Title: Teaching functional programming to first-year students

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Introduction

- Growing interest in functional languages like Miranda and Haskell
- Investigated using functional programming for intro programming course
- Taught experimental course from 1986-1991 before full introduction in 1991
- Wanted to introduce algorithmic thinking with minimal syntax/evaluation order distractions
- Still teach imperative language for connection to other courses
- Helps develop more objective view of programming languages

The Computer Programming Course

- One year course over 3 terms of 8 weeks each
- Lectures, tutorials, practical assignments

Term 1 - Functional Programming

- Miranda language, covers major concepts like pattern matching, recursion, higher order functions
- Aims to solve more complex problems than typical intro course
- Textbook: Introduction to Functional Programming by Bird and Wadler

Term 2 - Imperative Programming

- Modula-2 language
- Builds on recursion and higher order function knowledge from Term 1
- Emphasizes abstraction, modularity, reasoning about state and control flow

Term 3 - Software Design

- Covers programming techniques like backtracking, parsing, etc
- Implements project splitting modules between students

Evaluations

- Extensive evaluations done with students and experts
- Time expenditure in good agreement with course norms
- Students find course pleasant and useful
- Abstraction skills tested more than just coding ability
- Identified and addressed 3 main problems:
  - Operator syntax and associativity
  - Understanding types
  - Different computation models
- Experiment showed functional group produced better structured programs

Programming Project

- Implements railway information system in Modula-2
- Specification provided, students implement modules
- Teaches importance of specifications, testing, and integration

Conclusion

- Successful development of intro programming course with functional programming
- Students learn abstraction, formal manipulations, solve complex problems
- High appreciation from students