

ACCRA MATHEMATICS CONFERENCE

December 17 - 21, 1961

I. REPORT OF THE CURRICULUM COMMITTEEA. Preliminary Remarks

Education in mathematics not only provides the student with a highly useful skill, but also with an opportunity for developing imagination, inventiveness, and self-discipline in the use of the mind.

Mathematics is far beyond the art of fast computation of compound interest. It is similar to a game in which the full imagination is applied to systems whose properties we are free to invent, and out of which a delicate and complicated structure is created.

It is by nourishing this "mathematicians's delight" in mathematics that we can hope to achieve much more than the familiarity of the pupil with those concepts and methods of mathematics which find application in daily life. We can develop in him objective criteria for the distinction between true and false statements, deriving all the benefits of experience with unemotional problems. He will develop methods for checking statements for internal consistency; he will learn how to select models which test the essential points of an argument; he will learn to generalize from experience with a limited sample and to check his conjectures.

Education in mathematics rarely, however, has the objective of training professional mathematicians. Rather, its objective is to make pupils not simply competent at computation in a routine sense, but also to make them intelligent in their computation. Such intelligence can only be produced by giving the student a comprehension of the structure and operations that provide the underpinning of computation. If this were the only reason for teaching students something beyond routine skills, it would be sufficient. But there is surely a deeper reason for teaching mathematics. For mathematics has been a persistent and rich

contributor to human culture through the centuries, and just as one is cheated of a cultural heritage by failing to be acquainted with poetry, so is he cheated by failing to become acquainted with the deep delights of mathematical order.

B. Primary Grade Sub-Committee

The primary grades sub-committee of the curriculum committee makes the following suggestions to the plenary session.

1. That the Ways and Means Committee consider the holding of additional demonstration classes for interested teachers in various teacher training colleges in East and West Africa during the next six months, if invitations to give such classes are received.

2. That the Ways and Means Committee consider the formation of a writing group for Primary One during the summer of 1962. The efforts of this writing group should be directed toward the production of an enriched text and teachers' manual to be tried out during the academic year 1962-1963 in a small number of classes in those countries that desire to participate in the project. The writing group should be broadly representative of the participating African nations and should contain primary grade teachers, professional mathematicians, and members of teacher training college faculties and examining bodies. This group could begin with the construction of a general curriculum framework for mathematics in the primary grades before undertaking the actual writing of the text for Primary One. After the text has been used by a small number of classes in the participating African nations, it should be revised in the light of criticisms and experience. The sub-committee considered the question of what languages the text should be written in. It was felt that this matter would depend upon a number of factors including particularly the relative interest of various national and regional groups participating in the project.

The sub-committee makes this recommendation for a writing group for several reasons. In the conventional treatment of primary grade mathematics,

skills are learned by rote, in isolation from each other. Mathematical concepts are almost totally absent, and there is not sufficient challenge to the development of the thinking capacity of the child. The familiar gap between primary and secondary school mathematics is only one undesirable consequence. Our recommendations are intended to achieve the following objectives: (1) to foster understanding of and insight into the ideas and techniques of primary mathematics; (2) to give a unified treatment that gradually refines and generalizes the elementary concepts, and leads naturally to secondary school mathematics; (3) to stimulate the development of the child's thinking skills and imagination by using new approaches in the study of mathematics.

3. That the Ways and Means sub-committee explore methods of fostering cooperation between African and foreign universities in the study of research problems in the teaching of mathematics and in methods of testing.

C. Secondary School Curriculum Sub-Committee Report

Our principal criticism of the present secondary school mathematics curriculum is not that the topics treated are inappropriate, but that they are treated in a formal and unimaginative way, with excessive emphasis on solving set problems. We are convinced that this situation can be improved, and that experiments going on in other parts of the world deserve careful attention. The SMSG materials are an example.

We make three recommendations:

1. We recommend that SMSG materials be distributed to Ministries of Education, Institutes of Education, university mathematics departments, and participants in this conference. We suggest that Ministers of Education distribute copies to schools and individuals that will make the best use of the material.

2. We recommend that Ministers of Education, in collaboration with university mathematics departments and Institutes of Education, consider

running vacation courses, at which secondary school mathematics teachers would study SMSG materials.

3. We recommend that a study group be set up for the purpose of improving the secondary school mathematics curriculum. The improvements may consist of SMSG and other existing materials. It may ultimately be necessary for the study group to prepare new materials for use in secondary schools.

