

**LOCAL COURSE IMPROVEMENT
COVER SHEET**

1. Title of Project: A Modular Approach to the Introductory Course in Computer Science
(Limit to 70 letters and spaces)
2. a. Name of Institution Hope College
b. Location: City Holland State Michigan Zip Code 49423
c. Grant to: Hope College
(Official name of institution or agency to which grant should be made if different from 2a. above)
3. a. Type of Institution: Public ☐ Private ☒ Consortium ☐
b. Institution's opening FTE undergraduate fall enrollment as reported in Fall Enrollment in Higher Education, 1975, National Center for Educational Statistics, NCES #76-135 2095
c. Highest Degree Offered in Science by Campus Submitting this Proposal (Check One)
Associate ☐ X Baccalaureate ☐ Master ☐ Doctor ☐ Other (specify)
4. a. Major Discipline Code¹: (Enter Only One Code): CS
b. Field of Science and Engineering Code¹: Primary MD21 Other _____
5. a. Amount Requested from NSF \$ 14,600
(Round to nearest \$100)
b. Amount to be provided from non-Federal sources \$ 7,300
(Round to nearest \$100)
6. Number of students to be affected over a 5-year period 1500
7. From 6, the number expected: a. to terminate scientific studies with the Associate Degree 0: b. to terminate scientific studies with the Baccalaureate Degree 600: c. to continue scientific studies beyond the Baccalaureate Degree 900: d. to enter pre-college teaching careers 50
8. Are funds for any part of the project proposed herein being requested in another proposal to NSF or some other Federal Agency? No If yes, explain below.
9. Project Director:
a. Name: (Prof., Dr., Mr., Ms., etc. _____)
Herbert L. Dershem
b. Social Security No.²: 271-40-8660
c. Department: Computer Science
d. Phone: Office 616-392-5111
(Incl. Area Code) Home 616-392-3828
e. Mailing Address (Academic)
Hope College
Holland, Michigan 49423
(Zip Code)
f. Signature: Herbert L. Dershem
g. Date: Sept. 29, 1977
10. Authorized Institutional Representative:
a. Name: (Dr., Mr., Ms., etc. _____)
E. Sheldon Wettack
b. Title: Dean for the Natural Sciences
c. Mailing Address:
Hope College
Holland, Michigan 49423
(Zip Code)
d. Signature: E. Sheldon Wettack
e. Date: Sept. 29, 1977

NATIONAL SCIENCE FOUNDATION

PROJECT
SUMMARY

LOCAL COURSE IMPROVEMENT

NAME OF INSTITUTION Hope College	ADDRESS OF INSTITUTION (INCLUDE BRANCH/CAMPUS & COMPONENT) Holland, Michigan 49423
PRINCIPAL INVESTIGATOR Dr. Herbert L. Dershem	
TITLE OF PROJECT A Modular Approach to the Introductory Course in Computer Science	

SUMMARY OF PROPOSED WORK

The objective of the project is to develop a modular approach to the introductory course in computer science which will enable each student to meet his or her individual needs. This approach would be implemented by dividing the semester into three equal time periods. Each student would then choose, from among several offerings, a lecture and a laboratory module for each of the three periods. The choices made by the student would depend on background and career interests.

In the summer of 1978 nine modules will be developed and a student information system to aid in course administration will be implemented. During the 1978-79 academic year the modularized course will be taught for the first time. During the summer of 1979 a data bank of exam items will be developed, suitable programming will be compiled, and review and modification of all modules will take place. Full implementation of the modularized course will occur in 1979-80.

The proposed course would more efficiently serve the computing needs of students in a variety of disciplines. Since this approach could be useful at other institutions, all modules will be designed to be transportable. The modular approach will be evaluated in a variety of ways and the results of the project will be presented at a national meeting of computer science educators.

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LOCAL COURSE IMPROVEMENT
BUDGET SUMMARY

A. SALARIES, WAGES, AND BENEFITS

- 1. Professional Staff \$12,000
- 2. Assistants
- 3. Secretarial and Clerical \$500
- 4.

5. TOTAL: SALARIES AND WAGES (1 thru 4) \$12,500

- 6. Staff Benefits (when charged as direct costs) \$900

7. TOTAL: SALARIES, WAGES, AND BENEFITS (5 & 6) \$13,400

B. OTHER PERSONNEL EXPENSES

- 8.
- 9.
- 10.
- 11.
- 12.

