

PRNC066

PRNG 66

OFFICIAL USE ONLY

PUERTO RICO NUCLEAR CENTER

EVALUATION STUDY OF

SUMMER INSTITUTES IN RADIATION BIOLOGY

RE, RUSHFORD

1965

?OPERATED BY UNEVIRSITY OF PUERTO RICO UNDER CONTRACT

NO, AT (40-11-1199 FOR U. %. ATOMIC ENERGY COMMIEHON

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EVAWATION STUDY OF

SOMMER CNSTITVIES IN RADIATION BIOLOGY

F, B, Rushford

1965

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Abstract

From 1959 through 1964 six Summer Institutes in Radiation
Biology were offered in Puerto Rico. A total of 115 teachers were
enrolled. Since the number of applications for admissions dropped
in 1964, no Institute was offered in 1965, and instead a study was
made to determine the value of the Institutes to participants.
Sixty participants were interviewed, and this report is a detailed
account of the information obtained. The results indicate limited
utilization of the training in most cases, due to the absence of
radiation biology courses from the curriculum being taught, lack of
basic teaching materials including textbooks, inadequate laboratory
facilities, and lack of safe storage areas for equipment. The
conclusion is that continuation of the Institutes under these
conditions is not justified. It is recommended that the Department
Of Education be urged to recognize the importance of radiation
biology in the science curriculum,

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cOCCETON

The first Summer Institute in Radiation Biology conducted in Puerto Rico was offered at the College of Agriculture & Mechanical Arts of the University of Puerto Rico during the Summer of 1959. Table 1 presents pertinent data about the six Institutes offered from 1959 through 1964,

The objectives of the Summer In

stitute program in general are

(a) to improve the subject matter competence of the participating teachers, (b) to strengthen their capacity to motivate able students

toward careers in science, (c) to br

the teachers into personal,

contact with prominent

scientists participating in the Institutes,
and (a) to bring about greater mutual understanding and appreciation
of their problems among people teaching science at various academic
levels,

The specific objectives of the Radiation Biology Institute program are (a) to make Soachere aware of the importance of radiation in the modern world, (b) to provide them with an adequate fundamental knowledge of radiation biology, and (2) to train them in the use of radiation detection equipment so that they are prepared to teach radiation biology within the framework of the present school curriculum.

In 1962, the Director of PRIC requested the cooperation of the Department of Education of the Commonwealth of Puerto Rico in offering the Institute. The Department of Education agreed (a) to help select teachers to attend the Institute, and (b) to provide funds for the participants' traveling expenses and lunches. At the request of the

Science Curriculum Department of the Department of Education, the

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Table 1

Summer Institutes in Radiation Biology Offered in Puerto Rico, 1959-1964

(operating funds were provided by the US ABC, Participant support was

provided by NSP, except in 1962, when it was provided by the P.R. Dept.

of Education.)

So

Brochure

Year sponsor Director Location (total, 125)

ee

1959 CAMA, UPR Dr. J. Ramos, Dr. H. Ingo Mayaguez 2

1960 PRN, UFR Dr. J. Ferrer Monge Mayaguez a

1961 PRNC, UPR Dr. J. Ferrer Monge Mayaguez, 2

1962 PRN, UPR Mr. P. Z. Rushford Rio Piedras 12

1963 PRUC, UPR Mr. FB, Rushford Rio Piedras 20

1964 FRG, UPR Mr. F. E. Rushford Rio Piedras 2

eee

with the cooperation of the P.R. Dept. of Education.

a

Table 2

participation in Other Institutes by Radiobiology Institute

Participants Interviewed

ee

to. of other io. of of those

Institutes attended persons interviewed

Fs

° 3B a6

a 23 40.0

2 22 19.2

3 6 96

4 5 8.0

5 a 1.6

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The American Institute of Biological Sciences (AIBS) high school biology course materials were purchased for the participants, and a contemporary biology course was offered in addition to the radiation biology course. Eight percent of the Institute, Each course was assigned three semester hours of credit through the UPR Department of Biology in Rio Piedras. The contemporary biology course was taught by Mea, Graciela Candelas, Assistant Professor of Biology at UPR, The radiation biology course was taught by FRG staff members, The Department of Education wanted the BSCS high school biology course taught because the decision had been made to offer this course in the public schools, and trained teachers were needed. The PRIC staff thought that this course would upgrade the background of the teachers and help them understand the more complex radiation biology course,

The cooperation of the Department of Education in selecting

candidates for the Institute was cont

wed An order vo ensure that «

?maximum number of teachers participating would return to classroom

teaching, In 1963, 8 applications were received and were reviewed by
fn ad hoe aimiesions comittee composed of Mrs. Marfa Antonia Ruiz,

Director of Science Curriculum, P.R. Department of Biucation; Mra. Gré

ciele Candelas, Assistant Professor of Blology, UPR; and Mr. Frederick
B, Rushford, Director, Sumer Institute in Radiation Biology, PRIC.