D. Report of the "Transition" Sub-Committee

Examinations play an important role in nearly every educational system since they afford the criteria by which students are judged to have achieved the objectives of the educational program. The examination system is particularly significant for the African nations since the examinations perform a very highly selective process. On the basis of examination results only a small proportion of the primary students will enter the secondary program and likewise a very small proportion of the secondary students will go onto university work. Furthermore, other examinations serve to determine the students selected for training in various technical and trade activities. Accordingly, the examinations should be of the most effective instruments possible for selecting the students best qualified for further training. It follows that any changes introduced into the curricula to make the educational program more effective should be accompanied by a corresponding development in the examination system. Otherwise the examination structure itself may prevent the introduction of needed curricular reforms. In particular, new examination forms should be introduced on a small scale so as not to interfere with the existing examination schedule.

Much research and study is being carried on in various countries concerning the role of examinations in educational systems and the development of effective tests. The Educational Testing Service in the U.S. has been particularly active in this field and the results of their experience and research as well as experience of comparable organizations in other countries could be made available

to the appropriate examination groups in Africa.

Examinations in mathematics must test several aspects of mathematics proficiency. Some of these are the following:

- (a) Computational skill
- (b) Factual knowledge
- (c) Comprehension
- (d) Flexibility (ability to adapt mathematical methods to novel situations)

The present examinations strongly emphasize the testing of items (a) and (b). As such, they have been effective in maintaining high academic standards in the African schools. On the other hand, they may not be as successful in selecting students with broad capabilities for further mathematical work as other types of examinations stressing the testing of understanding, comprehension, and flexibility. Thus it is the consensus of the sub-committee that a comprehensive evaluation of the examination system in relation to the aims and objectives of the educational program is needed.

As a means of accomplishing this objective it is suggested that effort be made to convene a meeting of representatives of the West African Examination Council, the Cambridge Examination Syndicate, and any other relevant examining bodies together with the chief educational officers of the African countries and leading experts from abroad to examine the objectives and effectiveness of the present examination system and to define objectives and requirements for the future. This group should have available the results of preliminary study and research in the various countries on the effectiveness of the present examination system in testing the various aspects of mathematical proficiency. They should also have available the latest data on existing test instruments and methods.

In order to get such research underway, it is suggested that a team composed of African experts and experts from abroad be formed to study the

effectiveness of the present examination system. Such a team, or a comparable one, might also study methods for test construction which will minimize the effect of language and cultural differences. A preliminary step might be an immediate project by the Educational Testing Service or comparable body of the language problem.

In order to stimulate the interest of African educators in the problems of test construction it is suggested that support should be sought for a fellowship program which would enable representatives from various African countries to spend sometime at the Educational Testing Service, or comparable organization, to become familiar with the latest methods and techniques in the educational testing field.

Proposals

(1) The present system of examinations at the primary and secondary level should be comprehensively evaluated in terms of their objective and effectiveness.

(2) Such an evaluation might be undertaken by a team of experts from Africa and abroad in collaboration with relevant examination bodies.

(3) Preliminary to such a study, immediate pilot research should be undertaken by the Educational Testing Service or a comparable organization to study methods of test construction which will minimize linguistic problems.

(4) Support should be sought for a fellowship program which will allow representatives from the various African countries to spend some time at the Educational Testing Service or a comparable organization to familiarize themselves with the latest methods and techniques in the educational testing field.

(5) A conference should be convened of chief educational officers and leading African and overseas experts to consider long-range modifications in the system of examinations.

Note: The Annual Reports of the West Africa Examination Council should

be used in determining present objectives of the examination system.

II. REPORT OF THE COMMITTEE ON TEACHER TRAINING

A. General Principles

1. All programs should be based on a realistic appraisal of background and needs.
2. Outside assistance should aim at Africans most likely to provide active and continuing leadership in the development of mathematics teaching.
3. It should be made clear that the Africans will plan and make changes in curriculum and methods. Others can help provide the necessary background material and information upon the invitation of the governments and institutions involved.
4. When there are deficiencies in mathematical knowledge opportunities must be provided for further study.

B. Proposals

1. We take note of the provisions being made for teacher training under the Commonwealth scheme and we would hope that in the reviewing of the scheme, special consideration should be given to the provision of facilities for those who are concerned with the teaching of mathematics. In particular, we urge that the students specializing in mathematics be put in one or more groups so that more advance can be made than under the present system where subject areas are mixed.
2. That a program of institutes on a large scale be organized comparable to the recent efforts in the teaching of English in Nigeria done by a team of 150 teachers from the U.K. These institutes should be 4 to 6 weeks in length.
3. That visiting lectureships be established in teacher training institutions near universities. This would in each case involve two persons familiar with the newer mathematical materials and methods who would:
 - (a) present the background material (including subject matter when necessary)

- (b) establish a demonstration center for experience, observation, and evaluation.

