

## CS Principles Pilot at Metropolitan State College of Denver

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**Course Name:** Living in a Computing World

**Pilot:** Fall semester, 2010

### a) How *Living in a Computing World* Fit In At MSCD:

Metropolitan State College of Denver (MSCD) is a public, open enrollment, non-residential college attended by 23,000 undergraduate students, 94% of whom are from metropolitan Denver. MSCD has a *statutory mission of providing access for underserved and low-income students*. It is ranked in the top 100 schools in the USA for graduating Latino students and students of color.

Computer Science faculty in the Department of Mathematical and Computer Sciences recognized the opportunity to pilot the course *Living in a Computing World (LiaCW)* as a means to further the objective of making knowledge of computing accessible to all students. The course was open to all with the only requirement being that the students be “college ready”; that is, minimally eligible to enroll in College Algebra 1 and English 1. *LiaCW* did not satisfy any degree requirements other than college-residency units. The course thus had no prerequisite courses nor was it prerequisite to any other course.

### b) Course Specifics

- **Class Sessions:** Two 110-minute periods per week
- **Course:** 15-week semester, yielding 55 contact hours
- **Credit Hours:** 4 semester credit hours
- **Fulfills Requirements:** none (residency only)
- **Attendance:** 20 enrolled; 18 at term’s end
- **Algorithm Specification:** structured English; LightBot; Scratch
- **Grading:** activities, assignments, exams

**c) Class Pedagogy and Content** The class employed an opportunistic approach that emphasized human-to-human interaction.

The order of course content was guided by opportunities arising from the environment of students and their world. On the first day of class, students articulated items of individual and collective interest in response to prompts like “things you’ve wondered about,” “what you would like to know,” and “what you’d like to be able to do.” These formed the surface agenda for the course and the collection was revisited and updated during the semester. In addition, happenstance and current events were considered opportunities to leverage the associated interest that could facilitate addressing intended content. Such events arose in the news and in the lives of individuals and groups of students.

Class sessions were comprised of shorter sub-sessions during which students primarily interacted with one another toward a purpose. The pedagogical goals were usually to activate a concept, encourage curiosity, and facilitate discovery. Concept activation refers here to engaging in an activity that results in desired information being transferred from long-term memory to consciousness. Such activation and recollection was one foundational element that enabled acquisition of the intended CS Principles content.

Another key element was that of leveraging curiosity in order to encourage the cognitive processing necessary to connect new concepts into a student's existing knowledge framework. The goals were for the activities to arise from the interests of students themselves and to provide both sufficient challenge to be interesting and appropriate challenge to be rewarding. If the challenge was too little, students would be bored; if the challenge was too great, students would be frustrated; either way, learning would be compromised. Achieving the desired balance was difficult even with the small number of students.

Instructor presentations (lectures) were minimized as they were thought to be less engaging and less effective than active-learning experiences. However, the high resource burden necessary to develop active-learning experiences across the entire CS Principles content was too great and this objective was not met to the desired degree. That is, resource cost was a significant impediment to more effective pedagogy.

The course content was drawn from the items articulated in the CS Principles curriculum framework with each of the major areas identified as a big idea receiving roughly the same amount of emphasis. The pilot course environment and timeframe permitted only a subset of the curriculum framework to be addressed.

#### **d) Evidence of Student Work**

The combination of much activity being done by students during class time with the relatively small class size resulted in little difficulty for the instructor and community assistants to directly observe and assess the nature of work and associated learning. In addition, students were required to reflect on each activity and to report insights, observations, and key ideas from each.



*Students created animated dialogs regarding social and ethical issues, such as this image from a clip that highlighted privacy concerns associated with social network postings*

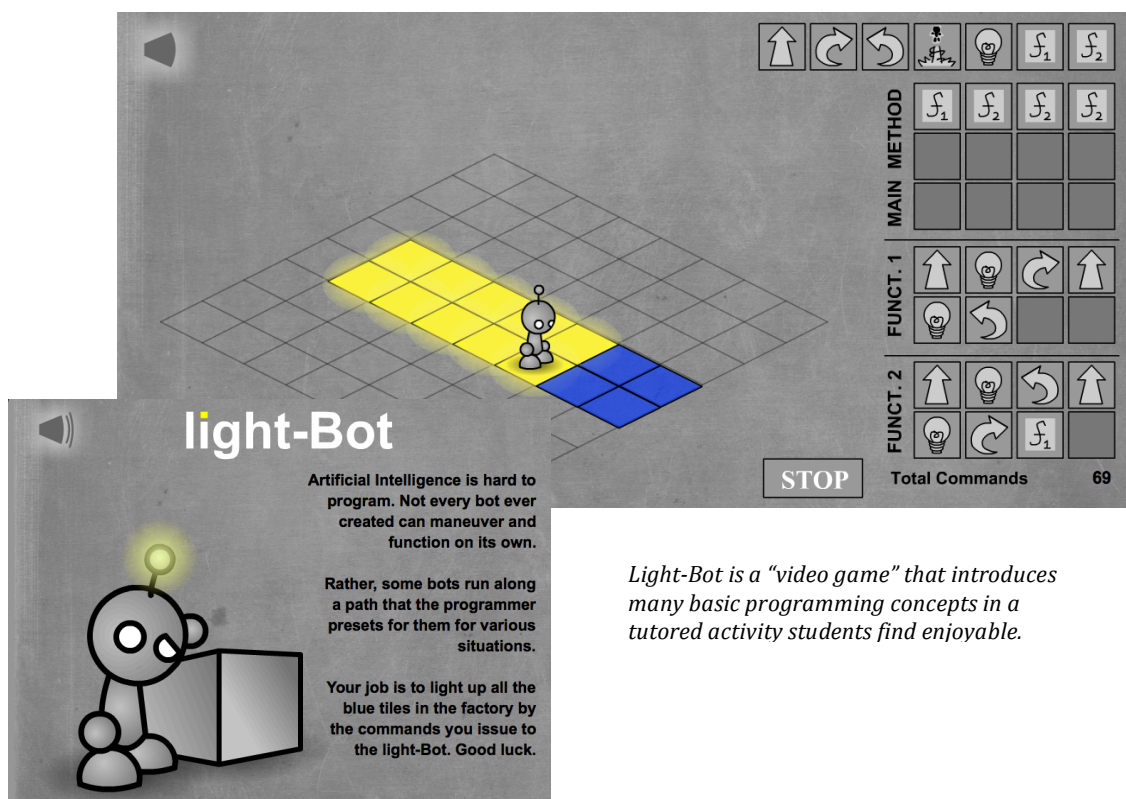
## e) What Worked And Didn't

*Active Learning.* This was, unsurprisingly, a primary contributor to successful learning outcomes. Greatest engagement and retained knowledge appeared to be associated with the active learning experiences.

*Lecture.* Some students found lectures to be the most comfortable, perhaps because lectures were more consistent with their past experiences and expectations and were much less demanding of their attention. Students reported enjoying the presentations, but the associated reflections were generally less focused and personalized.

*Numeric Examples.* This was, without doubt, the most devastating error in the pedagogy. An early appearance of a numerically-based example was sufficient to cause alienation from the concept. This may have been due to the math phobia common among the student population. Far more effective was to introduce and activate a concept using a non-numeric example.

*Lightbot.* Using the Lightbot game proved to be a very effective tool for concept activation, curiosity stimulation, and discovery learning.



*Light-Bot is a "video game" that introduces many basic programming concepts in a tutored activity students find enjoyable.*

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