificates. The fee is $40. Further information may be obtained from the School of Home Economics, UBC, Vancouver 8.

G. H. Fleming to be Honored

G. H. (Herb) Fleming will retire this year after 40 years of teaching, 38 of them at Burnaby South Senior Secondary School. Former students and staff members of the school are arranging a reunion in his honor, to be held on Monday, June 7, at the school. Requests for further information and/or donations toward a gift for Mr. Fleming should be sent to Mrs. Pat Fraser, Burnaby South Senior Secondary School, 6626 Kingsway, Burnaby 1.

Reading Conference and Workshop

The University of Chicago will be the location for the 28th Annual Reading Conference (June 29 to July 2) and the 13th Annual Workshop in Reading (July 6 to 30).

The central theme of the conference is 'Recent Developments in Reading,' and emphasis will be placed on important trends and experimental procedures in reading instruction. The conference will begin with a discussion of reading in modern society, followed by section meetings on how to meet the current needs of students in reading. The first afternoon session

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For Your Information

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will feature recent developments in instructional materials. Subsequent days will deal with many other aspects of reading instruction.

The workshop, which offers 1½ course credits (which can be augmented by an additional ½ course credit for attendance at the conference and by remaining through August 6 to complete a paper), is open to classroom teachers, reading consultants, supervisors, administrators, librarians and remedial teachers of reading.

The advance program for the conference will be ready about **May 1.** This program and applications for the workshop may be obtained from Mr. H. Alan Robinson, Conference Director and Director of the Workshop, 5835 South Kimbark Avenue, Chicago, Illinois 60637.

Occasional Papers in Geography

The Canadian Association of Geographers, B.C. Division, has published a series of Occasional Papers in Geography. They consist of collections of papers and individual monographs, printed in high quality mimeographed and/or offset form and attractively bound. Maps of excellent quality as well as photographs are included. The papers are produced on a non-profit basis. They constitute a rich source of teaching material and information on a wide range of topics of interest to all geography teachers. Although they deal to a considerable extent with geographical problems in B.C. and Northwest U.S., other areas of the world are by no means neglected.

Orders, subscriptions and general information may be obtained from The Editor, Occasional Papers in Geography, c/o Department of Geography, University of B.C., Vancouver 8.

Master of Arts in Art Education

Sir George Williams University offers a program of advanced studies in painting, graphics and sculpture, combined with seminars in the teaching of art, education, and psychology — a one-year program leading to the degree of Master of Arts in Art Education. Registration is open to full-time or part-time students. A number of fellowships ranging up to $1,200 and assistantships up to $1,000 are awarded annually to full-time students.

Requests for information or application forms should be addressed to The Chairman, Department of Fine Arts, Sir George Williams University, Montreal 25.

Useful Teaching Aids Wanted

The BCTF Lesson Aids service is constantly looking for useful materials to add to its inventory. The service depends entirely on teachers for its materials.

Lesson Aids is essentially an exchange service. Teachers who have found materials useful make them available to Lesson Aids, which prints them and makes them available at cost to other teachers. Some of the materials are for use by students; others are references for teachers.

The service welcomes contributions, particularly at this time of year. Materials submitted now can be prepared in time to include a listing of them in next year's Lesson Aids catalogs (the catalogs are revised each summer).

For Social Studies Teachers

Understanding Europe and Africa, the first in a three-volume series of comprehensive reports on all the major areas of the world, has been published by Pan American Airways. Later in 1965 two more volumes will cover Latin America, Asia and the Pacific.

The three volumes offer in book form the detailed study units which were originally printed in Pan Am's *Classroom Clipper,* a publication circulated periodically to teachers. All three volumes are bound with soil-resistant hard covers.

The new series provides up-to-date reference material for teachers with complete reports on the geography, history, culture and economics of each region. Each unit also contains teaching suggestions and a list of recommended reading material and audio-visual aids.

The series is also designed for tourists who want to make their sightseeing more meaningful, for business travelers who want background information, and for parents who want to help their children.

The books are available at $3.50 each at Pan Am Offices.

New Film Catalog

More than 1,150 educational films, including 57 new titles, are described in the new 120-page catalog issued by Coronet Films, 60 E. So. Water St., Chicago 1, Ill., for the 1965-66 school year. Virtually all of the films are available in color as well as black-and-white.