The Institute curriculue w

miler to that in 1962, with Dr, Gustavo

Candelas, Professor and Chairman of the UPR Department of Bictogy,

teaching the contemporary biology course with emphasis on the Green

* Biological Sciences Curriculum study

---Page Break---

version of the BSCS high school biology course. Mrs. Ruiz had indicated that the teachers trained in this Institute would be provided with the

1uScS materials needed for their students and would be

signed to teach

this course during the next academic year.

In 1964, 100 application forms and brochures were distributed, but only 10 applications were received. The Institute was held as in 1963, and the sharp decline in the number of applications indicated that an evaluation of the impact of the Institutes should be made. The JS ASC Division of Nuclear Education and Training granted permission to PRIC to utilize funds for making an evaluation study during the spring of

1965.

[EVAI/IATSON PROCEDURE.

A personal interview with each former participant still teaching was considered to be the best way of obtaining pertinent information, A letter (see Appendix 1) was sent to each of the 114 former participants requesting a personal interview and asking whether they were still teaching. In many cases a second letter had to be sent before an answer was received; in other cases information about former participants was obtained from Institute classmates or fellow teachers while visiting =

school. If the participant was no longer teaching, a personal interview was considered unnecessary.

Sixty former participants were visited. Each interview

Institute participants

lasted about 30 minutes and was based on the AEC-NSF Institute Evaluation Guide (see Appendix II) used in a national survey of the ABC-ISF sponsored Summer Institutes in Radiation Biology covering the period from

1956 through 1961, (In this national survey 795 questionnaires were

---Page Break---

returned out of approximately 1700 given 93% (4% response). Of the 795) only 5 were from Puerto Rico, Since 63 persons had attended the three Institutes in Puerto Rico from 1959 to 1961, the 5 responses

represented only an 8% response!

-) During the personal interview the

questions were

taken by the interviewer and the answers written down,

with any additional comments or qualifications added. The interviews were conducted in Spanish,

ANALYSIS OF DATA

The enrollment recorded for the six institutes was

but since

one teacher attended twice, the total enrollment was considered to be

Ah, the number of persons interviewed was 60 (52.64 of the total), of

the Lib participants, 69 (60.96) are as follows:

tears

829 (05.98) are as follows:

Longer teaching; and 16 (14) did not respond. Since the interviews were

based on the Institut

Evaluation Guide, the data are presented according

to the sections.

1. Identification Information, After giving his current home and

?School address, each person was asked to list all other x

titles,

besides Radiobiology, in which:

which he had participated, (See Table 2.) of

?those interviewed, 47 (78.46) had attended one or more other Institutes.

Table 3 Lists these by institution and type. Many of the Institutes attended were unrelated to actual teaching assignments. The data on

educational backgrounds are given in Table 4. Of those interviewed,

33.06 had either graduate training or two undergraduate degrees, Of the undergraduate majors, 42.5% were in biology and 28.5% in education.

Table 5 Lists subjects taught before attendance at the Institute

present, Biology only was taught by 29 prior to attendance and is

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Table 3

Institutions and Types of Institutes Attended by Persons Interviewed

To, of Ties

Institution ?Type of institute Date interviewed
attending

Catholic U. of PAR, PSEC Physics summer 1962 4

corned U. Chen atry Summer 1961 a

Selers Biucotton AYE 1962-63 1

Darwin Centennial Chentatry, Geology,

Mtg. Astronomy summer 1961 a

Florida U. Aerospace summer 1953

Fordham U. PBSC Physics Summer 1962 2

Indiana U. Biology ?Summer 1957 a

Inter-American U. Mathematics ?summer 1957 1

Biology Summer 1958 3

Mathematics Summer 1958 1

General Science Summer 1959 a

Biology. Summer 1960 2

Modern Biology Summer 1962 2

Modern Biology Summer 1964 5

Modern Biology Summer 1965 2

Missouri state

Teachers Coll. Biology Summer 1963 a

Montana U. Science Teaching Summer 1962 1

Science Teaching Summer 1963 a

Science Teaching Summer 1964 a

Ontario U. Biology ALE 1958-59 a

U. of Pennsylvania Biochemistry AYT 1960-61 a

Physical Sciences Study Committee.

