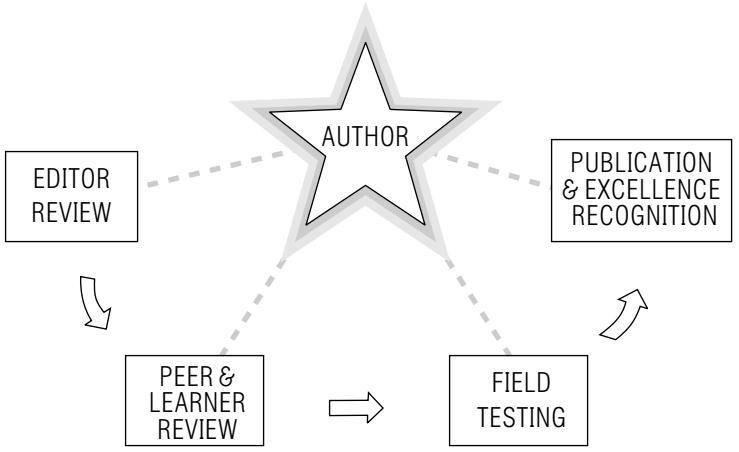
PHYSNET

MISN-0-84

PHYSNET MODULE AUTHOR'S GUIDE



Project PHYSNET Physics Bldg. Michigan State University East Lansing, MI

PHYSNET MODULE AUTHOR'S GUIDE

by

Peter Signell

Title: **Physnet Module Author's Guide**

Author: P. S. Signell, Michigan State University

Version: 2/1/2000 Evaluation: Stage 1

Length: 1 hr; 15 pages

Input Skills:

1. The ability to write in English.

Output Skills (Project):

P1. Write an instructional module in pure or applied physics that represents an advance over existing material and which has the documentation necessary for fitting it into the PHYSNET system of modules.

Post-Options:

1. "Designing Instructional Modules" (MISN-0-85).
2. "Best Uses of the Lecture" (MISN-0-83).
3. "Stills versus Animation: An Investigation" (MISN-0-87).
3. "Computers and the Broad Spectrum of Educational Goals" (MISN-6-100).

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1. Overview

1a. Project Background. The growing diversity in the backgrounds and needs of people desiring physics instruction, and the frustrations and inefficiencies encountered in trying to deal with this diversity, have made it clear that new and more flexible instructional materials are needed. In September, l974, the National Science Foundaton funded this project, now called Project PHYSNET, to develop a working model for the production of new and more flexible materials. The project's model calls for the eventual production, updating, and control of hundreds of instructional modules by authors throughout the physics community.

The modules are to be sufficiently short so that they can be:

1. quickly updated in response to field tests, new instructional ideas, and new scientific developments;
2. put together for use in either classroom or professional settings;
3. used to show the structure of physics knowledge;
4. quickly adapted to user needs ranging from single-skill instruction to complete custom textbooks.

1b. Targeted Audience, Form. PHYSNET modules are written for talented science-oriented high school students, for undergraduates, and for practicing professionals. They are aimed mainly at persons in technology and in the mathematical, physical, and biological sciences. They usually take the form of ten to twenty-page print modules but sometimes include films, videotapes, self-demonstrations, and projects.

1c. New Manuscripts. PHYSNET seeks manuscripts that represent an advance over existing instructional materials. Such an advance may be pedogogical; for example, the thorough teaching of major subconcepts before combining them into a single major concept. The manuscript may contain a new data-based approach to a problem previously solved with unrealistic approximations. Or it may make a professional technique easily accessible to other professionals and to the classroom for the first time.

1d. Content is More Important Than Format. We are more concerned with obtaining interesting topics and presentations than we are with particular module formats: If you have an interesting idea we urge you to submit it. If you would like guidance we suggest you consult *The American Institute of Physics Style Manual* and our modules on module design.[1] We put all accepted manuscripts into electronic storage for later editing, formatting and printing.

