Status Report on the SIGCSE Committee on the Implementation of a Discrete Mathematics Course

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SUMMARY
This session is a progress report from the first committee created under the SIGCSE Committee Initiative. The Committee on Implementation of a Discrete Mathematics Course is charged with developing implementation models and materials for the one-semester discrete math course proposed in Computing Curriculum 2001. At the time of the session, the Committee will be roughly half way through its task. This session will disseminate early ideas from the Committee that may be helpful in implementing the CC2001 discrete mathematics recommendation, while seeking input from the audience as the Committee completes its work. The session will also provide members of SIGCSE a glimpse at how the committee initiative is faring.

Categories and Subject Descriptors
K.3.2 [Computing Milieux]: Computer and Information Science Education – curriculum, computer science education.

General Terms
Algorithms, Theory.

Keywords
Discrete mathematics, computing curriculum, CC2001, SIGCSE committee initiative.

SIGCSE '04, March 3 – 7, 2004, Norfolk, Virginia, USA.
ACM 1-58113-798-2/04/0003

1 BACKGROUND
In June 2003, the SIGCSE Committee on the Implementation of a Discrete Mathematics Course was chartered, the first committee operating under the new SIGCSE Committee Initiative. The Committee's charge is to "work toward providing a few ... practical models for a one-semester [discrete math] course that will meet the basic needs of undergraduates in a computer science program."

The need for this committee arises from the discrete math (discrete structures) requirements of Computing Curriculum 2001 [1]. In particular, Computing Curriculum 2001 requires computer science programs to cover six core knowledge areas:

DS1: Functions, Relations, and Sets
DS2: Basic Logic
DS3: Proof Techniques
DS4: Basic Counting
DS5: Graphs and Trees
DS6: Discrete Probability

Computing Curriculum 2001 recommends 43 class hours devoted to topics within these six areas. Two approaches are provided for covering these topics, a single course (CS 115) and a two-course sequence (CS 105 and CS 106). Some guidance is available for departments implementing the two-course sequence [3], but there is little to help departments interested in the one-course approach.

Despite the lack of guidance, the one-course approach is exactly what local constraints lead many departments to favor. However, the material itself does not imply an obvious, coherent, course structure, nor does it lead obviously to lab exercises or group projects. Faculty trying to implement this approach are largely working in isolation, producing ad hoc courses.

The basic goal for the Committee on the Implementation of a Discrete Mathematics Course is to assist those trying to implement a one-semester CC2001-compliant discrete math course, by identifying successful implementations and making them available as models for others to build on. The Committee is hoping to find a small number of models (no more than six), each

of which can be characterized by a typical syllabus/course outline, possible laboratory exercises and homework assignments, and a list of possible applications that the course can cover.

The Committee organized itself and held preliminary electronic discussions during Summer 2003. While the intent of the preliminary discussions was not to produce final course models, rudiments of some possible models nonetheless emerged. For example, one thread of discussion explored the possibility of a discrete math course teaching a "core" subset of the CC2001 discrete math areas, while other areas appear in other required computer science courses; another comment explored the merits of a math department teaching the discrete math course for computer science students.

One of the first tasks the Committee identified is to survey the math and computer science education communities about existing one-semester discrete math courses, in order to identify course models that already exist. The survey is being prepared in early September 2003, and will be completed during Fall 2003.

During this special session, members of the Committee will present the Committee's preliminary findings, including survey results and initial ideas about course models. We will solicit input from the SIGCSE community at large concerning course models not already recognized, problems implementors of discrete math courses face, etc. We will also briefly discuss our experience as the first SIGCSE committee, for those who are considering starting other SIGCSE committees.

2 SESSION OUTLINE

We propose the following outline for the special session:

5 minutes: Introduction and overview of the session (Doug Baldwin).

5 minutes: Review of the SIGCSE Committee Initiative (Henry Walker).

10 minutes: History of the Committee, including experiences establishing it, its charge, and initial activities (Bill Marion).

20 minutes: Preliminary survey results and candidate course models (Bill Marion).

35 minutes: Audience discussion, guided by such questions as

- What other models should be considered?
- What problems do implementors of discrete math courses for computer science face (especially one-semester courses)?
- What products, beyond the Committee's report, would be useful, and how should they be distributed?
- Are others in the audience considering starting SIGCSE committees?

(Doug Baldwin, Bill Marion, Henry Walker)

3 EXPECTATIONS

This session is aimed primarily at people interested in discrete math as an important part of the computer science curriculum. The session should appeal both to people interested in discrete math's role in the abstract, and those with a concrete interest in implementing a course. Judging from the response to the call for Committee members (66 people are currently subscribed to the Committee's mailing list) and interest in recent years in a broader mathematical reasoning interest group [2] (89 e-mail subscribers, 40 to 50 attendees at each SIGCSE birds-of-a-feather session organized by the group in the last two years), there are a large number of such people.

A secondary, but nonetheless important, group is people considering starting other SIGCSE committees.

We foresee three specific outcomes from the session:

1. The Committee's preliminary ideas will be shared with the audience. While the Committee's work will not be complete by SIGCSE 2004, these preliminary ideas should be sound enough to help others implement one-semester discrete math courses.
2. Others considering establishing SIGCSE committees will be able to learn from our experiences, and ask questions about the process.
3. The Committee itself will receive input from its intended constituents, at a time when that input can still influence the Committee's final product.

ACKNOWLEDGEMENTS

Thanks to all the members of the SIGCSE Committee on the Implementation of a Discrete Mathematics Course for their comments on this proposal, and the illuminating discussions leading to it.

REFERENCES

[1] ACM/IEEE Joint Task Force on Computing Curricula, Computing Curriculum 2001: Computer Science. http://www.computer.org/education/cc2001/final/index.html

[2] D. Baldwin and P. Henderson, Integrating Mathematical Reasoning into Computer Science Curricula. http://www.math-in-cs.org/

[3] Pedagogy Focus Group 2 on Supporting Courses of the ACM/IEEE Joint Task Force on Computing Curricula, Draft Report, Version 5.2. http://www.cs.grinnell.edu/~walker/curriculum/pedagogy-5.2.html