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oF These

tion Type of Ingtitate ve interviewed

: attend

nig

PR (Rlo Piedras) Mathemat: Sumer 2958

Mathenat? In-service 1959-60

Samer 1960

Sumer 1960

Teaching of Mod

Astronomy acd Ne?

Matnonatic,

Shentetry

= Below ? Tnsderviny i906

Ecology

Matematica

Astrovoay ant Metecrozogy

PEC Physica ant Gooosy,

ume (caua) Biology

Biology

Matbenacice

Biology

Biology

Chentetay

Marine Blotogy

athena

Physi.

Chemistry, Wyeice, Biology

Field Biology

Blology Inegorvice 2964-65

rise 1959-60

Bo bebo HOHE

re

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tbls

University or College Training of Participants Interviewed

Undergraduate degrees Undergraduate majors Undergraduate minors

are wo. Tyne wo. \$

one 1 16 2 26

Baa, ak 40.0 39 cg

Bs, 8 16.5 Betence: 6 9

BAL & Mathenatice au 7

7 18 Howe Beononics 1 Yathenatics 5

Pharmacy 2 Biology 3

60 100.0 Chenietry i Brysics 3

Social Sciences 1 social Sciences 3

Nutrition a Ageiewtture L

Agronoay a Payshalogy L

French a spanish 1

not. 66 6

Profeseional Diploma Graduate Majors

Tyre mw. Tee %

Supervision 4 66 Professions Diplona

supervision h 30.7

Mab, Degree

Graduate Degrees 1 UT

2 agile

ype wo. i TT

! 2 UT

WA. & 66 1 TT

?5, B66 Biology. a TH

MPH. 1 6 Mathenatice i Tm

Degree

?Total, 9 1k8 9 Health 2 1

rand Total® 130 21. Tota, 13 100.0

?Walther Professional Diplows

or Masters Degree

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Se

Table 5

?

Teaching assignment before Radiat ton

Biology Institute participation Present

SS ee

Biology only 19 Biology only ab

ELology & Chemistry 4 Biology Demonstration Clas: 1

Biology & General Science a Biology & Chen st=y 4

Biology & Mathematics 2 Biology & Genera? SeLence 3

Biology & Physical Sciences 2 Biology & Piyaical selerce i

Biology, Chentetry, te Biology, Chenistey, General

Matheratice 3 Selentes, & Pysics 2

Biology, Chemistry, & Physical cheniesey only 2

Sciences 6 General Solenee only 8

Biology, General Science, & Mathenatice only 3

Mathonatice 3 Mathenatics & S:tence i

chenistry only L Prysica & Miyateal Seience 2

General Science only 7 Chentstey, Physics, &

Mathematics only 2 Mathematics a

Mathematics & Science 5 ?General Science,

Sciences 2 2

History, Physics, & Science Teaching Methodology i

Physical Science a Science Coordinator, Physics

Mathematics, Physics, English, 2

4 & Religion 1 Pathology Teaching Assistant 2

Science Coordinator i Curriculum ?Teaching 2

Printed 3

Total 60 ?Total, 60

Se

+9

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Number of Sections, Students, and Textbooks for Each of 16 Teachers

Subject No. of sections No. of students No. of textbooks

Basic Biology 3 a year

Biology B ay 30

Riclogy 4 158 no texts

Biology & bo no texts

Biology 2 65 no texts

BSCS Biology 3 225 60

OCS Biology 3 40 no texte

Eiology 3 ioe 60.

BSS Biology 3 320 &

Biology 5 io 2

Biology i 160 160

BSUS Biology i 36 2

General Sefence 8 320 160

BES Biology 3 430 no texts

90S Biology 3 iat 29

Biology i py no texte

totaa cord 65

---Page Break---

being taught by 24 now, For biology either alone or with other subjects,
he corresponding numbers are 40 (66.74) and 34 (56.76). ?Three persons
were pronoted to principal and two were named curriculum technicians

after participation, The merits of sections taught, pupils, and textbooks for each of 16 teachers are Listed in Table 6, note that only about one textbook was available for every three students on the average. of the

7 teachers teaching BSCS biology, only one had enough texts. 412 the teachers Interviewed indicated » shortage of texts, laboratory manuals, Laboratory equipment, or 2 combination of these.

2, Institute Carry-Over, A numerical tabulation of the answers to

the questions in this section appears in Tab!