13. TOTAL: OTHER PERSONNEL EXPENSES (8 thru 12) 0

C. OTHER DIRECT COSTS

- 14. Equipment (Normally not to exceed 15% of line 24)
- 15. Laboratory and Instructional Materials \$200
- 16. Computer Time \$500
- 17. Duplication Expenses \$250
- 18.
- 19.
- 20.

21. TOTAL: OTHER DIRECT COSTS (14 thru 20)	<u>\$ 950</u>
22. TOTAL: DIRECT OPERATING COSTS (SUM: 7,13,21)	<u>\$14,350</u>
23. INDIRECT COSTS <u>5.9%</u> of line <u>5</u>	<u>\$ 7,490</u>
24. TOTAL OPERATING COSTS (22 plus 23)	<u>\$21,840</u>
25. LESS LOCAL CONTRIBUTION	<u>\$ 7,280</u>
(at least 1/3 of line 24)	
26. NSF REQUEST (not to exceed \$25,000)	<u>\$14,560</u>

LOCAL COURSE IMPROVEMENT (LOCI)
DETAILED BUDGET
(DIRECT COSTS ONLY)

Name of Institution: Hope College Project Director: Herbert L. Dershem

Budget Summary Line Item	Activities	Refer to Narrative Page No.	First Year	Second Year	TOTAL
1	Faculty Summer Salary, Dershem	5,6,7	\$2700	\$2700	\$5400
1	Faculty Summer Salary, Whittle	5,6,7	\$1800	\$1800	\$3600
1	Faculty Summer Salary, Leland	5,6,7	\$1800	\$1200	\$3000
3	Secretary Salary, Typing	7	\$200	\$300	\$500
6	TIAA-CREF Benefits 7.5% of Faculty Salaries		\$472.50	\$427.50	\$900
15	Instructional Materials	7	\$200	0	\$200
16	Developmental Computer Time	7	\$200	\$300	\$500
17	Duplication Expense	7	\$50	\$200	\$250

A. NEED

Hope College is a four-year, liberal arts college with a current enrollment of 2200 students. The College has a strong tradition for excellence in science education.

The Department of Computer Science was established in 1974 to develop and coordinate computer-related academic programs on the campus. The department is interdisciplinary in nature with each member having a strong interest in some discipline outside of computer science and, in most cases, holding a joint appointment with some other department on the campus. In this way, the department is responsive to the computer-related needs of all of the students at Hope College. Presently, five faculty members hold appointments in the department and the total equivalent teaching commitment is $2\frac{1}{4}$ faculty. The department, in addition to serving the academic computing needs of the rest of the campus, has instituted a major program in Computer Science, which requires a considerable commitment from the faculty to teach upper level courses and to direct internships and research projects (see Appendix A).

The purpose of this proposed project is to develop and implement an effective and economical method for introducing the computer to all students on campus who require or desire computer knowledge, and to do so in a way which meets their widely varying needs and academic goals. Seven major problems must be overcome to achieve this purpose.

Problem #1 *Students with varied interests and abilities take the same introductory computer course.* Only one course is offered because staffing limitations make it very difficult to offer separate courses for each interest grouping. During the 1976-77 academic year, 250 students were enrolled in the introductory computing course. This group represents about 47% of the College's student body over a four year period. A list of the interests in this course in a recent semester is found in Appendix B.

Problem #2 *There is no course offered which is appropriate for students desiring minimal exposure to computers.* A course called "Computer Appreciation" has been offered twice in the last several years, but it cannot be offered on a regular basis because there is insufficient staff to teach it while maintaining our major program. Student demand for this course has been high.

Problem #3 *Students with some prior computing experience have difficulty fitting into the computer science course sequence.* In the fall, 1977 semester, 15% of the students enrolled in the introductory course had previous experience with computers. This creates instructional problems because these students are already familiar with much of the material taught, and yet, for a variety of reasons, are not prepared for upper level courses. The more common reasons are that they learned a different language, they did not develop a proper programming style, or their problem-solving ability is not strong enough.

Problem #4 *There is a high drop-out rate in the introductory computing course.* The drop-out rate in the present course, using a sample of nine sections taught in recent years, has been 20.1 percent. The reasons for the drop-outs are varied. Most common is that the course is not responsive to the student's interests or that the course requires a larger time commitment than the student is able to make. Often this latter problem becomes especially noticeable during the second half of the course.

