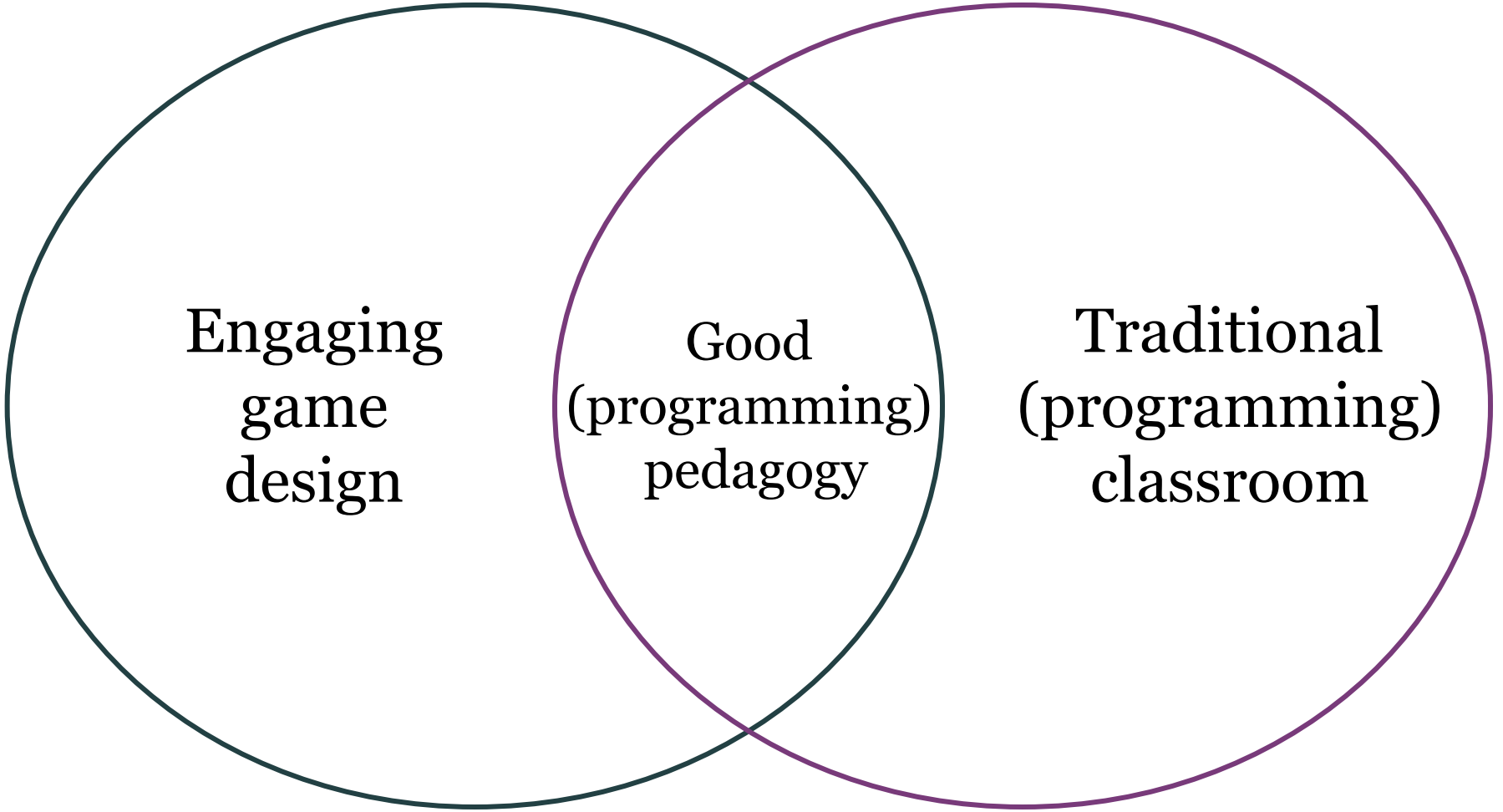
Improving Engagement in a Traditional Programming Class through Progressive Challenge and Community Building

Amber Settle
School of Computing

DePaul Faculty Teaching and Learning Conference
April 20, 2012

Introduction



Engaging game design

- Interactive
- Easy to begin but hard to master
- Progressive challenge
- Encourages risk through targeted reward
- Community development

- Sources:
  - *Good Video Games and Good Learning*
    - James Paul Gee
  - *Rules of Play*
    - Katie Salen and Eric Zimmerman

Traditional (programming) classroom

- CSC 241/242: Introduction to Computer Science I/II
  - Undergraduate developers
    - Computer science (currently)
    - Game programming (beginning Fall 2012)
  - Novice programmers
  - Programming syntax
  - Problem-solving skills
- Combination of lecture/lab
  - Lecture twice a week
  - Lab once a week

Good (programming) pedagogy

- Easy to begin but hard to master
  - Simpler programming environments
    - Non-majors: Alice, Scratch, App Inventor
    - Simpler syntax: Python
  - Interesting problems
- Interactive
  - Live coding
  - Peer interaction
    - Peer instruction
    - Pair programming
  - Tools for immediate feedback
    - CodeLab
- Progressive challenge
  - Solutions that generalize
  - Concepts that apply across varying problems
- Community development
  - Support
  - Retention

A case study

- Curricular context
- Course/assignment structure
- Advantages
- Emergent issues
- Lessons moving forward

Context

- CSC 241/242: Introduction to Computer Science I/II
  - Required only for computer science majors/minors
    - Next year: Game programmers too
  - Programming skills
    - CSC 241: Basic types, writing functions, decision structures, looping structures, file processing, exception handling, collections
    - CSC 242: Object-oriented programming, GUI development, recursion, searching and sorting, web application development, databases
    - Language: Python
  - Computer science problems
    - Searching
    - Text/file processing
    - Web crawling
    - Limits of computation

Course structure

- Augmented lectures
  - Introduction of syntax/concepts
  - Exploration through multiple examples
    - Until Spring 2012: Live coding only
    - Spring 2012 and beyond: Hands-on exercises
      - Using the interpreter
      - CodeLab
  - Highly interactive
- Lab sessions
  - Focused on problem solving
    - No suggestion of syntax
  - Collaboration highly encouraged

Assignments

- Lab exercises (first)
  - Time-restricted and challenging
  - 50% participation/50% exercise submission
  - 5% of the grade
- Assignments (second)
  - Individual work outside of class
  - (Nearly) unlimited resources
  - Strictly graded on correctness and style
  - 35% of the grade
- Exams (conclusion)
  - Taken in a lab
  - Time restricted and limited (but generous) resources
  - More generously graded on correctness only
  - 60% of the grade

Advantages

- Easy syntax but hard problems
- Process of programming is exposed
  - Partial solutions
  - Flawed solutions
- Failure management
  - Early identification of problems
  - Motivation for improved effort
- Close connections with classmates
  - Female students group together

Emergent issues

- Just in time preparation
  - Pace is unpredictable
  - Strengths/weaknesses vary
  - Coordination is key
- Balance in discussion
  - Attention-seeking students
  - Positive feedback
- Plagiarism
  - Lab time used to start assignments
  - Record number of violations
- Retaining attention
  - Monitors in front of them
  - Engagement with course material

Lesson moving forward

- Flexibility
  - Coverage of topics
  - Adjustment of assignments
- Academic Integrity policy
  - Labs collaborative
  - Assignments strictly individual
  - Choice of grading policy
- Focus on engagement
  - Is this presented in an interactive way?

Questions?

asettle@cdm.depaul.edu
http://facweb.cdm.depaul.edu/asettle/
(312) 362-5324

Thanks to Ljubomir Perkovic