7. Note that 63.0% of the

People interviewed stated that their participation in the Radiation Biology Institute was highly useful, yet only 16.7% stated that they could use the training received a great deal in their teaching. this is a reflection

of the fact that radiation biology has not been incorporated into the

School curriculum and that any teaching of this material comes from the

Individual teacher's effort alone without official support. of those interviewed, 54 (90%) stated that the school administration was generally apathetic toward their efforts to incorporate radiation biology into their regular courses, It appears that the Local school administrations are in favor of introducing radiation biology into the curricula, but that this is not supported by the Department of Education.

Of those interviewed, 51 (85%) indicated they had maintained contact with their Radiation Biology Institute Director; 36 (60%) of the 60 persons interviewed indicated they had not used their training in nonteaching activities; 45 (75%) indicated that their training had been helpful in

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Consider your participation in the Radiation Biology Institute to

why saofal 20, highiy usetd 36 , not

answered 0. Total?

Is. Has your school aiuiristratto: beer generaliy sympathetic

toward ineorporsting radistion ology into Your course work?

ye Sh, 00 3, ?iy not aneveret 2. Total 60,

2. To what oxtent have yo: been sble to ircowporate the training received

into your teaching? "le 9, sone 39, a great

@eal JO. Total

3. Have you contimed Liaison with your Institute director? yes SL

no 8, not anevered LI. Total 60.

3a, How? correspondence 13, repair equipment 2, arrange
student visits 13, Bienes fair consultation 3, not
specified 2 Total 5].

4, To what extent have you used your training in non-teaching activities,
lectures to community groups? won 36, civic defense 8
lectures to civic groups 12, not specified 1?, Total 60.

Has your training been of use with respect
clubs, etc.? yes 15, no 15, not answered

to science fairs, science
?Total 60.

6, Would you enroll in a Summer Institute in Advanced Radiation Biology?

yes 57, no 1, not answered 2. Total 60.

6a, Why? teacher supervision 1, improve teaching 24,
personal interest 17, reason given 15. Total 97.

7. How do you receive the Audtation Slolegy Hnsletter remuierlyt yee Ut
&

of moderate use _27

a. Total bb

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guiding students for science faire and ectence clubs.

Fifty-seven (95%) of those interviewed indicated they would enroll

in an Advanced Institute in Radiation Biology if it were offered, in order

to rest (308). Again it

should be stressed that the participants appear to recognize the value

to improve teaching (42.18) and for personal,

of radiation biology and indicate a desire to learn more, but there is no official provision within the existing science curriculum of the Public schools of Puerto Rico for them to use the training properly.

The Radiation Biology Newsletter is received regularly by 73.34% of those interviewed, and 12 find it useful. Suggestions for improving the Newsletter included describing experience in more detail, adding a Spanish section or translation, publishing more information on new equipment, adding topics related to a tropical environment, adding a section from Puerto Rico (possibly contributed through FRIC), and publishing descriptions of student projects. Note that language was

mentioned here as a prime factor in communication of ideas, and teachers

requesting a Spanish edition feel that their students' knowledge of English is too poor for them to use the present English version. It should be emphasized that more than 90% of the teachers interviewed indicated that their students have difficulty reading English, so that the

Teachers spend much of their classroom time translating into Spanish. This is an additional obstacle to the introduction of radiation biology into the curriculum, since most of the reference materials originate in the United States and are in English,

3. Baulynens Kit, Each participant in a Radiation Biology Institute

is provided with an equipment kit, which he learns to use during the Institute and watch de thes

signed to his school, The kit remains the

of

---Page Break---

property of the U.S. Government, but the teacher uses it as desired and takes it with him when transferred to another school. The return of some scaler ratemeters was requested because of a manufacturing defect, and some participants did not take a kit because of uncertainty regarding their next teaching assignment.

A typical kit contains the follows:

1 Scaler ratemeter

1 Beta-guma detector, side window

2 Beta detectors, mica end wintow

Probe and cable

1 0-in, cable

1 Tube mount and sample holder vith clamp

2 Absorber act, 8 sluninum, 4 lead

2 Radius D and F source

1 cobalt-60 source

00 Planchets and rings

A Jere and ground adapter

1 Blectroscope

1 Spintuariscope

2 Cloud chamber kit

2 Stop watch

4 Flam holders for autoradiography experiments

1 Package X-ray film

1 Package developer

2 Package fixer

2 lees ayringes

othe

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2 Sree eyringes

2 See ayringss

22 Wypodammic nesdies

1 Package assorted mi:

-opipe!

2 Rubber-bulb pipettes

1 Pair rubber gloves

1 Pair plastic gloves

2 Radioactivity warning placards

1 Roll radioactivity warning tape

Each equipment kit costs about \$700, and about 100 kits were issued

to participants in Puerto Rico, so that about \$70,000 worth of science

equipment was given to the schools. Note that part of this equipment:

is useful for conventional science experiments.

