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NONCAPITAL PROJECT PAPER (PROP)

Country: World-Wide Project No.: 931-11-570-~~820~~⁹²⁴
Submission Date: 2/10/71 Original: X Revision No.: //p
Project Title: Computer Assisted Training in Population Dynamics and Economic Development

U.S. Obligation Span: FY 1971
Physical Implementation: Two ~~One~~ Years

Gross Life-of-Project Financial Requirements:
U.S. Dollars \$282,000

A. SUMMARY

The main objective of this project is to encourage middle- to top-level political and professional leaders from the IDCs to recognize the consequences of rapid population growth for national development.

In order to do this, it is proposed that the Program Logic Automatic Teaching Organization (PLATO) system developed at the University of Illinois be utilized for the visual display of population variables as related to economic and social development variables. The PLATO system has four main parts: (1) population and social and economic data programmed and stored in a computer; (2) a keyboard wired to the computer; (3) a T.V. screen for visual presentation of data; and (4) an instruction manual for operation of the keyboard and provision of simple population and development concepts. A layman is able to rapidly learn how to use this system in order to explore the consequences of population growth for his own country. The system is set up with a standard set of exercises which show the student how to operate the system as well as giving him basic concepts, such as the fertility rate, GNP, etc. and basic data for his country taken from the most reliable sources available. These data are projected on the T.V. screen and the way they change over time is plotted on a graph which appears on the screen. Later on the student can begin to ask questions of the computer to see what the effects of different assumptions or changed conditions would be. Thus, for example, the impact of lower fertility may be demonstrated. These data which appear almost instantaneously on the screen may be reproduced on a sheet of paper for the student to retain and use later.

The advantages which this system offer are:

1. The participant works with data from his own country rather than data from another or imaginary country;
2. Results are presented visually in one second or less;

3. Any of the demographic/economic variables or assumptions can be changed by the participant by merely pushing a few buttons;
4. A reproduction of any set of data projected on the T.V. screen is made automatically for the participant's later use and analysis.

The project calls for the expansion and refinement of existing course materials; their computerization and the preparation of an accompanying workbook; instruction of up to 300 participants annually for one to five days for five years; the development of an evaluation program to measure the efficiency of the course; the development of a graphic print-out system (multi-floxing plotter); and the preparation of a full description of the underlying economic and demographic assumptions and the programming methodology. ↙

B. SETTING

The University of Illinois has spent 10 years in developing the PLATO system and has experimented broadly in the use of this system for teaching purposes. At the present time the University teaches more than 50 courses in some 10 different disciplines using the PLATO system.

The basic hardware consists of a CDC 6400 computer, previously programmed, and 20 terminals, each with a T.V. screen, which can accommodate 40 to 60 students simultaneously. The proposed course in Population Dynamics and Economic Development has been developed to a demonstrational level and now must be expanded and refined to make it suitably operational to satisfy A.I.D. objectives.

Even though the course in Population Dynamics and Economic Development is still in an early developmental stage, it is currently available and has been used. In October of 1970, some 20 participants in the Government Affairs Institute program took the course for two days. In December of 1970, a NESAs employee took the course for two days prior to assignment in India. It is anticipated that during the next few months several A.I.D./W employees will take advantage of the course on an ad hoc basis.

Problem (There are many countries who either have not as yet recognized the critical importance of population limitation, and therefore, have not sponsored a family planning program, or have recognized it to only a limited degree and therefore have not put family planning high enough on their scale of national priorities. Until LDC's are convinced that rapid population growth

does in fact pose a serious threat to the well-being and development of their country in much the same way that political upheaval or famine would, suitable policies of population control will not be instituted. It is imperative that leaders in LDC's be made fully aware of how rapid population growth interacts with the economic and social variables and what consequences may result therefrom. The University of Illinois course in Computer Assisted Instruction in Population Dynamics and Economic Development would provide A.I.D. with a unique method to attack this problem of education and population awareness. Even in its present preliminary stage, this course exhibits tremendous potential to influence attitudes. The material and method of presentation are sufficiently stimulating to enable the participant to project himself into the subject and become personally involved. There is both an emotional and intellectual excitement triggered by this method of instruction which encourages deep thought and interest in the population question. One of its outstanding features is to show in immediate visual form what effect any given policy decision might have on population growth and economic and social factors. This can be done using existing growth rates or any chosen growth rate including zero or a minus growth rate. It can be done by using any number of different program variables. It can be seen, for example, in the space of a few minutes, that if the United States today were to enforce a policy of only two children per family, which is below the replenishment rate, that the population would continue to grow for about the next sixty years. Not until around 2030 would the growth become zero and start to decline. To reduce the population back to its 205 million of today at this rate would then require more than one-hundred additional years (holding death rates constant and disregarding migration). If one wishes to study the effect of other variables either as alternatives or in combination with each other, this may also be done within the limits of the data available in the computer. Thus, for example, if you wish to limit the number of children to two and at the same time raise the age of marriage to twenty-five, you can show how these two factors will effect population growth. If in addition to this, you wish to assume increased health conditions, which lower the existing death rate and raise the child survival rate, this may be plugged in and the effect of all four variables can be studied in combination with each other.