The new catalog contains 96 pages of film descriptions with four-color illustrations. A 24-page index section printed on colored stock is bound in the center.

Free copies of the catalog are available upon request.

Course Improvement

Continued from page 293

by increasing public and private support for educational research and development, they have undertaken a number of fresh approaches to the improvement of school instruction in science. The aim has been to see that instruction presents contemporary knowledge as well as contemporary viewpoints on knowledge established earlier. In many cases it has seemed best to start anew rather than merely to patch up 'present' courses. A distinctive feature of many projects is the effort made to go beyond the presentation of what is known and to provide students experience in processes by which new facts, principles, and techniques are developed.

The purpose of this article is to help make information more widely available on course improvement projects. In particular, a list of major experimental programs recently completed or currently under development for use in the schools of the United States, is presented.

Senior Secondary Grades

Physics

Physical Science Study Committee (PSSC)

Text: *Physics*: D. C. Heath and Company, Boston.

Laboratory Manual: *Laboratory Guide for Physics*: D. C. Heath and Company, Boston, Massachusetts.

Teacher's Manual: *PSSC Physics—Teacher's Resource Book and Guide*: Parts I - IV, D. C. Heath and Company, Boston, Massachusetts.

Film Guide: *Teacher's Guide to the PSSC Films*: Modern Learning Aids, 3 East 54 Street, New York 22, New York.

Tests: *Tests of the Physical Science Study Committee*: Educational Testing Service, Princeton, New Jersey.

Supplementary: *Science Study Series*: Anchor Books and Doubleday Company, Inc., Garden City, New York.

Advanced Materials: *Advanced PSSC Physics Course Materials*: Educational Services Incorporated, Watertown, Massachusetts.

Harvard Project Physics

This course is being developed for the more average student with the intention of attracting more students to the study of physics. Information is available from: Harvard Project Physics, Pierce Hall, 29 Oxford Street, Harvard University, Cambridge, Massachusetts, 02138.

Chemistry

Chemical Education Material Study (Chem-Study)

Text: *Chemistry: An Experimental Science*: W. H. Freeman and Company, San Francisco.

Laboratory Manual: *Chemistry: An Experimental Science—Laboratory Manual:* W. H. Freeman and Company, San Francisco.

Teacher's Manual: *Chemistry: An Experimental Science—Teacher's Guide*: W. H. Freeman and Company, San Francisco.

Chemical Bond Approach Project (CBA)

Text: *Chemical Systems*: Webster Division, McGraw-Hill Book Company, Toronto.

Laboratory Manual: *Investigating Chemical Systems*: Webster Division, McGraw-Hill Book Company, Toronto.

Biology

Biological Sciences Curriculum Study (BSCS)

BSCS Blue Version:

Text and Laboratory Manual: *Molecules to Man*: Houghton Mifflin Company, Boston.

BSCS Green Version:

Text: *High School Biology*: Rand, McNally and Company, Chicago.

Laboratory Manual: *Students Manual, High School Biology*: Rand, McNally and Company, Chicago.

BSCS Yellow Version:

Text: *Biological Science: An Inquiry into Life*: Harcourt, Brace and World Inc., New York.

BSCS A Second Course in Biology:

Text: *Interaction of Experiments and Ideas*: Biological Science Curriculum Study, University of Colorado, Boulder, Colorado.

BSCS Special Materials for the Slow Learner: Experimental materials available from Biological Sciences Curriculum Study, University of Colorado, Boulder, Colorado.

BSCS Laboratory Blocks: D. C. Heath and Company, Boston, Massachusetts.

BSCS Pamphlet Series: D. C. Heath and Company, Boston, Massachusetts.

BSCS Research Problems in Biology Series: Anchor Books and Doubleday Company, Inc., Garden City, New York.

BSCS Teacher Materials: A single text to augment the blue, green and yellow versions of BSCS biology. John Wiley and Sons, Inc., New York.

Equipment and Techniques for the Biology Teaching Laboratory: D. C. Heath and Company, Boston, Massachusetts.

BSCS Newsletter: Biological Sciences Curriculum Study, University of Colorado, Boulder, Colorado.

General Science

History of Science Cases (HOSC)

A series of 15 cases are being prepared in booklets for student and teacher. Available from: Science Research Associates, Chicago, Illinois.

