Computer Science as Concurrent Enrollment: A Strategy to Broaden Participation

Virtual Panel & Webinar (SIGCSE 2020)
May 20, 2020
This session will be recorded.

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Welcome

Jennifer Rosato, Director, National Center for Computer Science Education, College of St. Scholastica

● Zoom etiquette
● Poll results - who is here?
● Agenda
  ○ Intro
  ○ Panel statements
  ○ Breakout group discussions
  ○ Discussion w/ panel & participants
  ○ Resources / next steps
Panelists

**Seth Freeman**, Professor, computer information systems & dept. chair, business and technology, Capital Community College, Hartford CT

**Dan Kaiser**, Professor of computer science & chair of math and CS dept., Southwest Minnesota State University

**Debbie Jackson**, Associate professor & interim dept. chair, Teacher Education, College of Education & Human Services, Cleveland State University

**Ronald Greenberg**, Professor of computer science and undergraduate program director, Loyola University Chicago

**Renee Fall**, Research scholar, NCCSE, College of St. Scholastica (moderator)
## Advanced Coursework in High School

<table>
<thead>
<tr>
<th>Type/Term</th>
<th>Where Taught</th>
<th>Teachers</th>
<th>Assessment</th>
<th>College Credit</th>
<th>Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Enrollment</td>
<td>Campus</td>
<td>Faculty</td>
<td>Course Grades</td>
<td>At end of course</td>
<td>HE Accreditors, Campus, State</td>
</tr>
<tr>
<td>Concurrent Enrollment</td>
<td>High School</td>
<td>Certified HS Teacher</td>
<td>Course Grades</td>
<td>At end of course</td>
<td>HE Accreditors, Campus, State. NACEP</td>
</tr>
<tr>
<td>Advanced Placement</td>
<td>High School</td>
<td>HS Teacher</td>
<td>Exam Score</td>
<td>After college matriculation, depending on exam score</td>
<td>College Board</td>
</tr>
</tbody>
</table>
What is Concurrent Enrollment?

- **Partnerships** between college/university and high schools
- College courses offered *in high schools, during the school day*
- Grades/credit based on work through the term (vs. one high-stakes test, as AP)
- Students earn credit on a college transcript + high school credit at course completion
- Qualified *HS teachers* offer college-credit courses
- Often supported by state and/or federal funds to *reduce cost* to students
- National Alliance of Concurrent Enrollment Partnerships
  - Accreditation
  - 6 Standards (partnerships, faculty, assessment, curriculum, students, evaluation)
Reach and Growth of Dual/Concurrent Enrollment

- Dual enrollment grew more than 7% from 2002 to 2010, with higher growth in rural schools and majority students of color
- 82% of public high schools enroll students in college courses (2010-11) and this has grown since
- 1.4 million high school students (10%) took college courses (2010-11), much higher in upper grades and in some regions
- 77% of students were taught at secondary schools (CE)
- DE/CE exhibit gaps in participation rates (White, Asian, and students whose parents have college degrees more likely to participate), similar to AP

http://www.nacep.org/resource-center/fast-fact-on-dual-and-concurrent-enrollment/  NCES data
Unlocking Potential: A State Policy Roadmap for Equity & Quality in College in High School Programs
Participation in DE and AP (2015-16 school districts)

Positive Effects of Dual Enrollment

- High school
  - Completion
  - General academic achievement
  - Staying in school, attendance, college readiness

- College
  - Access and enrollment
  - Degree attainment

- Some evidence that dual enrollment has better outcomes for students of color and first-generation college students.

IES, What Works Clearinghouse, Dual Enrollment Programs
Haxton et al, 2016; An, 2013
Broadening Participation in Computing (BP) via CE

- Computer science graduates are majority male, White, and Asian
- BPC efforts are creating new curricula, tools, pedagogies, PD
- Nearly all 50 states sponsor dual- or concurrent- enrollment programs
- Concurrent- and dual-enrollment is growing, especially to rural schools and those with high minority student populations
- Has positive impact on college degree attainment, access, and enrollment, credit accumulation, high school completion and achievement
- Low cost to students due to state and federal funding
- **Colleges can reach HS students with intro CS courses via CE, and tap into and help develop the growing number of HS CS teachers**
Computer Science as Concurrent Enrollment

How many post-secondary institutions offer CS as CE? What do they offer?