Problem #5 *There is limited staff availability to computer science.* The joint appointments of three of the department's five faculty members makes it hard to arrange schedules as the availability of faculty can vary greatly from year to year.

Problem #6 *It is a formidable task to obtain an adequate number of good problems for assignments and examples in an introductory computing course.* Once a problem is assigned, it is not desirable to assign it again for several years since solutions are readily available. As a result a large number of problems must be available. In addition, it is very difficult to match the problems to the skills and interests of the students.

Problem #7 *Student evaluation is perplexing in an introductory computing course.* The best measure of a student's mastery of the subject in an introductory computing course is his/her performance on assigned programs. However, solutions to such assignments are easily obtained from outside sources and hence these assignments are not necessarily valid measures. Therefore, testing is also required, but tests must be carefully designed if they are to truly measure programming ability in the limited time of a class period.

Proposed Solution. The intent of this proposal is to address the above problems by developing a modularized approach to the introductory course in computer science which will allow each student to meet his or her individual needs by choosing those modules most appropriate to their academic interest. This approach will be implemented by dividing the semester into three time periods. Each student will then choose, from among several offerings, a lecture and a laboratory module for each period. The choices the student makes would depend on background, career interests, and the courses he or she plans to take in the future. The computer will be utilized to facilitate record-keeping and evaluation for the project.

Relationship to Past Activity. The current introductory computing course is a three-semester hour course, "Introduction to Computer Science", which evolved from an earlier two-semester hour offering. A detailed description of the course is found in Appendix C. The major emphases in the course include problem-solving techniques, programming style in FORTRAN, and introduction to features of computer hardware and software.

In the past this course was populated almost entirely by students majoring in the natural sciences or mathematics. However, in the last two years a substantial portion of the students had other academic majors, particularly in the social sciences. The student whose career interest does not require the direct use of the computer, but who would like some exposure to its applications and capabilities, has found this course to be too mathematical and programming-oriented. The "Computer Appreciation" course was intended to meet the needs of such students.

A one-year course, "Applied Statistics and Computer Programming", was offered from 1971 to 1975. Designed for social science students, this course was removed from the curriculum because of staffing limitations and scheduling constraints on the students. Although the social science student is presently expected to take a one-semester course in statistics and the Introduction to Computer Science course, many take only one of these courses.

The modules to be prepared in the proposed project would coordinate, enhance, and add to the prior developments and would permit the various options to be offered with

sufficient frequency to meet student demand.

Two other developments by members of the computer science faculty would be applicable to the success of this project. Professor John Whittle, who holds a joint appointment with the Mathematics Department, has worked for the past two years on a individualized approach to teaching precalculus mathematics. One feature of his work was the development of a computerized test generator for this course. It is expected that the proposed introductory computing course would use this test generator in the modules designed.

A second development is an extensive student information system for recording grades and other pertinent information. This campus-wide system, developed by Dr. Richard Brockmeier, Professor of Physics and Computer Science, would be adapted for the proposed course to keep the grade records of the students enrolled as well as to provide information concerning scheduling and module enrollments.

The computer facilities at Hope College will be sufficient to carry out this project. The equipment includes a Xerox Sigma 6 computer with 96K of core memory which supports simultaneous batch and time-sharing operations.

B. PROJECT AND PROGRAM OBJECTIVES

The objective of the project is the development and implementation of 15 distinct modules which will cover the variety of needs in beginning computer education at Hope College. These modules will include eight modules for the lecture periods and seven modules for the laboratory periods. These modules will be distributed throughout the semester in three equal time periods as illustrated below. The student will choose a lecture and laboratory module for each period.

	Period 1	Period 2	Period 3
Lecture Modules	<i>Intro. to Problem Solving</i>	<i>Computer Programming with BASIC</i> <i>Numeric Techniques</i> <i>Business Applications</i> <i>General Applications</i>	<i>Nonnumeric Techniques</i> <i>Social Implications</i> <i>Data Analysis</i>
Laboratory Modules	FORTTRAN I COBOL I	FORTTRAN II COBOL II	FORTTRAN III COBOL I BASIC SPSS

A brief description of each module is given in Appendix D and more detailed proposed outlines are found in Appendix E.