Table 8 summarizes the information obtained on equipment kits from

the persons interviewed. The average dimensions of 39 classroom-

laboratories indicated adequate size and ventilation. The utilities were

Anadequate in many cases (e.g. de

stallations, =o

water, no gas}. Tho result 1s that many tonchers conduct a very Limited

Lnhoratory program as part of courses euch as biology, vaich require

laboratory exercises. With utilities defective or missing, it is impossible

to do experiment in radiation biology. Autoradiography experinents

require dark room facilities, and the fact that 764 of the teachers had

none indicates thst they were not able to do autoradiography experiments

even though all the equipnent was provided,

?The equipment Kit was used, on the average, 23 days or 12.84 of the

academe year. ?This does not mean that all the equipnent was being used

oe

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Laboratory Pasi

Kite, and Tnforma?

Radiation Biology.

Estimated size of average sci borstory (based on approxi-
mate floor area of one of #9 2-ageroom-laboratories visited)
approximately 40 ft. x 25 ft. , approximately 1075 sq. ft.

?

3. available in school or nearby: yes 9, no 32.

L, Betinated a kit during an approximately 180-day

?school year ej: 23 days

Ten (16.7%) Of the persons

caution kit for the following reasons:

returned to Director 2), eai:poact rot

from 2

e4 they 444 not have an

letter another school 5,

issued _L_, equipment in

Utilization of equipment in con

plies): physics 20, chenze"ry

scterce lb, muthend=a

the> than ?ology (based on M6

2 13, physical

7. Utilization of egutzment for

Type of research; student yrojece for avien!

Be total ah,

arch: yes ih, no 36, total 50

not ape?

8, Does scaler ratenster function sproperiy at this timo? yes 30, ro 18

poral us

9. Has maintenance ard repair of wqaimect been a minor problen? 33, a

jous problen? i. Total La

10. Evaluation of five 4

value to the participa)

neste from the equipment Kite in onder of their

(eased on 13 vepliea):

Ba et Mh sth

Sealer rateneter 3 2 t 3 3

Hlestroscope 3 6 B 1 2

Autoradiography Kit 3 % 3 a 9

Cloud. chaser 2 3 6 n 3

Spinthersecore c 2 7 10 a

11. Would you prefer the scale= ratencter available ag a separete unit?

yee jr, 20 8. Total us.

ratenctor were portable, as a eoparate unit, would 4t be preferred

the present combined unit? yes 36, no 7.? Total 3s

wz,

13. Estinate hoy mich use you coud make of the catemeter: cone 1, Little

?2, sone TZ, considerabie 32. Total lo,

---Page Break---

t the sane time, bot only that some part of the equipment, in most

scaler retener, was used in demonstration or an experiment.

The equipment it had been used for 2

far in less than one-third of

the cases, mostly on projects being done by students for a science fair,

Almost two-thirds of the scaler

meters were not functioning

properly. Since the scaler rate meter is a basic radiation detection

unit needed for the majority of radiation biology experiments, it may be

assumed that teachers with defective ones were doing little or no radiation

biology laboratory work, One-fourth of the teachers stated that maintenance

and repair of equipment has been a serious problem. The main difficulty

is that the equipment must be brought to the Nuclear Center for repair,

and, since 4% does not belong to the school, the teachers have difficulty

in obtaining transportation and in some cases have made little or no effort.

4. Radioisotopes, Radioisotopes are needed for most experiments in

radiation biology, Each participant is entitled to order a free package

of Radioisotopes once during each of the three years following an Institute,

Subsequently he must either purchase them or find another source of supply.

The utilization of radio:

is a direct reflection of the extent that

each participant has been able to incorporate the training received into his

teaching.

Table 9 summarizes the information obtained. Only 20 (33.34) of the 60
teachers interviewed indicated that they had

1 ordered radioisotopes.

Not one of the 16 partici

pants from the 1964 Institute had ordered any.

Some of the reasons for failure to order free radioisotopes were as fol

lows. After the 1959 and 1960 Institutes the free packages were sent
without being ordered. Some teachers had no equipment and therefore could

Not use the radioisotopes. ?Three

37.

fachers had 0 safe place to store the

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Tnformation on Radioisotope Procurement and on Availability of
a Source of Ionizing Radiation

maple 9

1959 1960 1961 1962 1963 1964 Total

a

1. Dia you enter radioisotopes?

yes

2, Tf MO, why not?

fa) free package sent without

ordering

») no equipment

e) not teaching

4G) Inadequate facilities

fe) no specific reason

3. If-YES, how many times did you

order the free packages?

a) one time

2) two times

fe) three times

4, Did you ever purchase

radioisotopes?

yes

no

5. If NO, did you obtain additional

free radiotests?

yes 1

no

6. If WS, where aia you obtain

?then?