Obviously, the projections can be no better than the data itself. However the best data obtainable can be stored in the computer and changed as additional information becomes available. Assumptions and limitations of these data would be identified and cautions provided regarding their interpretations and use.

The University of Illinois with more than ten years of experience in Computer Assisted Instruction (CAI) is doing developmental and experimental work in CAI ranging from college courses to courses for "slow learners", remedial courses and regular courses at the primary school level. With the support

of \$600,000 from the Department of Public Instruction of the State of Illinois, the University of Illinois will expand its facilities with some 4,000 T.V. terminals to provide CAI to the public school system within a radius of 150 miles of Urbana, Illinois, including almost all of the City of Chicago. In addition to these courses, the University of Illinois is developing a population/economics course for Computer Assisted Instruction with graphic presentation on a television screen. These components are particularly appropriate to help meet some of the education/awareness needs of the A.I.D. population program.

OUTPUTS

Computer specialists from the National Bureau of Standards and the Bureau of the Census have examined the proposal and were all favorably impressed with the computer technology. Dr. Nathan Keyfitz, University of California, Berkeley visited the University of Illinois installation on two occasions and is quite familiar with the demographic elements of the proposal. Dr. Keyfitz has expressed very strong approval of the demographic methods used, of Dr. Handler's capabilities and of the total innovative approach embodied in this proposal.

PLATO is a time-sharing, computer-based educational system. This means that it can produce the mathematical calculations which are basic to demography for each participant simultaneously. Moreover, the participant using the results of the calculations can, depending on his interest and mathematical sophistication, follow every detailed step of the mathematics, follow the calculations superficially, or ignore them completely. Experience can be transferred to the participant without recourse to tedious calculations.

The PLATO system allows each participant to work independently on the country and variables of his choice. The student does not have to extrapolate from a handful of examples offered by a lecturer. He can choose his own examples and immediately see exactly what would happen to his country under this choice of conditions. Moreover, the material is presented in the form of simple, attractive, computer-generated graphics. The infinite flexibility of the computer, whereby the various combinations and permutations of demographic, economic and social parameters can be calculated for different population situations provides an ideal tool for efficient and effective teaching of groups of foreign participants, visiting foreign dignitaries such as directors of family planning programs, ministers of finance, health, etc., as well as A.I.D. personnel. Finally, by providing insight into the future, the PLATO system has the potential to motivate people to act.

C. STRATEGY

With funds made available under this grant, staff would be provided so that the course in Population Dynamics and Economic Development can be expanded to incorporate a number of additional features which would provide added breadth and scope to the impact on participants.

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First, textual materials would be developed. The textual materials will be carried away by the student for further study and analysis. It will contain definitions used in demography and economics and will provide explanations for a better understanding of population changes when coupled to a broad range of economic and social variables.

Second, additional inputs for A.I.D. countries, insofar as they are available in reliable form, would be programmed in the computer. An illustrative list of these additional inputs might include such things as Gross National Product, personal savings, productivity, per capita income, national income, labor force data, health, education, welfare data and dependency ratios.

Third, an evaluation of the course effectiveness would be developed to determine the success of the course and how it may later be improved to meet the requirements of the participants and A.I.D. The PLATO System has incorporated within it a basic evaluation procedure to measure participant comprehension. It has been used in a variety of courses such as French, Russian, Analytical Geometry and Mathematics. For the Population Dynamics and Economic Development course, a number of test questions will be interspersed throughout the material to continuously check whether concepts, both qualitative and quantitative, have been understood by the participant. Associated with each question will be a branching program. The branching program will review certain background material which the participant may have forgotten and needs to review before attempting to answer a question. The evaluation will include such questions as:

Does the participant understand:

- a. The effect~~ize~~ of changes in fertility and mortality on future total population;
- b. The relationship of the number of fertile women by age cohort to the number of live births;
- c. The effect of various dependency ratios on the productivity of a population.

Fourth, would be the acquisition of a multi-flexing plotter, which would be part of the basic hardware installed at the University of Illinois. This relatively inexpensive piece of equipment would be interfaced with the present hardware so that while the participant is viewing charts on the T.V. screen which he has generated from the computer, the plotter will produce the same image on paper. This then is a permanent record of what was seen on the screen and can be used in a number of different ways. Weeks or months later, this record can be referred to in order to refresh the participant's memory and also can be used for further analysis. The participant can carry this record home for display among those who have not had the opportunity to use the PLATO system themselves.

workbook

Fifth would be the preparation of a comprehensive methodological handbook which describes and explains the projection techniques, uses and sources of inputs, estimation procedures used when "hard" data is not available, computer programming procedures and all other relevant information necessary to permit the viewer and A.I.D. personnel to properly evaluate the final output.