In addition to the development of these instructional modules, the objectives of the project are to implement a computerized system for test generation for the modules, to compile suitable programming problems for assignments and examples in the modules, and to adapt the extensive student information system to handle the complex record-keeping demands of such a course.

The test generation system will be used in the laboratory modules and will generate tests by making random selections from a data bank of problems. The software previously developed by Professor Whittle will be adapted for the proposed course. This system will permit retesting of students who do not meet a certain success criterion on a given module test.

The compilation of programming problems will give instructors in this course a wide selection of problems from which to choose assignments and classroom examples. The problems will be classified on the basis of required language features, level of difficulty, and required mathematical knowledge. They will be collected from textbooks, articles, and files of faculty members.

The student information system will be based on the software developed by Professor Brockmeier. Using this system, all faculty who teach modules will have access to computerized files which will permit them to easily enter, retrieve, and summarize scores on homework and exams. In addition, enrollment information will be recorded in this file, and reports will be produced after each module indicating to each student his or her score and current standing in the course.

C. PROJECT DESIGN

In order to test the feasibility of the modular approach to introductory computer education at Hope College, six preliminary modules were developed during the summer of 1977. These modules are *Introduction to Problem Solving*, *Numeric Techniques*, *Non-numeric Techniques*, *FORTTRAN I*, *FORTTRAN II*, and *BASIC* and are being tested by Professors Whittle and Harvey Leland during the 1977-78 academic year. The project design is

based on the experience of developing these trial modules. The schedule for completion of the project under support from the National Science Foundation is as follows:

Summer, 1978: The development of the remaining nine modules, review and modification of the six modules previously developed, and the implementation of the student information system for students enrolled in the course.

Academic Year, 1978-79: The modularized course will be taught for the first time.

Summer, 1979: Development of an extensive data bank of exam items for the modularized course and compilation of suitable programming exercises for use as assignments and examples. Review and modification of all modules.

Academic Year, 1979-80: Full implementation of the modularized course.

Professor Herbert L. Dershem will be project director. He will have responsibility for coordination of the development and implementation effort. The development of the modules, the data bank of exam items, and the programming exercise list will be done by Professors Dershem, Leland, and Whittle of the Computer Science Department. Professor Dershem will develop the *General Applications*, *Social Implications*, and FORTRAN III modules. Professor Leland will develop the *Business Applications* and the COBOL I and COBOL II modules. Professor Whittle will develop the *Data Analysis*, *Computer Programming* with BASIC, and SPSS modules.

All three of these faculty members have taught several of the current and past introductory computing courses at Hope College. In addition, Professor Leland has considerable experience in business data processing and Professor Whittle has done extensive work in statistical computing and data analysis for social science applications.

An average of two weeks is allotted for the development of each module during the summer of 1978. During these two weeks the faculty member will organize the material to be presented in the module, prepare any written materials that will be required, design problem assignments, and design examinations or any other appropriate evaluation instruments. During the summer of 1979, funds are requested for the three faculty for four weeks to build the data bank of test items, compile problems, and review and improve the modules. In addition, Professor Whittle will devote a minimum of two weeks to

adapting his test-generating software for use in this course and Professor Dershem will spend two weeks implementing the student information system. Stipends of \$300 per week are requested for the above work. Based on the work carried out this past summer, the suggested times are minimal and each participant is willing to devote additional time to the project as needed.

The project director will spend an additional three weeks each summer. In 1978, he will coordinate the module development, prepare the appropriate record keeping facilities, and administer the project. In 1979, this time will be used to prepare reports, disseminate information, and evaluate the project.

Five hundred dollars are budgeted for secretarial salaries. This will be used for the typing of materials which will be distributed to the students. Two hundred and fifty dollars are budgeted for instructional materials, such as books and audio-visual aids. Computer time is budgeted at \$500. This will be used for the development of the software necessary for the teaching of the course and for testing solutions to problems which are designed. All computer time used in teaching the course during the academic program is considered instructional expense and, as such, is not included in this request.

D. PRODUCT AND UTILIZATION

In the NEEDS section the following problems with the current Hope College computing course were detailed. Each problem is restated below with an explanation of how the proposed project addresses that problem.

Problem #1 *Students with varied interests and abilities must take the same introductory computer course.* By making the appropriate choice of modules, each student will be able to choose a sequence which is most appropriate for his or her interests and abilities. There are eighteen different paths through the recommended offerings of modules. Some typical sequences are listed in Table I (on page 8). This flexibility in the course will allow us to meet the needs of the large number of students with different interests who take the introductory computer course.