The purpose would be to generate interest and enthusiasm as well as to provide factual background in regard to the newer ideas in the teaching of mathematics. Six possible locations are: Accra, Ibadan, Zaria, Nsukka, Kampala, and Freetown.

- 4. That one or more teams of lecturer-demonstrators be formed to visit other teacher training institutions on a short term basis to stimulate interest in the new curriculum developments.
- 5. After the assessment of pilot studies, a selected group of African teachers at teacher training colleges should be chosen to receive a year of training in the USA to get experience not obtainable in Africa. In particular:
 - (a) to see some of the problems of getting teacher and administrative acceptance of the new programs in the USA
 - (b) to see the differences in classroom environment and students in Africa and US schools so that necessary modifications of US methods and materials might become more evident.
- 6. We suggest the immediate carrying out of some exploratory work on teachers training in selected teacher training colleges and universities in Africa. This would involve the appointment of a visiting lecturer familiar with the newer mathematical materials and methods to work with the teachers at these institutions in exploring possibilities for future action.

III. REPORT OF THE WAYS AND MEANS COMMITTEE

A. Plans and projects for Spring 1962 (January - June) (based upon requests from persons or regions concerned).

1. Ghana (Primary)

(a) Arrangements have been made to have ten classes (with their regular local teachers) in and near Accra try out Primary One material from the Stanford University Experimental Arithmetic Project during the period from the latter part of January through June, 1962.

(b) Misses Shirley Hill and Ann Boyle of the Stanford Project will go to Accra around the middle of January to work with the teachers. Miss Boyle plans to spend approximately three weeks there and Miss Hill, one month with probably a week's absence for demonstration classes in Ibadan. At regular intervals thereafter one person from the Stanford Project (Miss Hill, Miss Boyle or Mr. Suppes) will spend a week in Accra working with the teachers.

(c) It is proposed that Miss Charlotte Wiredu, Winneba Training College, Winneba, Ghana, be invited to Stanford in the spring of 1962 to visit classes there and to work with the group there.

2. Nigeria, Ibadan, Western Region, Wesley College (Primary)

Mr. J. O. O. Ojo has requested that Mr. Harlan Bartram (or another representative of the University of Illinois Arithmetic Project) come to Wesley College for two weeks in February to conduct demonstration classes and to work with the mathematics teachers in the Teachers Training College of Wesley College, and with the persons there training to be primary teachers.

Mr. Ojo would also like to have syllabi and other pertinent literature sent to him in advance.

It is also suggested that Miss Shirley Hill visit Wesley College and work in the same way as Mr. Bartram. This visit is tentatively scheduled to follow her next visit to Accra, in early February.

3. Nigeria, Lagos - Ibadan (Secondary)

Messrs. C. O. Odunkwe of the Federal Emergency School, Lagos, and J. C. Oyelese of the University College, Ibadan, have proposed a two-day conference for late January, with a steering committee consisting of the two of them plus Messrs. O. Offurum, King's College, Lagos, and N. O. H. Setidisho, Institute of Education, University College, Ibadan, and one further person from Ibadan. The Committee would invite other participants to the conference. The purpose of the conference would be to consider the Secondary School Mathematics Curriculum with particular emphasis on the first year (corresponding to Grade 7 in USA). The School Mathematics Study Group material would also be reviewed.

The plan is to follow the conference with work sessions, preparing and revising material, on Saturdays, alternating between Lagos and Ibadan.

(Five complete sets of current SMSG material have been sent by air freight, December 26, 1961, three to Mr. Oyelese; and two to Mr. Odunkwe.)

4. Nigeria, Owerri, Eastern Region (Secondary)

Mr. C. N. Okosi, Government Secondary School, Owerri, and two associates plan to submit a proposal similar to the one planned by Messrs. Odunkwe and Oyelese. It was suggested that this group concern itself mainly with the second year of Secondary School mathematics (corresponding to Grade 8 in USA).

(Three complete sets of current SMSG material have been sent by air freight, December 26, 1961 to Mr. Okosi.)

5. Sierra Leone, Bo and Freetown (Secondary)

Messrs. Smith and Lieb of Fourah Bay College will act as joint supervisors for the following activities:

Three graduates carrying out studies for the Diploma in Education will teach SMSG material in junior classes, one at Bo Government School (W. Conton, Headmaster), two in schools to be arranged in Freetown.