?FRNC

7. Do you have acces to 8 source

of onizing radiation?

yes we

no 1

-18-

4

o

ar)

8 6

otal

oo

a2

1 0

loa

5 oak

otal,

2 0

2 0

oo

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eo 8

2 36

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Cay

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60

20

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Bsus Ss.nne Bas

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radioisotopes. Three did not return to the classroom, Minete

no specific reason, but the factors prompting them not to order
radioisotopes included inadequate utilities, lack of safe storage area,

no official place in the curr

ilun for radiation biology experiments,

not teaching biology or other courses including Laboratory work,

schedule too full to allow time for preparation of experiments, and equipment not functioning - or a combination of these, Total one of the 60 persons interviewed has purchased radioisotopes, All of this indicates that the application of the training received at a Radiation Biology Institute is limited largely to mention of theoretical concepts in class while the more valuable laboratory training of the students is generally not done.

Almost all the teachers had access to a source of ionizing radiation where they could send seeds or other materials to be irradiated, namely,

the Puerto Rico Nuclear Cen:

irradiation sources in Rio Piedras and

Mayaguez. The main difficulty is transportation of samples from small towns that are not near either San Juan or Mayaguez.

S. Supplementary Information. To obtain additional information helpful to PRN in determining its role in training and support of teachers in Puerto Rico, a series of questions was added to the ABC-NSF Institute Evaluation Guide Questionnaire. The results are tabulated in Tables 10 and

The most frequently mentioned applications of the training received

were curriculum enrichment (32.6) and classroom demonstrations (22.2%).

In general, the ideas and concepts on radiation biology are mentioned to the students when appropriate during regular science classes. Demon-

strations are usually limited to showing the scaler ratemeter functioning

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Supplementary Information on, Utilization of Training,
Training Program, and Equipment

UTILIZATION OF TRAINING

2. How has the teacher

Curriculum: 3

Classroom demonstration 2

Not specific about

Science fair 8

Special a 7

Science 6

Civilian defines teaching 3

Teacher supervisor 3

?Total (based on 60 90

AB, or Ly not sure 3, 20

TRAINING PROGRAM (60 interview-tape)

a

ov on ot BR

8

tion alloy you to ada radiation

?solerce courses you teach? yee

Total 60.

Hee Me Ho angwor

1. Was St adequate? a

2. Were you able to retain

to feel confident in this area? 7 8 2

3. Was the labor story

enough for you to tour

HB equipment v4 2

Did you receive enough reference

material for your own use? Be 2

5. Sufficient enough reference

for your equipment use? 29a a

If NO, why not? e.g

English too difficult eS

Contents too difficult 6 206

Quantity not sufficient 9

Total, 29 200.0

EQUIPMENT KIT (60 interviews)

Bo Ho answer

2. Was St adequate for teaching

radio biology? 38 7

2. Is it now adequate? a 5 3

3. Is the equipment now working? 0 7 OB

U2 do you have radioactive source Bk

5. Would you like to receive additional

free radioisotope packages? 2 1 30

6. Would you like FRI? to service your

equipment? 3030

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?

Table 12

Possible Future Contributions of the Puerto Rico ticlear Center

(60 interviews)

Yes No Mo anaver

? __¥__?

2, Would you like a fim library available? 6 2 3

2, Does your school have a projector? 45 ae 3

?3+ Would you like HUW to prepare detailed

radiation biology laboratory exercise? 38 2 3

4, Would you like a bibliography of refer-

ence material on radiation biology? 57 ° 3

5. Would you like PRIC to make available

expert lecturers or consultants on

radiation biology to visit your school

and speak to the students? 67 ° 3

Do you think PRIC should keep the

Department of Education informed about

new developments in the teaching of

radiation biology? 67 ° 3

?Do you think PRIC should organize a

seminar for all former Radiation Biology

Institute participants? 67 ° 3

8, Would you like descriptive brochures

for the Puerto Rico Nuclear Center for

your students? on °

oe

---Page Break---

by using the radioactive sources provided with the kit. It has been

clearly established that the participants have made very limited use of

the free radioisotope packages (see above). Of the 60 persons interviewed,

UB (GOK) stated that the Department of Education allowed them to add

radiation biology to biology or

Junior Science courses; only one person

and he was not allowed to teach radi

ation biology and this could be

misunderstanding, ?The disportent point here 4 that radiation biology 4s not

dp the curriculm, and the individual teacher is completely on his om

+ hae been shown above that the

majority of teachers are working unier far fron ideal conditions (textbook shortages, inadequate laboratory facilities), which makes them hesiatant to undertake any task without receiving official support. Almost all of ?tne 60 teachers interviewed said that the training they had received was adequate, that they still felt confident in this area, and that the