Table I

<u>Type of Student</u>	<u>Period 1</u>	<u>Period 2</u>	<u>Period 3</u>
Natural Sciences	Intro to Prob. Solv. FORTRAN I	Numeric Tech. FORTRAN II	Nonnumeric Tech. or Data Anal. FORTRAN III or SPSS
Business	Intro to Prob. Solv. COBOL I	Business Appl. COBOL II	Social Impl. or Data Anal. BASIC or SPSS
Social Sci.	Intro to Prob. Solv. FORTRAN I	General Appl. FORTRAN II	Data Analysis SPSS
Liberal Arts	Intro. to Prob. Solv. FORTRAN I	General Appl. FORTRAN II	Social Impl. BASIC
Mathematics	Intro to Prob. Solv. FORTRAN I	Numeric Tech. FORTRAN II	Nonnumeric Tech. BASIC or FORTRAN III
Computer Sci.	Intro to Prob. Solv. FORTRAN I	Numeric Tech. FORTRAN II	Nonnumeric Tech. COBOL I

Problem #2 *There is no course offered which is satisfactory for students desiring minimal exposure to computers.* As indicated in Table I, there is a sequence of modules which is appropriate for the liberal arts student. However, this sequence involves more programming experience than may be needed by some students. For this reason, students will be given the option of enrolling in a two hour course which consists of three lecture modules with no laboratory. The possible sequences for this two-hour course are Introduction to Problem Solving (Period 1), General Applications or Computer Programming with BASIC (Period 2), and Social Implications (Period 3). It is expected that this course will be very popular since it might be used by students to fulfill part of their college science requirement.

Problem #3 *Students with some prior computing experience have difficulty fitting into the computer science course sequence.* With the proposed course, almost all students could profitably take the introductory course since it is not likely that they would have learned all the languages and techniques presented. They would simply choose modules which are outside of their previous experience and avoid those which duplicate what they already know.

Problem #4 *There is a high drop-out rate in the introductory computing course.* This will be helped by the existence of modules which are appropriate for the student's interest and background. The modular approach will also benefit the student who begins the course and finds that the material is too time-consuming well into the semester. Such a student can change his or her original sequence plans and choose a less demanding path through the remainder of the course or eliminate the laboratory from his or her schedule and take the two-credit-hour course. Past experience shows that the time commitment is a prevalent reason for the high drop-out rate.

Problem #5 *There is limited staff availability to computer science.* The proposed course would allow us to handle the introductory computing needs of the students more efficiently. The course proposed above could be offered for 125 students with 12 hours per week of faculty classroom time. Under our present class structure, this number of students would require 16 hours per week. These figures allow for multiple offerings of language laboratories where needed. In addition, the above structure gives a great deal of flexibility in the use of part-time faculty. Such faculty can teach a few modules even when their other duties would not free them for teaching an entire course. Also, it is expected that additional faculty from other departments will be able to teach modules, in their area of interest, whereas their normal loads will not allow them to teach an entire introductory computing course.

Problem #6 *It is a formidable task to obtain an adequate number of good problems for assignments and examples in an introductory computing course.* The compilation of problems will be collected from available sources and will be classified according to the requirements of language features, programming techniques, mathematical ability, and level of difficulty.

Problem #7 *Student evaluation is perplexing in an introductory computing course.* The division of the course between lecture and laboratory will assist in the design of examinations. The lecture portion will be graded primarily on the student's problem solving ability by weighing programming assignments highly and giving tests which require the student to produce a solution program from the statement of the problem. The

laboratory will be graded mainly by examinations which will test knowledge of language details.

The test generation program will be used to generate tests randomly from a bank of test items for the laboratory modules. At the completion of each laboratory module, each student will take an examination generated by the program to test that module. Those students receiving a grade lower than B will be required to take a second test over that same module. Other students may retake the exam to improve their grade. Students retaking the exam will receive the highest of the two grades. The laboratory lends itself to this procedure because the material to be tested yields test items which can be equated for difficulty and purpose when placed in the data bank. It is also likely that experience in the next module and self-study will improve the student's grasp of the language.

A student will be required to pass all six modules in order to receive credit for the course. The grade for the course will be the average of the grades received in the six modules.