Junior Secondary and Elementary Grades

Elementary School Science Project:

A carefully structured program in Astronomy for Grades 5-8. Materials include a teacher's guide and six books for students: *Charting the Universe, The Universe in Motion, Gravitation, The Message of Starlight, The Life Story of a Star,* and *Galaxies and the Universe.* Available from: Elementary School Science Project, 805 West Pennsylvania Avenue, Urbana, Illinois.

American Association for the Advancement of Science Project (AAAS):

Materials include *Science—A Process Approach,* in six parts. The materials are suitable for kindergarten, primary and intermediate grade levels. For information, write to: Dr. A. Livermore, Deputy Director of Education, American Association for the Advancement of Science, 1515 Massachusetts Avenue, N.W., Washington, D.C., 20005.

Science Curriculum Improvement Study (SCIS):

Materials are being developed for Grades 1-6. Available are combined student manuals and teacher guides for Grades 1-3. Information can be obtained from: Science Curriculum Improvement Study, Tolman Hall, University of California, Berkeley, California, 94720.

Elementary Science Study (ESS):

A series of units, classroom equipment, and film-loops, suitable for Grades 1-6, have been developed. Information can be obtained from: Dr. B. Nichols, Educational Services Inc., Watertown, Massachusetts, 02172. Also available is the 'ESS Sampler' containing printed matter, and apparatus for 5 units. These can be purchased from: Miss P. E. Thompson, Houghton Mifflin Company, 2 Park Street, Boston, Massachusetts, 02107.

Elementary School Science Project:

A wide variety of teaching units is being prepared, including topics in physiology and embryology suitable for Grades 1-6. For further information write to: Dr. Herbert L. Mason, Department of Botany, University of California, Berkeley, California, 94720.

School Science Curriculum Project (SSCP):

Teaching units, inexpensive classroom apparatus, and student reference materials are being developed for Grades 1-9. Only the SSCP Newsletter is available at this time. Write to: School Science Curriculum Project, 805 West Pennsylvania Avenue, Urbana, Illinois, 61801.

Learnings in Science Laboratory:

This is a multilevel program of science materials similar to the Reading Laboratories. At present, materials have been developed for Grades 4-6. Materials can be purchased from Science Research Associates, Inc., 259 East Erie Street, Chicago 11, Illinois.

PSSC Junior High Physical Science:

A course is being developed with the major emphasis on the study of matter. A laboratory program as well as classroom materials for the course are being prepared. It is intended to be suitable as a terminal course or a preparatory course for the study of biology, chemistry, and physics. Information can be obtained from: Physical Science Study Committee, Educational Services Inc., 164 Main Street, Watertown, Massachusetts, 02172.

Junior High School Science Project (Princeton Project):

A program dealing with such topics as time, space, and matter has been prepared for Grades 7-9. For information write to: Junior High School Science Project, Princeton University, Princeton, New Jersey.

Earth Science Curriculum Project (ESCP)

A comprehensive program in earth science has been prepared for Grades 7-9. Included in the program is a text, laboratory equipment, laboratory manual, teacher's guide, films, filmstrips, slides and overhead projection transparencies, a field-study guide series, reference series and a single-topic series of pamphlets. Information and materials available from: Earth Science Curriculum Project, Box 1559, Boulder, Colorado.

Further information related to science improvement projects can be obtained from the booklet: *Science Course Improvement Projects,* National Science Foundation, July 1964. The booklet is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, at a price of 50c. Information is also available from the Science Department of the Faculty of Education, University of British Columbia. □

Teaching 'Science'?

JOHN BURDIKIN

EVEN A BRIEF EXAMINATION of what science is, i.e., what the distinguishing features of scientific laws and theories are, is the task of voluminous works, but one might, as a starting point, think of science in Popper's terms as 'not a system of certain, or well-established statements; nor is it a system which steadily advances towards a state of finality. Our science is not knowledge (episteme): it can never claim to have attained truth, or even a substitute for it, such as probability.'[1] Furthermore, he asserts, 'Science never pursues the illusory aim of making its answers final, or even probable. Its advance is, rather, towards the infinite yet attainable goal of ever discovering new, deeper, and more general problems, and of subjecting its ever tentative answers to ever renewed and ever more rigorous tests.'