Laboratory training was suffictest for them to use their equipment. About

half said that they did not receive adequate reference materials for

?thelr students. The reaso

8 elven were intufficient quantity (51.91), contents too difficult (20.6%), and English too aifricuit (27.58). This ?ig the second tine the Language problem yas mentioned specifically.

Most of the teachers agreed that the equipments provided is adequate

for teaching radiation biology, Cf the 47 answering the question, Wz (69.1) stated that their equipments 1s still adequate. On the other hand, 17 (36.28) sai that their equipment (scaier retener) was not functioning; in some cases it had not been fimctioning for several years. Pive people mentioned theft as one of the reasons why their equigment was no longer

adequate. The ick of

fe storage areas in the schools scons to be a

?2.

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serious problem throughout Puerto Rico, Many teachers do not keep the

equipment in the school, When they want to use it they transport it

from home. Obviously, this contributes to the over-all lack of use,

as it is a major task to move this equipment each time it is needed,

In regard to possible future contributions of the Puerto Rico

Nuclear Center, it is apparent: that the teachers are overwhelmingly in

favor of any additional help that could be provided. In regard to film

library services, 12 teachers (20%) stated that their school does not have

8 projectors, which precludes the showing of movies.

IMPLICATIONS OF THE INFORMATION RECEIVED

The training in radiology has been utilized only to a

limited extent by most of the Institute participants, This is primarily

because radiation biology has not been in:

incorporated into the school

curriculum, and therefore any effort

this direction is made by the

individual teacher without official support. Additional factors are

overcrowded schools and shortened school days, lack of basic materials such as textbooks, inadequate facilities for laboratory work, and a lack of safe storage areas for the equipment.

It appears that the Summer Institutes in Radiation Biology were

started in Puerto Rico prematurely. That is, the more basic problems of

the Department of Education have not been resolved, and no real effort

to incorporate radiation biology into the school curriculum has been made

during the past 6 years. This is true in spite of the fact that the

Department of Education was cooperating with the Puerto Rico Nuclear Center

in offering the last three Institutes, in which 52 teachers were trained,

AG the request of the Department of Baucstion the particspants in the last

23.

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Uhree Institutes were also trained to teach the Green version of the

BSCS high eehool bSology course. However, most of those interviewed

from this group stated that their training was not recognized by the

science supervisor or thst they

sre not provided with adequate

textbooks and materisis, es they hat been promised.

Im sumary, after the Sraining of 11% teachers during the past

6 yours in the basic fundamentals of raiiation biology, it 4s clear that

the application of this training to the actual teaching of students in

the classroom has been very Limited, To continue the program under

?these conditions does not appear to be justified.

RECOMMENDATIONS

1. The Department of Education

should recognize officially the importance of radiation biology in the science curriculum.

2. The Department of Education should take full advantage of the training and equipment received by the participants in the Radiation Biology Institutes.

3. Closer cooperation should be established between the Puerto Rico Nuclear Center and the Department of Education to explore ways in which PRNC can continue its efforts toward training teachers and introducing radiation biology into the schools.

4. Summer Institute Directors should make a greater effort to select

participants who have not had previous opportunities and who can give

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Fousonable assurance that they will return to classroom teaching after
the Institute,

9. Teachers who accept appcintaente to an Institute should recognize
and accept the moral responsibility for returning to classroom teaching
Amediately aftervard,

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APPENDIX 1

LBPTER GENT TO PARTICTPANTS BEFORE INTERVIEW

PUERTO RICO NUCLEAR CENIER

U. 8, ATOMIC ENERGY COMMISSION

cable Address: ?Address reply to:

Bio-Medical Building

Nuclear. Bfo Piedras Caparrs Heights Station

San Juan, Puerto Rico

00935,

In reviewing our records I noted that you participated in a Summer Institute in Radiation Biology in For the past three years I have directed these Institutes offered by the Puerto Rico Nuclear Center.

During the current academic year I am interested in visiting former participants at the school where they are teaching in order to evaluate the effectiveness of this program. I would sincerely appreciate your filling in the attached paper and returning it to me in the addressed envelope as soon as possible.