In addition to the above seven problems which the proposed approach was designed to address, there are several problems which arise from the nature of the approach itself. These are discussed below.

Problem #8 *The multi-path approach complicates the prerequisite definition for upper level courses.* No longer will it be sufficient to list the first computing course as a prerequisite, but modules must be listed instead. For example, Data Structures would have FORTRAN II and *Nonnumeric Techniques* as prerequisite, Numerical Analysis would require *Numeric Techniques* and FORTRAN II, and File Management would list the COBOL I as prerequisite. A student who has completed the course but has not taken the prerequisite module for a course in which he now wishes to register will be able to arrange to take the needed module.

Problem #9 *It will be challenging to administer a course which involves so many different instructors and modules.* This problem will be addressed through the use of the student

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

Directorate for Science Education
Division of Science Education Resources Improvement

Letter to Project Directors
of
FY 1978 Awards
in
Local Course Improvement - LOCI

APR 10 1978

This letter brings with it congratulations from the LOCI program staff on the recent announcement of your award. Our intention, also, is to provide some helpful information for your forthcoming direction of the project.

A copy of the official award notification letter is enclosed for your information. Also enclosed are verbatim copies of the reviews obtained for the proposal and the staff's "Proposal Recommendation Form," together with an explanation of the review and scoring. Please understand that the reviews are for your information. They do not reflect a Foundation policy or position and are not to be construed as Foundation directives.

Foundation approval should be secured prior to any major project changes, which include those:

- (1) Affecting the overall intent or scope of the approved project.
- (2) Involving a change in project director.
- (3) Involving a change in equipment valued at \$1,000 or more.
- (4) Involving a time extension for completion of grant expenditures.

The definitive source for information on these and other matters relating to grant administration is the NSF Grant Policy Manual, NSF 77-47. Your institutional business officer should have a copy of NSF 77-47, which may be consulted when doubts arise or project changes become necessary.

A special word of caution is in order on one particular aspect of project operation. The fiscal period for the grant extends from the date of the award letter (enclosed) thru September 30, 1980. We strongly urge you to complete expenditures for your project prior to this latter date. Because of recent changes in Foundation policy, late requests for no-cost time extensions should be submitted and will be approved only under the most exceptional circumstances. If a time extension request does prove necessary, the request must be received by the program no later than August 15, 1980. Further information on extensions is located at Section 244.3 of the Grant Policy Manual.

Within the constraints above, chronological changes in expenditures within the total time period of the grant may be made at the discretion of the project director.

Foundation approval should also be secured before publishing, selling, or commercially distributing any materials developed under the award. Requests for such approval or information in this area should be directed to the NSF Division of Grants and Contracts.

Foundation approval is not normally required before project results are described in scientific or educational journals, at professional society meetings, or under other similar circumstances. Such publications should contain a brief statement acknowledging LOCI support of the project. Please send preprints, reprints, or any other documentation of project accomplishment to the LOCI staff, as soon as possible.

The project director must submit to the Foundation a final comprehensive analysis of the project's accomplishments following its completion. Requirements for submission of this report and a summary report are contained in the LOCI guidebook, SE 78-34.

A copy of the press release which announced the LOCI awards is enclosed for your own information as well as for use in providing information about the program to interested colleagues and students.

If any of us on the program staff can be of assistance as you undertake the project, I hope you will feel free to either write or call us at 202-282-7751.

Sincerely yours,



Robert F. Watson
Program Director
Undergraduate Instructional
Improvement Program

APR 10 1978

NATIONAL SCIENCE FOUNDATION

PROJECT
SUMMARY

NSF AWARD NO.

