Final Report by H. Tvermoes, Professor of Mathematics at the Universi of Liberia.- Report for the Year 1954.

On the 15. December 1953 I arrived in Liberia, but no teaching was undertaken until the 4. January, when a "teachers training" course wa kept. Native teachers from different parts of the country came to hav brushed up their knowledge and to learn some more. The course was kep at the University and lasted till 31. January; my counterpart teacher taught about 16 students geometry and I taught them algebra. Only ver elementary matters could be understood, and even here their knowledge was poor; but allready now I saw that most of them really wanted to learn, and they worked with great interest. I think they got much goo from this course and will absolutely recommand not to give it up; it should be kept by the Unescoexpert or another qualified teacher, even although it is not exactly University teaching.

In the beginning of February the teaching at a high-school, connec ed with the University and controlled by the University faculty opene This school is meant as a pattern for other high-schools, an excellen idea. Here I listened to some hours of mathematics and suggested that neither of the two subjects algebra and geometry be dropped for some time (and forgotten) when first begun. That was how it was, but I was promised by the faculty it would be changed form next year on.

The 22. February the teaching at the University began. I taught ac cording to this schedule

	22/2 - ca. 15/9	15/9 -15/11
first year ("Freshmen")	Algebra	
second year ("Sophomores")	Plane geometry	Trigonometry
third year ("Juniors")	Analytical geometry	Calculus

(the students of the fourth year are called "seniors" and graduate when they pass their final examination).

1. Algebra was taught from its very beginning; all formal axioms and their corollaries were discussed, but of course in a practical way, the letters meaning rational and later real numbers. Equations o the first and second degree , roots logs and powers were treated. log was defined by the functional equation $\log(xy) = \log x + \log y$, and a^x, x real, as antilog (xloga) . This abstrct looking, but rather short way, prooved very satisfactory.

2. Plane geometry was also treated by means of axioms and, so far as possible, strict proofs on basis of them. Of course geometry was made intelligible, but to rely on this only would not be mathematics. Elementary theoreme about triangles, quatrilaterals and circles were taught in a systematical way.

3. Trigonometry. Definitions of the trigonometrcal functions sin, cos, tg and cot were first given in a way applicable for all angles, later they were investigated for angles of triangles. Relations for right triangles were prooved and applied. Of course use of tables was excercised very much.

4. Analytical geometry. Here we only came as far as to the theory of the equations of straight lines and circles in their variuos forms and examples and applications of this; interception of different curves was found.

5. Calculus. Only differential calculus, not integration was taugh

and the students were taught very thoroughly the definition and meaning of the differential quotient. They learned how to differentiate $y = x^r$ for any rational r, and also polynomials, products and fractions. By means of this they were taught how to draw curves, using tangents in some points. More advanced calculus and some analytical geometry are supposed to be taught in the senior class next year.

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For my successor I should like to observe about the pattern and organization of work in the mathematical department: The students are taught 5 hours a week in all classes from about 20/2 till about 15/11; there is vacation 15/7 - 1/8 and examinations or tests 4 times a year, final 10-15 November. No.s 2 and 4 have to be passed, else they must be passed later. Furthermore sophomores and seniors have a "comprehensive examination" in October. For the seniors this examination is only considered a hint for th faculty, but in connection herewith I would mention a circumstance which I declared I wanted to be changed: Mathematics is (together with English) compulsory in freshmen- and sophomore-classes, but not later. Now all students must go to the comprehensive in maths, even if they have not had it for about 2 years and thus forgotten everything, so that the comprehensiv tells nothing and is just waste of time.- The marks given at all examinatoins are A,B,C,D and F(failing) . With F in two subjects they will fai. the examination, but rules are sometimes discussed by faculty. Beside marks,"credits" are given, usually one for each hour a week, yet only 3 for maths each of the two first years, as 2 of the 5 hours are considered auxilary because of the particular poor background in maths. A minimum number of credits in all is demanded, and absence will give decredit. All examinations are written and are applications of theorems, not proofs, but sometimes mentioning definitions. Yet the teacher may, of course, to some extend, have this his own way.

Maths is att ended by about 45 freshmen, divided in 3 classes, 4o sophomores, divided in 2 classes, 15 juniors and 10 seniors. There is also 'preengineering class" and the professors may give other courses than the scheduled, but I doubt this is advisable (with the exception mentioned in the last paragraph). Final examination for seniors was passed by about 10 students with maths. Of my students only two, I think, will be qualified for teaching at the end of their studies. There were 5 teachers of maths, teaching 15, 13, 5, 5 and5 hours a week respectively.

The main difficulty with which my successor will be faced in his university work will surely be this:- In spite of the student's poor background, Mr. Stubblefield, an American exchange professor and other teachers want to teach the students diffucult things like advanced calculus and probability or give them too difficult examination problems (and then let them pass even with very bad answers). They do not seem to realise the importance of the foundation, and therefore the examination answers are are sometimes very bad, almost all mistakes being in the elements, not in the mor e advanced matters, which they learn by heart without real understanding. Mr. Stubblefield is the main representative of the superficial way of teaching, and as he knows the whole routine of the University, he has a great influence. The new Unescoexpert should be the so called head of the mathematical department and control him as far as possible. - In the beginning I felt that the above mentioned way of teaching was completely wrong, one should begin with the elements and make the students quite familiar with them, and then go on gradually, always checking their elementary knowledge. I still think you should stick to this way, but there are two reasons for not being too strict. One is that the students g get tired of always talking about the same, and another is, that the poor

results, which anyway must be feared, will be said to be due to your wrong methods. It is likely, that any attempt to decrease the syllabi will result in long discussions and still be unsuccessful, and the work will be damaged. Of course much depend upon the new president of the University. I think you should try a compromize, and I would recommend this: leave the syllabi as they are, but claim that they be not increased, drop everything not absolutely necessary and make the problems so, that the theorems taught can be directly applied. Do not use too difficult numbers. If the number of hours per week could be raised, it would be a very happy thing. I have myself suggested that, but it will meet with opposition from several sides.

About the students it must be said, that most of them are willing to learn and very grateful when they feel they understand. They do not overestimate themselves, but the mathematical difficulties also teach them not to. You must be very patient and give the students plenty of examples on the blackboard and for themselves before and after a theorem is treated. They should have much homework, but only in matters well exercised before, else many answers will be meaningless. Also in the instruction problems you should begin with easy numbers, as else arithmetical difficulties will disturb the understanding of the problem itself. Often elementary things must be repeated on higher levels, for example, I had to use 2-3 hours in the junior class to teach equation of second degree, which most of them had forgotten. Every new concept, f/i. coordinate system, limit, differential quotient etc. uses a very long time before it is familiar to them. I think one should check their presence daily, else it will be a temptation for the students not to come, as the hot climate makes even the natives tired, it need not exactly be lack of interest. - It would be very good if 2 or at least one qualified teacher came as assistent under guidance of the Unesco-expert to replace some of the teachers being.

One of the most essential things is to find out which of the students are able to teach after having finished their university work. - some of them, and some others, who have graduated will surely ask you to give them lessons outside the University, and also students, who do not understand what they are taught by other teachers will come to your place and ask for help. I myself gave it to all students that met regularly. As a whole, very few of thr students understand the foundations so well, that they can teach others, but the standard is slowly improving, and if they only do not expect too "quick results", a common phrase here, but work systematically and thoroughly, the results may perhaps come a little quicker than you would expect.

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