A.I.D. may derive a spin-off from this project in the form of the use of remote control installations of PLATO when they become technically feasible at a reasonable cost. The prognosis for this is about eighteen months. A.I.D. will then be able to have the University of Illinois set up remote control stations in Washington and other sites such as university population centers with the software and course materials developed in this project immediately available. The whole course or any part of it could then be presented to participants at any of these remote control installations. This potential will be reviewed from time to time to determine when and how this can best be done and funded. 18

Although funding is only for the first two years, the course will be available for five years. The University of Illinois will assume the financial burden of updating the inputs during the last three years.

D. PLANNED TARGETS, RESULTS, OUTPUTS

The ultimate goal of this project is to help LDC leaders become fully aware of the critical nature of rapid population growth and resulting economic and social side effects and thereby stimulate them to devote maximum effort toward the reduction of fertility. The immediate objective is to provide the University of Illinois with the capacity to expand and refine the Computer Assisted Instruction in Population Dynamics and Economic Development course and provide instruction for as many as three hundred individuals annually. The course will run from one to five days, depending on the interest of the participant. This course will be available to participants from LDCs already in the U.S. for other training, visiting dignitaries from other countries, foreign students under non-A.I.D. auspices and A.I.D. personnel. Participants from LDCs who are studying at the Bureau of the Census, NCHS, NIH, Department of Labor and other agencies will be programmed to take the course. The Fellows who will be studying at the Margaret Sanger Research Bureau will take this course as part of their population/family planning training.

In addition to the "population awareness" aspects, the participants will also learn some basic concepts of population and economic development. Finally, the multi-flexing plotter will provide the participants with a permanent record for later analysis of exactly what was seen on the T.V. screen.

E. COURSE OF ACTION

In order to supply a much-needed motivational tool and at the same time provide some basic instruction in demography/economics, it is recommended that the University of Illinois proposal be funded for two fiscal years for \$282,400. With these funds, the University of Illinois will be able to hire a program director, economist, demographer, computer programmers and auxiliary staff for program development and operations as described above. These funds will also be used for visiting consultants/lecturers (very likely economists who have worked on the GE-Tempo model), the printing of course materials and the development and installation of a multi-flexing plotter. This will allow as many as 300 persons annually for two years to use the installation at the University of Illinois for from one to five days at no charge. These funds are all for additive elements of the program and do not include the use of the computer and the developmental work which has already been carried out. For the subsequent three years, an additional 300 participants annually will have access to the installation and instruction at a cost of approximately ten dollars per student per day. (2)

Although it is recognized that course development and refinement will be a continuing process over several years, within four months of contract signing, the University of Illinois will be in a position to accept participants for instruction. A.I.D. will arrange with other government agencies, private contractors, universities, etc. to send participants to the University of Illinois for the Computer Assisted Instruction in Population Dynamics and Economic Development. Visitors from LDCs to Washington will be encouraged to spend some time at the installation.

Rigorous procedures will be incorporated in the contractual agreement with the University of Illinois in order to secure maximum performance.

- a. A.I.D. will approve all professionals who work on this project.
- b. The basic demographic methodology will conform to A.I.D. specifications.
- c. A panel of outside consultants in ^{computer assisted instruction,} demography and development economics will frequently review the content of the course and all course materials and submit reports to A.I.D. and the university.
- d. Other outside consultants such as computer experts and behavioral scientists will be utilized as needed and submit reports to A.I.D. and the university.

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Yearly reviews will be conducted by A.I.D.'s Office of Population, using consultants as necessary, to evaluate the progress and results of the program.

A budget is attached.

Attachment

PROPOSED BUDGET

	<u>First Year</u>	<u>Second Year</u>	<u>Total</u>
<u>Staff</u>			
Director 9 mo. 1/2 time	11,500	12,500	24,000
2 mo. (summer) full-time	5,100	5,500	10,600
Economist 1/2 time	11,000	11,500	22,500
Demographer 1/2 time	11,000	11,500	22,500
Chief Programmer full-time	12,000	12,800	24,800
Assistant Programmers (3) 1/2 time	15,500	16,500	32,000
Editor for course books full-time	7,000	7,500	14,500
Secretary/Coordinator	6,500	7,000	13,500
Consultants	<u>6,000</u>	<u>6,500</u>	<u>12,500</u>
Total	85,600	91,300	176,900
<u>Service & Travel</u>			
Memory Disc Drive Rental	3,000	3,000	6,000
Printing of Course Books	1,000	1,500	2,500
Travel (University staff)	<u>500</u>	<u>500</u>	<u>1,000</u>
Total	4,500	5,000	9,500
<u>Equipment</u>			
Multi-flexing Plotter	15,000	15,000	30,000
Indirect costs (estimated)	<u>30,000</u>	<u>36,000</u>	<u>66,000</u>
Total	45,000	51,000	96,000
GRAND TOTAL	<u>135,100</u>	<u>147,300</u>	<u>282,400</u>