SER78-00478

NAME OF INSTITUTION (NSF DIRECTORY NAME)		ADDRESS OF INSTITUTION (INCLUDE BRANCH/CAMPUS & COMPONENT)	
Hope College		Holland, Michigan 49423	
PRINCIPAL INVESTIGATOR		DIVISION (OFFICE) AND DIRECTORATE	
Herbert L. Dershem		AD/SE	
		SECTION	
		SERI	
PROPOSAL NUMBER	FISCAL YEAR	PROGRAM	
SER 78-00478	1978	LOB1	
TITLE OF PROJECT			
A Modular Approach to the Introductory Course in Computer Science			
SUMMARY OF PROPOSED WORK (LIMIT TO 22 PICA OR 18 ELITE TYPEWRITTEN LINES)			
This project develops a modular approach to the introductory course in computer science which will enable each student to meet his or her individual needs. This approach is implemented by dividing the semester into three equal time periods. Each student would then choose, from among several offerings, a lecture and a laboratory module for each of the three periods. The choices made by the student would depend on background and career interests. At the beginning nine modules will be developed in addition to six previously developed modules and a student information system to aid in course administration will be implemented. During the regular academic year the modularized course will be taught for the first time. During the following summer a data bank of exam items will be developed, suitable programming will be compiled, and review and modification of all modules will take place. This course serves more efficiently the computing needs of students in a variety of disciplines. Since this approach may be used at other institutions, all modules will be designed to be transportable. The modular approach will be evaluated in a variety of ways and the results of the project will be presented at a national meeting of computer science educators.			
START AND END DATES		AMOUNT GRANTED	PROGRAM APPROVAL
04/01/78 - 9/30/80		\$14,200	DATE

A copy of this summary has been sent to the Science Information Exchange at the Smithsonian Institution for reference and public records.

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NATIONAL SCIENCE FOUNDATION
WASHINGTON, D. C. 20550

APR 10 1978

Dr. Gordon Van Wylen, President
Hope College
Holland, Michigan 49423

Proposal/Grant No.
SER78-00478

Dear Dr. Van Wylen:

It is a pleasure to inform you that \$14,200 is awarded to Hope College for support of the project entitled, "A Modular Approach to the Introductory Course in Computer Science," as outlined in the above-numbered proposal. This project is under the direction of Herbert L. Dershem, Department of Computer Science. The grant is effective on the date of this letter and, unless otherwise amended, will expire on September 30, 1980.

The attached budget indicates the amounts, by categories, on which NSF has based its share of the project.

The Final Technical Report, the Summary of Completed Project, and the Financial Status Report (SF 269) must be submitted to the Division of Grants and Contracts within 90 days after the expiration of the grant.

This grant is subject to the provisions of FL 118, "Grant General Conditions," with the cost sharing provision replaced by the "Contributions to Project Costs," page 3 of the Program Guidelines, SE 78-34.

The provisions of the grant relating to project income as prescribed in Section 650 of NSF 77-47 are as follows:

- 1.a. Income, as used herein, means gross revenues received by the grantee, except royalties as defined in 2 below, including any interest earned thereon, except interest earned on advances of grant funds. Income may include but is not limited to proceeds received by the grantee from the sale, lease, rental, or other disposal of books, monographs, reports, films and other materials and properties, except inventions developed or produced with NSF support. Income accruing to the Government means the Government's share of income which will be in proportion to the Government's share of the costs of the activity as determined by the Government and the grantee.
- b. Income generated as a result of the activities supported by this grant, will be accounted for and maintained in a separate

account which shall be interest bearing to the extent practical. Such income, to the extent practicable shall be used to offset costs otherwise allowable and chargeable to the grant. Income receipts and disbursements will be reported to the Foundation semi-annually during the grant period and for five years following the expiration of the grant. Income accruing to the Government not used for the above purpose will be remitted to the Foundation's Grants and Contracts office with such reports.

2.a. Royalties, as used herein, means moneys received by the grantee from a publisher or distributor for the right to manufacture, sell or distribute materials developed or produced with NSF support, including payments to the grantee based on sales and any interest earned thereon. Royalties accruing to the Government means the Government's share of royalties which will be in proportion to the Government's share of the costs of the project as determined by the Government and the grantee.

b. Royalties generated as a result of the activities supported by this grant, will be accounted for and maintained in a separate account which shall be interest bearing to the extent practical. Royalties will be reported to the Foundation semi-annually during the grant period and for five years following the expiration of the grant. Royalties accruing to the Government will be remitted to the Foundation's Grants and Contracts Office with such reports.

The provisions of "Local Course Improvement for Undergraduate Science Education" (SE 78-34) are applicable to the technical direction of the project and to the preparation of technical reports.

The cognizant NSF Program Officer is Oscar N. Garcia, Undergraduate Instructional Improvement Program, Telephone: Area Code 202-282-7751.

The cognizant NSF Grants Manager is Idele Kruithoff, MPE/BBS/SE Branch, Telephone: Area Code 202-632-5938.