Mr. Smith will supply details as soon as he has completed arrangements.

Some lessons will be tape recorded and the tapes will be available in March for assessment.

6. Sierra Leone, Freetown

Mr. F. B. Harding of Freetown Teachers College plans to make proposals for a project at Freetown Training College which will probably be similar in character to that proposed by Mr. Ojo for Wesley College, Ibadan.

7. Uganda, Kampala (J1)

A pilot project is being set into motion immediately to explore revisions in Junior Secondary mathematics teaching in Uganda. Operating within the framework set by the syllabus for the Junior Secondary schools (US 7th and 8th grades,) Madison Project working jointly with Miss Lyn McLane of the Makerere College Demonstration School is working on ways of presenting existing syllabus topics in a way to increase mathematical insight while at the same time maintaining required mastery of arithmetical skills. The project is under the general supervision of Mrs. Moira Harbottle,

Head of mathematics instruction and teacher training at the Institute of Education at Makerere College.

Miss McLane has come to the United States for the month of Christmas holidays and is working with Mrs. Beryl Cochran and Dr. Robert Davis of Madison Project on instructional sequences for Junior Secondary I and will return in mid January to begin teaching by the techniques currently being devised. A first preliminary report of this work will be prepared for the late March meeting scheduled in Ibadan, Nigeria. Revision of the Junior Secondary curriculum will continue until summer through collaboration between Miss McLane and the Madison Project. Should it appear advisable, Mrs. Harbottle will come to the United States in April or May to observe the classroom techniques employed in the Madison Project.

If the experimental curriculum revision and teaching this spring seems successful enough to warrant it, a member of the Madison Project will go to Kampala for six weeks during the summer to aid Mrs. Harbottle and Miss McLane in a teacher training program that is routinely scheduled for Junior Secondary teachers during July and early August. The program will be organized in terms of the new approach to the Junior Secondary syllabus being formulated this spring.

Again, pending an estimate of the success of the effort further plans will be made for the year following.

8. U.K., London

Miss Doris Lee, Institute of Education, University of London, will take a group of African students in the E. T. A. Department and introduce them to some of the material and approaches in use in the U.K. and U.S.

These students will be postgraduate students studying for the Postgraduate Certificate in Education or experienced non-graduates doing special courses.

(Two complete sets of current SMSG material have been sent by air freight to Miss Lee, December 26, 1961.)

9. U.S.A., Princeton, New Jersey

The Ways and Means Committee strongly endorses the proposals made by the "Transition" Subcommittee (Part 1 D of this Report) and in particular would be glad to cooperate in efforts to convene a meeting as outlined in Part I D to examine "the objectives and effectiveness of the present examination system and to define objectives and requirements for the future."

The Ways and Means Committee will help get the necessary preliminary study and research under way before the meeting is scheduled, and will endeavor to obtain formal support for the preliminary work and for the meeting.

Mr. R. P. Dilworth (on leave at Princeton) will explore with Educational Testing Service in Princeton some of the recommendations made by the "Transition" Sub-Committee.

B. Ibadan Meeting, March 21-March 23, 1962

1. A meeting is being arranged in Ibadan in March 21-23 to receive reports of the various activities then underway in West Africa, and to make further plans for future activities. A representative from each of the groups actively at work in West Africa will be invited. Messrs. L. J. Lewis and W. T. Martin of the Ways and Means Committee, and Jerrold R.

Zacharias, Chairman of the African Education Program will attend.

The tentative schedule is as follows:

Wednesday, March 21	5:00 - 6:30 p.m.	Report Session
Thursday, March 22	8:30 - 12:30	Report Session
	2:30 - 4:30	General Discussion
Friday, March 23	8:00 - 12:30	Individual Consultation

Mr. Lewis, Mr. Lucas of Makerere College, Kampala, Uganda, and others plan to be in Ibandan on another matter prior to the March 21 - 23 Ibandan meeting. At that time Mr. Lucas will be asked to report to Mr. Lewis on the activities in mathematics then underway in Kampala.

C. Plans for Summer 1962

1. The Ways and Means Committee endorses the recommendation of the Primary grade sub-committee that a writing group for Primary One be formed for the summer of 1962, with participants as described in that report.

2. The Ways and Means Committee recommends that a writing group be formed for Secondary School Mathematics, for the summer of 1962 preferably in East Africa. The year or years on which the group would concentrate its efforts should be determined after reports have been received in March from the various groups then at work on Secondary material.

