Preston High School

Supporting Multiple CS Pathways in One Class

Lisa Bennett
Technology Teacher
Kingwood, WV

Implementation

Grades Taught 9-11

Length of Use 1 year

Students Enrolled this Year 10 AP
40 Intro to CS

10 students in 9th-12th grade AP CSP plus 40 Intro to CS students in one class

Courses Covered

- CompSci 1
- CompSci 2
- CompSci 3

Favorite Features

- User friendly
- Lesson plans
- Clear instructions

Preston High School happens to be the only high school in all of Preston County, West Virginia serving over 33,000 residents, including over 12,000 families that call the rural community of Kingwood, West Virginia home.[1] Preston High School has a population of 1,185 students and a student-teacher ratio of 14:1, slightly lower than the national average of 16:1.[2] One of the biggest benefits of having fewer students in class is being able to accommodate different learning styles, something that Preston High School Career Technical Education teacher, Mrs. Lisa Bennett, knows plenty about.

As the only educator teaching computer science and coding at the only high school in the district, she has the challenge of finding solutions that work for multiple grades and experience levels, and genuinely preparing her students for careers in West Virginia and beyond. Preston High School Principal, Steve Plum, speaks to the popularity of Bennett's class as “a class that the school has no problem filling. The class is full every semester since its inception.”

Early in 2018, Bennett was told she would have to teach AP Computer Science Principles (AP CSP) *and* Introduction to Computer Science students in one class. While West Virginia requires high schools to offer computer science,[3] there was little guidance on how to make sure students and teachers were successful: “The state didn't give a lot of guidelines. They just said they want them to learn to collaborate. They want them to use multiple devices.” Along with AP CSP and computer science, Principal Plum had the expectation that Bennett’s students learn good digital citizenship.

1 https://www.census.gov/quickfacts/fact/table/prestoncountywestvirginia/HCN010212
2 https://www.publicschoolreview.com/average-student-teacher-ratio-stats/national-data
3 https://code.org/promote/wv

So Bennett started to look for a solution that would help her balance the diverse needs of her future classroom: a mix of Advanced Placement Computer Science students, Introduction to Computer Science students, and special education students. Her goal was to find a self-paced solution that would immediately engage students within the constraints of a traditional 45-minute learning block and cover all the necessary course requirements designated by her state and administration.

Challenges

Many of Bennett's students are low income and do not have computers at home. Since students also have no access to tablets at school, the state allows the use of a personal device for authorized use. Unfortunately, the draw of playing a video game like Fortnight or chatting on social media on their cell phones can be too enticing for some students and sometimes leads to disciplinary issues and disruptions in class.

The hardest challenge for Bennett is having to teach students entering her class with almost no exposure to coding and trying to help them through their frustration. Bennett recalls how that sense of exasperation was echoed by many of her students: "They would be like, 'I don't get it. I just don't understand computers.' "

Bennett is adept at the flexibility needed to teach a mix of grade levels and abilities. With a class of 9th through 12th graders, she'll sometimes have special education students or students that have been held back numerous times. This year, she has a total of 42 students learning Introduction to Computer Science across two classes and five students that are learning AP CSP at the same time.

While all her students have a rubric they must follow, her AP CSP students have the most stringent standards since requirements are dictated by the College Board. There's also the added pressure she and her AP students feel to do well since it's such a big investment of resources, money and time for both.

Implementation

> **This school district has limited funding, so choosing CodeCombat for AP CSP was a well thought out decision due to its curriculum and the interest the students have in using the program.**
>
> **Steve Plum, Preston High School Principal**

Before purchasing CodeCombat, Bennett tested various coding products. “I was looking for something that would engage my students without me having to force them to learn. And so I looked at a few programs.” While walking around and asking the students how they were enjoying another coding product, one female student who was good at coding said to her, “Oh it's okay but you should try CodeCombat. My teacher last June let us do CodeCombat. We really liked it.”