Additional examples we know of:

- UWashington in the High School - 3 CS courses
- Montana University System CE - Joy and Beauty of Computing
- Utah Valley University - Computer Science Principles

Share in the Chat:

- What other campuses offer CS as CE? What do they offer?
- Are there national or other sources for this data?
# CS-through-CE Problem of Practice

<table>
<thead>
<tr>
<th>AP CS Principles</th>
<th>Concurrent Enrollment</th>
<th>Problem of Practice</th>
</tr>
</thead>
</table>
| - Increases female and minority student participation in computing  
- College credit based on single exam score and college policies  
- Not all schools offer AP  
- Not all students choose AP when offered | - Has positive effects on college enrollment, degree attainment, high school completion and academic achievement  
- College credit based on multiple assessments throughout the course and earned upon completion of course  
- One third of HS students took courses for postsecondary credit  
- Very few CE programs offer computer science | - How can CS be implemented as a CE offering in a way that broadens participation in computing at the high school-to-college transition? |
Mobile CSP through CE

- NSF “CS for All” RPP Grant
- 2 states, 3 years (2 of PD/course)
- 40 teachers; 600+ students
- Year 1: 13 schools
- Can CS-through-CE broaden participation?
## Four examples of CS-through-CE

<table>
<thead>
<tr>
<th>Campus/presenter</th>
<th>Inst. type</th>
<th>Terms &amp; funding</th>
<th>Curricula/ college courses</th>
</tr>
</thead>
</table>
| Capital Community College (Seth Freeman) | Public 2-year CC Urban         | Concurrent enrollment “College Career Pathways” Perkins / CTE | ● Mobile CSP (CSC 117)  
● Intro to Prog. Logic  
● Web Design |
| Southwest MN State Univ. (Dan Kaiser)   | Public 4-year state univ. Rural | Concurrent enrollment “College Now” State funded          | ● Mobile CSP (IDST 164)  
● Fundamentals of Programming  
● Computer Applications |
| Cleveland State Univ. (Debbie Jackson)  | Public 4-year state univ. Urban | Dual credit “College Credit Plus” State funded            | ● CS Principles (CIS 151) |
| Loyola University Chicago (Ronald Greenberg) | Private 4-year univ. Urban    | Dual credit “Loyola Dual Credit” Inst. funded             | ● AP CS Principles (Intro to Computing)  
● AP CS A (Intro to Object-Oriented Programming) |
College Career Pathways Program (CT)

- Common CE program across 12 CT Community Colleges
- Funded by Carl D. Perkins federal grant
- HS instructors are approved by each comm college to teach CE courses in their school building
- Students must choose a career pathway and take a minimum 2-course sequence in a pathway
- Available to 10th, 11th and 12th graders
- Opportunity to earn up to 15 college credits
- No eligibility requirements (from community college)
- No cost to students / participating schools
Mobile CSP Articulation and Professional Development

- CCC developed **CSC 117 - Mobile CS Principles** to articulate with partnering high schools
- CCC approved teachers to participate in Mobile CSP PD and teach the course the next academic year
- Participating teachers participated in a 100-hour Mobile CSP PD over the summer
- Teachers meet monthly with Mobile CSP Master Teacher to receive year-round support
CSP-through-CE @CCC, Year 1

2019-2020 Participating Schools / Student Population
6 Participating Schools / 5,002 students total
48% female*
51% URM students*
Range: 14% - 98%

2019-2020 Mobile CSP Participating Students
123 students
24% female
28% URM
Lessons Learned from Year One in CT

- We were able to recruit 6 participating schools in Year 1
- Encountered barriers in recruiting schools
  - CS is not a core requirement
  - Preference of AP over CE
- CSP CE courses alone in year 1 in CT do not broaden participation
- Student Recruitment within school building is critical
- Difficult for Schools to Recruit Students for the 1st year
  - Recruitment often occurs before Summer PD
- Some participating schools are offering Mobile CSP course in dual AP/CE format
  - Difficulty teaching course in dual format
  - Students lose benefits of CE version of the course (pacing)
Southwest Minnesota State University

- Public, 4-year
  - Carnegie classification – Master's Colleges & Universities: Medium Programs
- ~ 7000 headcount, ~ 3600 FYE
- Opened in 1967
- Located in Marshall, MN, (pop. 13,500)
  - Only two other towns of similar size within a 90 mile radius
Concurrent Enrollment – College Now

- Accredited - National Alliance of Concurrent Enrollment Partnerships (NACEP)
- ~ 100 School Districts (Most with enrollments of 300 - 600 high school students)
- ~ 4500 Students
  - ~ 3000 Mathematics (College Algebra through Calculus)
IDST 164 Essentials of Computing

● SMSU adopted the Mobile CSP curriculum for COMP 164 in 2018
  ○ Changed the prefix from COMP to IDST (Interdisciplinary)
  ○ Broaden perspectives by attracting teachers from other disciplines
  ○ Current teachers are licensed in: Business, English, Mathematics, Psychology, and Technology
  ○ Required: Masters (any discipline) + 100 Hours Professional Development

● Prior to adopting Mobile CSP
  ○ ~ 5 schools doing computing through College Now, only 1 programming
  ○ 2019 - 2020, 6 schools doing IDST 164
  ○ 2020 - 2021, ~ 14 schools
CSP-through-CE @SMSU, Year 1

2019-2020 Participating Schools / Student Population
7 Participating Schools / 2,731 students total
49% female
16% URM students*
Range: 2.15 - 47.18%

2019-2020 Mobile CSP Participating Students**
41 students
17% female
15% URM
**data from 5 schools
CSforCLE Dual Enrollment: Background