3. The two writing groups should work at the same location in close communication with each other. They should make use of the work of the various groups described in Items 1 through 7 of the preceding section (III A, 1-7)

4. Both writing groups should aim toward the production of enriched texts and teachers' manuals to be tried out during 1962-63.

D. September 1962 - September 1963

The material produced by the writing groups should be tried out in a small number of classes in those African countries that desire to participate. The material should be revised in the light of criticism and this experience, and further writing should then be undertaken.

E. Other Plans

(1963--64) Mr. Roy Dubisch of the University of Washington, Seattle, Washington, U. S. A. , has proposed that there be an Institute at the University of Washington during the academic year 1963-64, under his supervision, with 25-50 participants consisting of teachers in Teacher Training institutions in Africa. The Ways and Means Committee endorses this proposal. Details of his proposal are as follows:

(a) Criteria for selection

- (1) Fairly able with English language
- (2) Homogeneous in regard to mathematical level of training (the exact level is not too important).
- (3) Should be potential leaders
- (4) Two or more should be selected from any one area to avoid isolation

(b) Number of participants: 25 - 50

(c) Program

- (1) A regular university course in mathematics chosen with regard to participant's background
- (2) A regular university course in , say, Physics or Chemistry also chosen with regard to participant's background

(3) A continued course in methods, and materials of the newer mathematics curricula (including films, models, Cuisenaire rods, etc.)

(4) Observation and participation at local schools

(d) Location: University of Washington

Reasons for:

(1) My experience at this conference

(2) Flexibility of our teacher training program and the spirit of close cooperation between the mathematics and education departments

(3) Wide variety of newer materials used in the schools of the area: SMSG, Illinois, Cuisenaire rods, etc.

(4) Wide variety of types of school districts (metropolitan, rural, etc.)

(e) Selection Procedures

(1) Preliminary selection of, say, 150 potential participants locally.

(2) Personal interviews by me for final selection. (At the same time I would get some idea of the institutions from which they come.)

(f) Time: 1963--64

2. Mr. Lewis will be seeing Mr. Taylor and will discuss with him

(a) Cooperation in Nigerian programs

(b) Development of a testing research center

3. Mr. Lewis will inform Sir Christopher Cox and Sir Andrew Cohen of progress and pursue with them the question of a British financial contribution.

4. Mr. Smith of Fourah Bay College will make informal contact with mathematicians in Liberia on his way to Ibadan in March, or earlier.

Dakar discussions (December 23 - 24, 1961)

Following the Accra conference a small delegation traveled to Dakar to inform interested persons at the University there of the work that had been accomplished and that was being planned. This was felt to be of particular importance since no representative of French-speaking Africa had been at the Accra meeting. Accordingly, a meeting was arranged in Dakar with M. Robert Faure, Professor of general mathematics at the University of Dakar; with Madame Madeleine Collomb, Director of the Center des Etudes Pedagogiques; and with M. Henri Collomb, Chief of Neuropsychiatry of the Faculty of Medicine.

M. Faure was duly informed of progress, expressed a keen interest in seeing new American curriculum materials, and noted that the problems that the conference had discussed in Accra were the very problems that concerned mathematical educators in French-speaking Africa. Materials and reports are being sent to Prof. Faure.

Both M. and Madame Collomb expressed strong interest in collaborating in any research enterprise on the nature and conditions of learning and intellectual development in African school children. Some research has been in progress there both at the University and under the sponsorship of the small but active Societe Africaine de Psychologie, of which Madame Collomb is Executive Secretary. Plans for further contact

were made in the hope, also expressed at the Accra conference, that a collaborative reserach program on the improvement of teaching and learning can be got underway in Africa. Professors Bruner and Suppes will explore next steps to be taken in the US, Professor Lewis is to explore possibilities with Professor Andrew Taylor at the University of Ibadan. A preliminary proposal will be prepared for the review meeting of the group to take place in Ibadan in late March.

5. P. S. S. C

Mr. Hockey (Fourah Bay College) is to be invited to ask Mr. Taylor (Ibadan) to release Mr. Paul Merrick on May 1 so that the latter may spend a week in Freetown demonstrating P. S. S. C. material. Mr. Lewis will write to Hockey before the latter proceeds to USA in January.

F. Note to Participants in the Accra Conference

The Ways and Means Committee would be very glad to learn of any further activities which participants plan for the coming months. It is the Committee's hope that many of the participants will have matters related to the work of the conference which they wish to pursue. The Committee stands ready to help in any way it can.

Suggestions and proposals for projects may be addressed to

African Education Study
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December 17 - 21, 1961

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