1e. Project Services. The PHYSNET project office provides editorial services to contributing authors, including electronic typing and figure drafting, and arranges for review and field testing.

2. The Modules

2a. Level and Content. A PHYSNET module typically contains about the same amount of material one would expect students to remember from a fifty-minute lecture. The modules' content ranges from simple kinematics to current work in particle physics, from the updating of scientific information to the locating, evaluating, and use of data. Applications modules build upon the skills and knowledge in basic-skill modules.

2b. Professional Applications of Physics. Applications modules are intended to teach applications which are professionally timely and genuine. Such an application should be more than an illustration of physics; it should be in current professional use or considered to be of potential practical importance. A professional in the field in which the application takes place should be able to say, "Yes, this is something that people preparing to work in my field should learn."

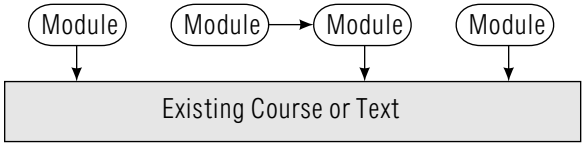
2c. Life Enriching Applications. Some modules present applications of physics which give understandings of nature, or of our biophysical perception mechanisms, or of the processes of science itself. Others explain the physics useful for understanding controversial public issues.

2d. How PHYSNET Modules are Used. Modules have four features that enable them to be used in a variety of ways. First, each module is self contained, except for the prerequisite skills and knowledge listed inside its cover. Second, each module begins with a brief description of its processes and usefulness. Third, each module has a list of skills to learn and there is a corresponding self-test for the learner's use. Fourth and last, modules' main learning activities are often carefully designed

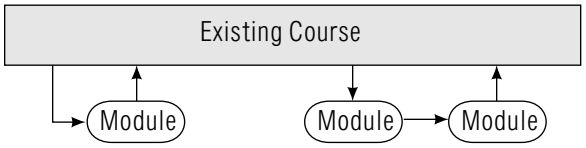
[1] "Ideas for Designing Instructional Modules" (MISN-0-65).

to have learners fill in gaps in arguments, examples, and problems; and those learners who cannot fill in the gaps are given graduated assistance in a supplement. Thus the modules can be easily used to:

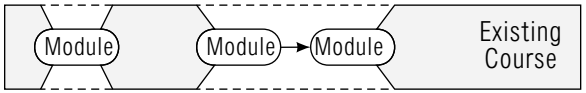
1. provide prerequisites for particular learners,



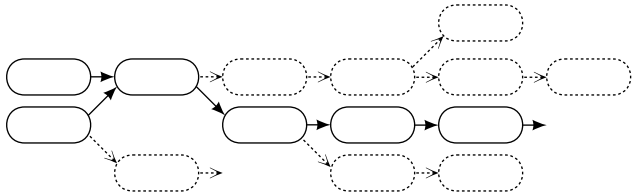
2. supplement existing courses or texts,



3. replace topics or presentations in existing courses,



4. build alternative courses of study for specific learners or groups of learners, as illustrated for one learner by the solid lines in this diagram:



3. Features of a Model Module

3a. Overview. Modules have certain features that ultimately assure their compatibility with each other and which take advantage of recent

information about effective lesson design.The model module that accompanies this manual illustrates some of those features and the rest of this section describes them.

3b. Statements of Prerequisite Skills. The module's prerequisite statements show the concepts and skills that a learner is assumed to have acquired before beginning the module. Not all of them are listed, of course, for there has to be a cut-off somewhere. A good rule of thumb for determining where to stop is: list only the most advanced prerequisite of a linear sequence of prerequisites.

3c. A List of Skills and Concepts to Be Developed. The list of "skills and concepts to be developed" describes what a learner should be able to do upon completing the module. It should:

- enable potential users to determine the extent to which the module fulfills their instructional needs,
- enable users to match the skills and concepts developed in one module with the prerequisites of other modules in the network,
- enable users' newly acquired knowledge and competence to be evaluated,
- enable the module itself to be evaluated.