- **Ohio College Credit Plus Program**
  - Students grades 7-12 who meet CSU entrance requirements can come to campus and take CSU courses
  - CSU certifies teachers to be able to teach college level courses in the high school

- **Dual Credit CS courses through CSU**
  - AP Computer Science Principles professional development
  - CIS 151, Invitation to Computing

- **The numbers**
## CSforCLE Dual Enrollment: Numbers

<table>
<thead>
<tr>
<th>Year</th>
<th># of Schools*</th>
<th># of Students</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>7</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>4</td>
<td>29 (22 students from one suburban school)</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>4</td>
<td>16 students</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>4</td>
<td>14 students</td>
<td></td>
</tr>
</tbody>
</table>

*Only one of the schools each year has a majority racial minority population

Since 2013, 53 teachers have been offered the opportunity to teach the CCP course in 48 schools.
CSforCLE Dual Enrollment: Benefits & Challenges

- **Benefits**
  - Students receive CSU credit
  - Teachers are part of the CS teaching community
  - Recruiting tool for CSU

- **Challenges**
  - Not all students in the high school course receive college credit
  - Common route to teaching CCP in CS requires master’s degree level coursework
  - Some skepticism among CS professors about the high school classroom
Loyola University Chicago

- A private university with undergraduate and graduate programs and a strong emphasis on research, teaching, and promoting diversity.
- Approximately 12,000 undergraduates, including nearly 400 students in the most computing-focused majors (Computer Science, Software Engineering, Cybersecurity, and Information Technology).
- Varying pathways into computing majors with courses to which we articulate both Computer Science Principles and Computer Science A AP exams (score of 4 or 5). We also offer courses that may spark interest in students not originally planning a computing major:
  - History of Computing
  - A programming introduction geared towards non-majors (Past languages have included Visual Basic, App Inventor, and Processing.)
Dual Credit at Loyola

- A well-developed program across 15 subject areas. In a recent semester, over 20 high schools participated, running nearly 100 sections of 40 courses.
- In Computer Science, the program is small — currently just two high schools running several sections of AP courses: CS Principles and CS A. Since 2015 (with a different high school). About 150 CS dual credit students; 40% female.
- Most class sections have a mix of students who are signed up for credit at Loyola and others who are not. Some of the latter students may be planning to take the College Board AP exam, and others may not.
- Fully taught by regular high school teachers. Vetted by Loyola. Loyola faculty member makes a site visit and organizes a PD session at Loyola.
Best Practices

● Loyola follows recommendations of the Learning Commission aligning with standards of the National Alliance of Concurrent Enrollment Partnerships (NACEP) covering six categories:
  ○ Partnerships (university mission alignment and collaboration with secondary school partners)
  ○ Curriculum (standards and oversight consistent with university courses)
  ○ Faculty (teachers meet on-campus qualifications, engage in professional development, etc.)
  ○ Students (prereqs, advisement, support, and logistics consistent with on-campus)
  ○ Assessment (comparable grading standards and assessment methods to on-campus sections)
  ○ Program Evaluation (student feedback to instructors and continuous improvement institutionally)

● Loyola is planning to seek accreditation.
Benefits and Challenges

- **Benefits**
  - Students receive Loyola credit at a greatly discounted rate and typically can transfer it to other institutions.
  - Overall program helps recruit students to Loyola and aligns with social justice mission.
  - CS Department joined to promote these goals and broaden participation in computing.
  - Broadens communication and sharing through a community of CS teachers.

- **Challenges**
  - Biggest by far: Finding high school teachers satisfying state regulation of meeting "same academic credential requirements as faculty teaching on campus", generally interpreted to require a "masters-level degree in the subject matter" or a "master’s degree with at least 18 graduate hours in the discipline".
  - Loyola has operating authority in only four out of ten Illinois regions.
Breakout Group Instructions

- Zoom will put you in a breakout room for 10 minutes.
- Introduce yourselves (name, role, organization)
- Assign a note-taker to capture key ideas or questions
- Discuss either or both questions
- Watch time (5 min. and 1 min. warnings)
- Zoom will put you back into the large group room
- Note-taker to type key ideas or questions from your group into the Chat
Breakout Group Discussion Questions

1. Do you have dual enrollment in CS/computing? If so, what are your goals and are you meeting them? If not, might it help meet any of your goals?

2. In the context of your organization (school or college), what would be the benefits and challenges to offering CS as CE?
Participant / Panel Discussion

Key ideas from discussions

Questions
Next steps

Resource [handout](t.ly/2p5D)

Complete the short survey: [t.ly/2p5D](https://t.ly/2p5D)

Recording of webinar: [https://youtu.be/UICWjOD7Hto](https://youtu.be/UICWjOD7Hto)

Stay in touch

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Acknowledgement

This material is based upon work supported by the National Science Foundation under grant numbers 1837723, 1836990, 1836983, 1339270, 1738607, and 1738691. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
References


National Alliance of Concurrent Enrollment Partnerships. *Fast Facts on Dual and Concurrent Enrollment*.