Sincerely yours,

Frederick E. Rushford

Director, Summer Institute

?in Radgation Biology

safe

Enclosures: As stated above

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ane:

eee

Hone address:

rs

Nane of school where you

are now teaching:

School address:

TS

ory Teiqhone

Hours during which you would be available for @ personal interview at your

?school:

NOTE: If you are not teaching, please let ue know as I an interested in
determining 4f the equipment you received ia being utilised ine school,
I would like to know the type of work you are now doing if you are no
longer teaching.

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APPENDIX TI

QUESTIONS ASKED DURING INTERVIEW

UUSABC ~ RBI

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ABC-NGP INSTITUTE EVALUATION GUIDE

IDENTIFICATION INFORMATION

Name (No initials, please)

Home address

High School or University address

Radiation Biology Institute attended Date,

other institutes attended, dates

University or college training: Major, minor, degrees, dates

What did you teach before participating in the Radiation Biology

Institutes

What do you teach now?

TL. INSTITUTE CARRY-OVER

L

Do you consider your participation in a Radiation Biology Institute

useful (consider factors such as new subject matter,

new teaching techniques, career benefit.)

Has your school administration been generally sympathetic toward

Incorporating radiation biology into your course work?

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To what extent have you been able to incr

wrporate the training

received in a Radiation Biology Instiwute into your teachis

one very Little » some ,

8 great deal .

Have you continued liaison with your institute director?

"To what extent?

ee

a

To what extent have you used your training in radiation biology in non-teaching activities, i.e, lectures to community groups, etc.?

eS

How has your training been of use with respect to science fairs, science

clubs, etc.?

ee

Would you enroll in a summer institute in advanced radiation biology?

iy?

With respect to the Radiation Biology Newsletter, do you receive it

regularly? - Do you find it of little use
of moderate use, » of much use, 2 How might it
be improved?

Estimate how much space (in square feet) you have and describe

briefly present facilities for using your kit. Is it adequate?

SSS

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o

1

How frequently is the kit used?

Taare por weeks

a per sae hae Fer theo! year

ae the eit been used in course otner than biology, i.e., physics

chemistry others

(be specific, please).

Mas the kit been used in research?

Wroset,

le your scaler rate meter functioning at presentt,

tive maintenance and repair of the equipment been « minor problent

@ serious problon? ,

Please rate thocce five instrusents frox the equipment kit in the

order of their value to you. (Use scale of 1 to 5 with Las

highest rating). Scaler rate meter electroscopes

» cloud chamber

spinthaloscope » autoradiography kit

Do you recommend additional items? watch?

Would you prefer the scaler rate meter available as separate units?

If the rate meter were portable, as separate units,

would it be preferred over the presently combined unit?

Estimate how much use you make of the rate meter (none-little-

some-considerable).

See

IV. RADIOTISOTOPES

L

2.

Did you order radioisotopes?

If no, why not,

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3. If yes, how many times aia you order the free packages?,

4. Dig you ever purchse radioLsotopest,

5. If no, did you obtain aaaits

1 free raatotsotopes

6. If yes, where dia you obtain then?

7. Do you have access to a source of ionizing radiation?

SUPPLEMENTARY INFORMATION

A. Utilization of training

Now has the teacher been able to use the training received,

2. Does the Department of Education allow you to add Radiation Biology to Biology or other science courses you teach?

B. Training Program

Was it adequate?

2. Were you able to retain enough to feel confident in this area?

3. Was the laboratory training enough for you to learn how to use the

equipment,

4, Did you receive enough reference material for your own use?

Did you receive enough reference material for your student's use?

Da. If no, why not?

Equipment Kit

Was it adequate for teaching Radiobiology?

2, Is it now adequate?

Is the equipment now working?

4, Do you have radioactive sources?

5. Would you Like to receive additional free radioisotope packages?,

6. Would you Like PRIC to service your equipment?

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vr.

POSSIBLE FUNURE CONTRINUTIONS OF THE FUBRTO RICO NUCLEAR CENTER

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Would you Like 9 film Library available?,

Does your school have a projector?

Would you Like PRNC to prepare detailed Radiation Biology laboratory exercises?

Would you Like a bibliography of reference material on Radiation

Biology. \$\$ _____?

?Would you Like PENG to make available expert lecturers or consultants

for Radiation Biology to visit your school and speak to the students?

Do you think PRC should Keep the Department of Education informed

about new developments in the teaching of Radiation Biology?.

Do you think PRNC should organize a Seminar for all former Radio-

biology Institute participants?,

Would you Like descriptive brochures of the Puerto Rico Nuclear

Center for your etudente?

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