3d. Additional Resources, Recommended or Required. Examples of external resources are: hand calculators, computers, a periodic table of the elements, graph paper, and references to source material. External resources are to be optional if not widely available.

3e. The Module Is Otherwise Self-Standing. Except for the stated prerequisites, each module has enough internal material to enable it to be used without an additional text and without apparatus that cannot be readily obtained. However, this does not exclude suggestions for enrichment.

3f. There Are Section Headings and a Table of Contents. To display the content and organization of each module we recommend a system of headings. Section headings, we feel, are essential, and paragraph headings are highly desirable. In general, the more complete the system of headings, the more useful the module will be.The section and subsection headings are combined to produce the module's Table of Contents.

3g. There are Exercises, With Answers. Modules generally provide opportunities for a learner to reinforce, refine, extend, apply and evaluate the skills and concepts developed in the module. There are often exercises and problems that require the concepts and skills to be strengthened and extended. The answers to the exercises and problems are sometimes quite instructive.

3h. A Special Assistance Supplement. A number of modules have Special Assistance Supplements which provide the kind of well-designed tutorial assistance that teachers often give during office hours.Such assistance helps the weaker learners overcome particular sticking points in the text and in the working of exercises and problems. Special Assistance Supplements do not normally provide assistance in acquiring the Prerequisite Skills.

3i. A Model Exam. Almost every module has a Model Exam that serves as a model for teachers wishing to construct their own exams. Students can also use the Model Exam to test the thoroughness of their learning before taking their teachers' exams. The Model Exam should be one that you, the author, could use to test learners on the skills developed in your module.

4. A Check List for Module Design

1. Make the module lecture-length.
2. Include a Table of Contents that consists of section and paragraph titles.
3. Begin the module with an overview of some kind, perhaps containing illustrative problems, to tell readers where the module is heading.
4. Use applications that are timely and genuine.
5. Use graphs, diagrams and tables, with full captions that are self-contained and contain key words. Refer to all graphs, diagrams and tables in the text. Use line drawings where feasible, since they are especially efficient for learners.
6. Make it obvious that you respect your readers' images of themselves:[1]
   a. Adopt a tone similar to the one you would use in communicating your specialty to a colleague in another field.
   b. Avoid instructions that appear authoritarian.

c. Do not use the word "student" in referring to the reader.

5. Your Manuscript and Physnet

5a. Submitting a Manuscript. If you have a manuscript ready for consideration, please complete the attached Module Description Sheet and Author's Agreement. Then send to us:

1. The completed Module Description Sheet;
2. A clear copy of the manuscript;
3. A signed copy of the Author's Agreement.

Our address is on both of the forms listed above. Keep a copy of the materials for yourself to insure against loss.

5b. If You Have an Idea, Send a Plan. If you would like to write a module, and would like our comments before you begin, send a short description of your plan (one page will suffice) to:

Editor
Project PHYSNET
Physics/Astronomy Building
Michigan State University
East Lansing, MI 48824

5c. Review of the Manuscript. Each manuscript follows the review procedure shown in simplified form in Fig. 1. First, the manuscript undergoes a physics content review and, if appropriate, a review by one

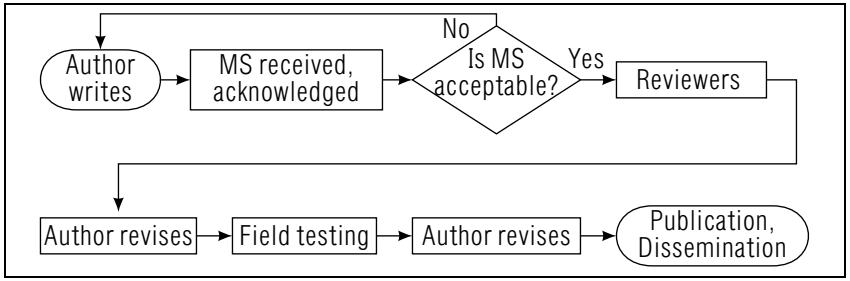


Figure 1. Flow of a PHYSNET manuscript.

or more professionals in an applied field. It is also reviewed by one or more learners.[2] The manuscript, with the reviewers' comments, is then returned to you if revision is suggested. The revised manuscript is then field tested and the analysis returned to you. This is a time when you might want to add to the module's *Special Assistance Supplement*.