The other coding product did not hold her students’ interest and Bennett herself was hoping to find a better alternative to the coding product she was testing in class, saying “I personally didn't really like it that much.” So her student’s recommendation was Bennett’s initial big push to try out CodeCombat.

Bennett’s class tested out CodeCombat’s Introduction to Computer Science for two weeks just before the holidays in 2017. They started in Python, learning basic programming concepts such as syntax, loops, variables, and algorithms.

63 Total Students
50 Current Students

Students at Preston High School have written:

1,314 *computer programs*

13,669 *lines of code*

Concepts Learned

Basic Syntax
Arguments
Strings
While Loops
Variables
Algorithms
Place game objects
Construct mazes
Create a playable, sharable game project
If Statements
Functions
Parameters
Advanced Strings
Arithmetic
Input Handling
Boolean Logic
Arrays
Break Statements
Continue Statements

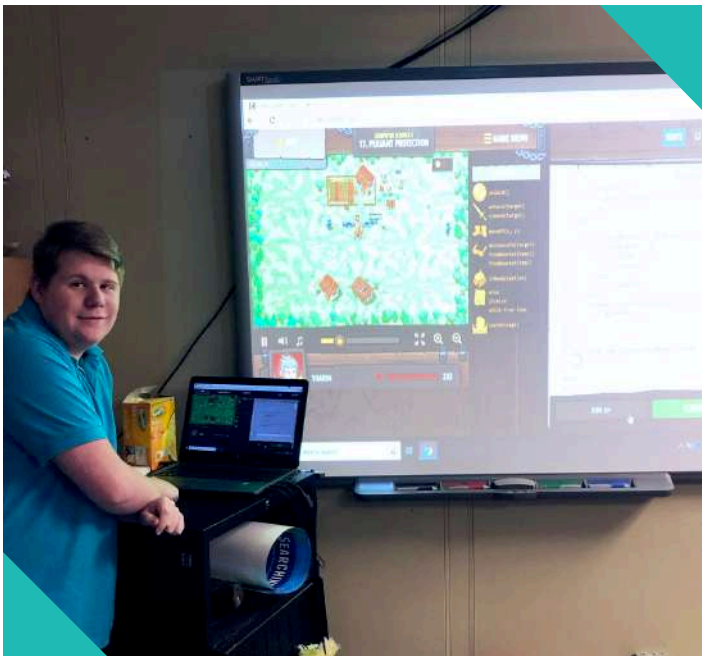
> **...everyone was engaged and really interested. It wasn't like I was forcing them. A lot of kids said by doing it, it helped them know why they were writing certain code.**
>
> **Lisa Bennett, Technology Teacher**

With the thought of her combined AP CSP and Intro to Computer Science class looming on her mind, Bennett knew she had already found a solution she wanted to purchase for her class.

Fortunately, another middle school teacher in the district had already received CodeCombat funding approval from the school board, so Bennett just needed to wait for the funds to be released. By the end of September, her class was ready with a full curriculum of CodeCombat.

Creating Opportunities for Deeper Learning

Through CodeCombat, Bennett's first challenge was immediately solved. Students are not only motivated to focus on their work, but they're also ready to start working at the start of class. "I didn't expect the students to get on the program every day without prompting." She also no longer has to compete with cell phones for their attention. "I don't have to say, 'OK. Come on. Get off the game and get on to your work.' I don't have to do that with them. They just come right in and get on there."