What relevance have the distinctive features of science as a form of knowledge to the teaching of the subject in school? What principles of procedure are really what one wants to know? It is, in Peters's words,

The author is Supervisor of Elementary Instruction in Powell River.

'absurd to think that knowledge, as we know it, could originate in the experience of the individual.'[2] He asserts also that the acquisition of knowledge does not consist in 'spinning out the implications of innate ideas as a spider spins a web,' but rather is a matter of accepting or rejecting assumptions on the basis of experience. It is not sufficient that children be taught things (scientific or other); they must also be 'initiated' into a tradition of experiment and critical discussion. The study of science in school ought not to be altogether so much to impart and absorb knowledge as to form habits—the habits of approaching scientific matters in a scientific way. Whitehead[3] explains that in his view the important tasks of science teaching are involved in: (a) transmuting thought into 'instinct,' which does not smother thought but directs it; (b) generating the feeling for the important scientific ideas and for the important ways of scientific analysis; (c) implanting the habit of seeking for causes and of clarifying similarities, and (d) implanting the habit of definitely controlled observation.

He further advocates that science curricula be thought of as requiring two major elements—a 'hard' part and a 'soft' part. The hard part would consist of imparting exact knowledge based on first hand observation. It would center largely around laboratory work so framed as to illustrate such concepts and theoretical generalizations as the subject demands. This laboratory work must be sequentially ordered so that there is a progressive opening out into the more ultimate and basic generalizations within each subsection of the scientific disciplines. The purpose of each discrete, ordered laboratory experience should be (or become) clearly evident to the pupil and the relation of groups of experiments to the whole body of scientific knowledge (within particular fields) must also become increasingly apparent to him. The soft element of the program could include browsing, with little overt direction, through literature on experiments in the physical sciences, field work in geology or botany, or astronomical observation.

It could also include descriptive lectures that could, for instance, give necessary information on physiology, or be designed to arouse general interest in the various sciences through demonstrations and the examination of up-to-date use of scientific data. A judicious balance must be kept between these kinds of elements, keeping in mind the age, ability and experience of the pupils. It cannot be pre-supposed that more than a small proportion of those pupils studying science at school will become practising scientists. This must not, however, lead to the construction of popularized science curricula that can only produce layman's science. Such curricula cannot serve any worth-while educational purposes; the 'soft-option' is valueless. The basic structure of a science curriculum must be uncompromisingly true to the underlying principles of science as a form of knowledge, otherwise it is misnamed. This does not, of course, preclude the possibility of having curricula of various levels of difficulty—indeed the construction of such levels of curricula is very necessary—but this must not be done by dilution or pill-sweetening.

Apart from the demands of the subject, there is the very practical reason given by Whitehead for shunning the popularizer's approach. With regard to motivation and interest he claims, 'You can only elicit sustained interest from a process of instruction which sets before the pupils definite tasks which keep their minds at stretch in determining facts, in illustrating these facts by ideas and in illustrating the ideas by their application to more complex facts.' Science curricula should be so constructed that 'written into them' is the idea of making it clear to the student that in learning to understand the principles of this field of knowledge, in becoming familiar with the special vocabulary, the methods of reasoning and the modes of verification in the scientific necessities, he is being required to look at things in a very particular way. He needs to be made consciously aware that he is being initiated into a particular discipline and that this discipline has a distinct field of applicability outside of which scientific criteria and tests may not be applicable. Those aspects of science that are relevant in other fields should certainly be examined if time permits, but it is the natural sciences and not the social sciences that are being considered. The kind of science curriculum being suggested is oriented to the demands of the discipline, rather than to the student. The student should become involved in the thought and language of the subject—should come to think scientifically—so that in the sense described by Peters, he comes to care about the subject as well as becoming knowledgeable in it.

The attitude and experience of the teacher are probably crucial factors. The curriculum and the value of the discipline itself would not of themselves be sufficient to achieve the desired results. The teacher must be an initiate in the sciences to be taught. Popper states that 'the wrong view of science betrays itself in the craving to be right: for it is not his possession of knowledge, of irrefutable truth, that makes the man of science, but his persistent and recklessly critical quest for truth.' Science teaching can have no higher objective than to foster a devotion to this recklessly critical quest for scientific truth in students equipped with the skills and knowledge to make this quest significant. □

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