5d. Non-Profit Distribution. Materials developed by PHYSNET for small audiences will be made available to them in single copies for local reproduction. We expect that much of the material developed during the life of the National Science Foundation grant will be distributed in that fashion. Pricing will be designed simply to cover the cost of production, distribution and other services. It is assumed that this pricing policy will be continued after the grant period by a consortium that produces and disseminates the materials. You are therefore asked to contribute your writing effort except when your material is published commercially (described in the next section). Your manuscript will be reviewed by colleagues as a professional courtesy.

5e. Commercial Distribution. A significant number of the PHYSNET modules should have a market potential large enough for a commercial publisher to offer them at a price competitive with local reproduction and distribution. Arrangements will be made for the commercial distribution of such modules. A module's royalties will be used first to cover costs of publication and of royalty distribution. All remaining royalties will be distributed according to each development participant's fractional contribution to the development of that module (see the Author's Agreement attached to this module).

Acknowledgments

Much of the wording of this module was developed through collaborative efforts of the CHEMI, UMAP and PHYSNET projects. Particular thanks go to Ernest Henley, Bill Walton and Ross Finney. Preparation of this module was supported in part by the National Science Foundation, Division of Science Education Development and Research, through Grant #SED 74-20088 to Michigan State University.

[2] See "Learner Review Guide" (MISN-0-69).

A. Author's Agreement

I hereby grant Project PHYSNET the sole and exclusive right to copyright the Work entitled:

_____

(Module Name)

in recognition of the editorial, distribution and other services to be provided the Work under the program of Project PHYSNET. However, I reserve the right to make copies of the work for use in my own classes. I understand that any income Project PHYSNET receives from distribution of the Work will first be used to defray PHYSNET's costs, if any, of services to the Work. This specifically includes costs of income distribution. All remaining income from the Work will be distributed according to each contributor's fraction of the total effort expended specifically on the Work, not including general development time or Work-specific learning time. My own contribution is shown below, along with the name of the person or institution to be credited for the purpose of royalty distribution.

I warrant that all of the material in this Work is my (our) own and original creation and that it has not been published elsewhere; with the sole exception that if the Work contains any material copyrighted by another, the copyright holder has granted permission for the material to be included in the published Work. I am one of the authors and I can make this agreement in the name of the other authors, if any, or, in the case of a "work made for hire," my employer.

_____ _____

(Signature) (Hrs. Contr.)

_____

(Print Name)

_____

(Institution)

_____ _____

(Person or Institution to be Credited) (Date)

Return To: Editor, Project PHYSNET, Physics-Astronomy Bldg., Michigan State University, East Lansing, MI, 48824.

B. Module Description Sheet

Your Module Description Sheet should cover items 1-15 below .

1. Module Title:
2. Author(s), incl. Institution(s):
3. Basic Field (e.g. physics):
4. Application Field (e.g. biology):
5. Key words to Index Contents ($<$ 10 words):
6. Abstract (Optional: $<$ 100 words):
7. Prerequisite Skills Required:
8. Modules or textbook chapters that can provide the above-listed prerequisite skills:
9. Completion of this module should enable the learner to (list skills):
10. Targeted Audience:
11. Other possible audiences:
12. Typical learner time (e.g. 1 hr.):
13. History of use and evaluation:
14. Date this form completed:
15. This form completed by (name):

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