932-11-500-800
Population

PROP
1971

932-924

MEMORANDUM

February 18, 1971

TO : AA/TA, Mr. Samuel H. Butterfield
FROM : TA/PM, John H. Kean

SUBJECT: Approval of PROP and Project Authorization for Computer Assisted Training in Population Dynamics and Economic Development Project

This project proposes a program to provide \$282,400 in central funding over a two year period to assist the University of Illinois to expand and refine its Computer Assisted Instruction in Population Dynamics and Economic Development program to provide instruction for 300 LDC participants annually in support of A.I.D. population activities. A major component of this activity will be the use of Program Logic Automatic Teaching Organization (PLATO) system for teaching purposes developed by the University for the visual display of population variables and their relationships to the economic and social variables. The objective of this activity is to assist LDC leaders to become more cognizant of the critical consequences of rapid population growth on national development through participation in this program.

The plan is to fund for two years a contract with the University to finance the technical personnel services and commodities required to expand and refine its existing program. The course will be available for 5 years with A.I.D. providing funding for the initial two years and the University, for the last three years. A possible spin-off from this activity is the establishment of remote control installations of PLATO, when it becomes economically feasible, in other locations, e.g. other university population centers, with readily available information on equipment and course material requirements.

It is recommended that you signify the approval of this project by signing the attached Project Authorization.

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PROJECT AUTHORIZATION

1. PROJECT NUMBER 51-11-570-924	3. COUNTRY Worldwide	4. AUTHORIZATION NUMBER 0109
2. PROJECT TITLE Computer Assisted Instruction in Population Dynamics and Economic Development		5. AUTHORIZATION DATE
7. LIFE OF PROJECT		6. PROP DATED

a. Number of Years of Funding: 2
Starting FY 19 71 Terminal FY 19 71

b. Estimated Duration of Physical Work After Last Year of Funding (in Months): 24

FUNDING BY FISCAL YEAR (in U.S. \$ or \$ equivalent)	DOLLARS		P.L. 480 CCC + FREIGHT	LOCAL CURRENCY			
	GRANT	LOAN		Exchange Rate: \$1 :		HOST COUNTRY	
				U.S. OWNED		JOINTLY PROGRAMMED	OTHER
Prior through Actual FY				GRANT	LOAN		
Operational FY 1971	\$282,400						
Budget FY							
B + 1 FY							
B + 2 FY							
B + 3 FY							
All Subsequent FY's							
TOTAL	\$282,400						

9. DESCRIBE SPECIAL FUNDING CONDITIONS OR RECOMMENDATIONS FOR IMPLEMENTATION, AND LIST KINDS AND QUANTITIES OF ANY P.L. 480 COMMODITIES

10. CONDITIONS OF APPROVAL OF PROJECT

PROP cleared by:

NESA/OPP, Jalden, memo, 12/18/70 *[Signature]*
 EA/TECH, RPagan, phone, 12/17/70 *[Signature]*
 OIT/PD, GPhilpott, phone, 1/12/71 *[Signature]*
 VN/ND, MPhelps, memo, 12/17/70 *[Signature]*
 ARA/LA/PCD, GColeman, phone 3/3/71 *[Signature]*
AFR has reservations, but has not yet taken a formal position as of 3/4/71 *[Signature]*

(Use continuation sheet if necessary)

11. Approved in substance for the life of the project as described in the PROP, subject to conditions cited in Block 10 above, and the availability of funds. Detailed planning with cooperation of the country and drafting of implementation documents is authorized.

This authorization is contingent upon timely completion of the self-help and other conditions listed in the PROP or attached thereto.

This authorization will be reviewed at such time as the objectives, scope and nature of the project and/or the magnitudes and scheduling of any inputs or outputs deviate so significantly from the project as originally authorized as to warrant submission of a new or revised PROP.

A.I.D. APPROVAL	CLEARANCES	DATE
<i>[Signature]</i> SIGNATURE	TA/POB, RTRavenholt	<i>[Signature]</i>
	TA/POB, MCilbert	<i>[Signature]</i>
	PK <i>[Signature]</i> TA/PM, JKean	
AA/Assoc. Assist. Administrator <u>3/9/1971</u> TITLE DATE	A/CONT	