Sincerely yours,

/s/ George J. Lynch

Grants Officer

Enclosures

June 17, 1981

Mr. William K. Sprague
Grants Officer
National Science Foundation
Washington, D.C. 20550

Dear Mr. Sprague:

This will acknowledge receipt of your letter of May 27 regarding the project "A Modular Approach to the Introductory Course in Computer Science" under the direction of Professor Herbert Dershem.

We will abide by the terms outlined in your letter and follow through on this matter as required.

Sincerely yours,

Gordon J. Van Wylen

GJWV:jb

cc: William Anderson
Sheldon Wettack
Herbert Dershem

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

RECEIVED

MAY 27 1981 JUN 1 1981

PRESIDENTS OFFICE
Hope College

Dr. Gordon Van Wylen, President
Hope College
Holland, Michigan 49423

Grant No. SER-7800478 A01

Dear Dr. Van Wylen:

By letter dated April 10, 1978, the sum of \$14,200 was awarded to Hope College for the support of a project entitled "A Modular Approach to the Introductory Course in Computer Science," under the direction of Herbert L. Dershem, Department of Computer Science.

The purpose of this amendment is to revise the income provisions contained in the original award letter.

Royalties earned henceforth until September 30, 1983 up to a maximum of \$10,000 may be retained by the grantee. Royalties received in excess of \$10,000 will, to the extent practicable, be maintained in an interest bearing account, and remitted and reported annually to NSF.

Other income may now be used to offset costs associated with the income producing activity and/or be used for science research and/or science education.

Income accruing to the grantee prior to the date of this letter is still subject to the reporting and remission requirements contained in the original award letter. The grantee shall submit an income report (for the period up to the present time) in accordance with those provisions.

Reports for income accruing henceforth shall be submitted on an annual basis, and are required only where cumulative royalties received to date exceed \$10,000. (No special report form is required.)

These changes are effective as of the date of this letter (and are contingent upon the Foundation's receipt of the income report as delineated in the preceding paragraph.)

Except as modified by this amendment, the grant conditions remain unchanged.

Sincerely yours,



William K. Sprague
Grants Officer

SUMMARY OF COMPLETED PROJECT

Please read instructions on reverse carefully before completing this form.

1. INSTITUTION AND ADDRESS Hope College Holland, MI 49423		2. NSF PROGRAM Local Course Improvement	3. PRINCIPAL INVESTIGATOR(S) Herbert L. Dershem
4. AWARD NUMBER SER78-00478	5. DURATION (MOS) 29	6. AWARD PERIOD from 4/10/78 9/30/80	7. Awardee ACCOUNT NUMBER

8. PROJECT TITLE
A Modular Approach to the Introductory Course in Computer Science

9. SUMMARY (ATTACH LIST OF PUBLICATIONS TO FORM)

This project instituted a new modular, multi-path approach to treat a variety of problems in the introductory computer science course. Among these problems are working with students of varied backgrounds and interests, providing minimal exposure to computers for liberal arts students, merging students with prior experience in computing into the course, dealing with the shortage of available staff, and providing good problems, examples, and examinations.

A set of fifteen modules were developed for inclusion in this course. These modules were divided into lecture or problem solving modules and language modules. This approach made significant improvements in all of the problem areas mentioned above.

Based on data collected before and during the implementation of this approach, significant improvement resulted in student performance as measured by course grades, student attitude measured by lower drop rate, enrollment increases, and student evaluations, and faculty attitude. The development of this course will continue in the future as new modules are added and old modules modified. In addition, a growing number of faculty will be involved with the teaching of this course.

The major conclusion that can be drawn from this project is that this modular approach is a useful model for the introductory computer science course.

9. SIGNATURE OF PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR <i>Herbert L. Dershem</i>	TYPED OR PRINTED NAME Herbert L. Dershem	DATE 1-6-81
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Final Technical Report
to
Local Course Improvement Program
National Science Foundation

Project Title: A Modular Approach to the Introductory Course in
Computer Science

Grand No.: SER78-00478

Project Director: Herbert L. Dershem
Hope College
Holland, Michigan 49423

Grand Period: April 10, 1978 to September 30, 1980

The following report is also being published as a paper in the
SIGCSE Bulletin, February, 1981.

Signature of Project Director

Herbert L. Dershem

Date

1-6-81

[illegible]

Final Technical Report
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Signature of Project Director Herbert L. Dershem
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Herbert L. Dershem

Date

1-6-81