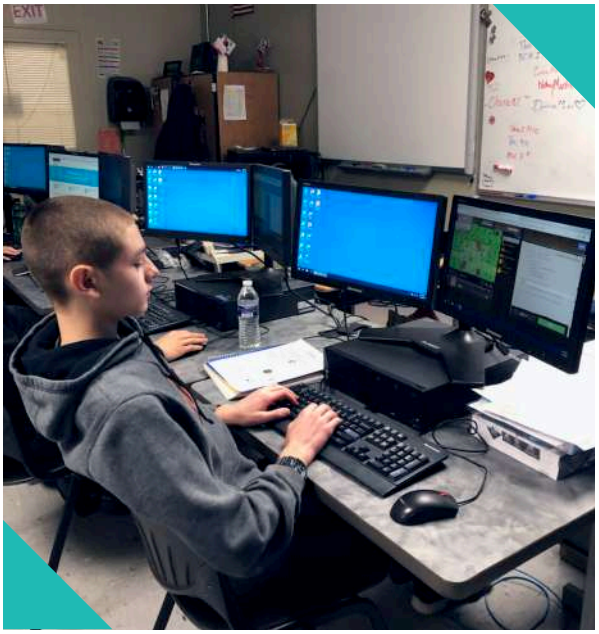
CodeCombat's game, with it's clear instructions and varied content, is not only fun, but also helps to reinforce the lessons students are learning. "The students use what they learn." Students are engaged in coding because they are playing a real game. Not only that, but they begin to understand how the games (that previously distracted them) actually work and how they can create a game themselves. Bennett also mentions that students now easily sit through instructional videos because "They want to learn how to do the next step," and love that they can pick up their work within the program where they left off right when class starts.

Bennett has even created opportunities for students to enhance their communications and build digital citizenship skills by teaching them to use the CodeCombat forums: “I love the fact that they use it. They ask questions of other kids across the country. That's really important.” Bennett has also taught them to use the website to report any issues they encounter so that they no longer have to tell her and can take the initiative to report it themselves.

The structure of the CodeCombat curriculum allows Bennett to cover more topics in a shorter amount of time. Bennett acknowledges that the time constraint can be a challenge for a teacher that wants to offer deeper or more personalized learning, but with CodeCombat things have been much easier.

> **“With CodeCombat, 45 minutes is enough to get them engaged and get them going... It's so active and interactive that they get a big bunch of it for 45 minutes and then they can come back and do it again 45 minutes later.”**
>
> **Lisa Bennett, Technology Teacher**

Bennett uses the CodeCombat lesson plans to create her own worksheets and provides it to the students as an overall summary of what they’ve learned. She also uses CodeCombat’s assessments and a student’s overall completion of the levels as part of her own rubric in order to motivate her students to work their hardest and meet classroom as well as their own expectations.



Fascination Over Frustration

The frustration inexperienced students once started with has now evolved into a rewarding challenge for them. “I don’t hear students with little experience getting upset and not trying.” Bennett adds, “I enjoy hearing that this is hard. Yet, they continue to dive in and figure out the process.” When students communicate that a level is hard, her advice to them is an encouraging push to keep trying: “I say, ‘Just stick with it.’ Bennett adds, “I tell them when you first start out it's gonna be different, kind of like learning a foreign language.” Bennett’s encouragement and her students’ ability to code through trial and error is working. “Now they're not afraid of making mistakes.”

Tips for Teachers

Bennett's recommendation to teachers is to engage in student-centered learning in coding, involving students in the creation of learning goals and the discussion about which tools to use in class to support those goals.

> **"[Because] I asked them if they would be interested in using this program, the students felt like they were a part of their learning."**

For some of Bennett's students, CodeCombat has also helped funnel disruptive behavior into positive temperamental changes, transforming them into empowered learners. Bennett recalls one special education student's exclamation of joy: " 'Now I understand why I'm doing what I'm doing.' "

While Bennett will pull students together at the beginning of class to reinforce concepts or introduce a new lesson, the class is largely self-paced. A self-paced class allows Bennett to avoid the boredom induced disruptions caused by students that have to wait for peers to catch up. This way, no one is left behind and it allows AP and advanced students to be individually challenged.

Bennett is able to track a student's progress on the teacher dashboard. If she notes that a student seems to be having difficulty independently solving a problem, she'll engage with AP students to see how they think they may be able to help, teaching both collaboration and critical-thinking. "I'll say, 'Do you want to walk her through this? [Do] you think there's a snag somewhere?' "

21st Century Skills for a Brighter Future

CodeCombat and Bennett's own efforts have helped transform her class into a critical-thinking space where AP students and Intro to Computer Science students of all skill levels can work independently or collaborate, communicate problems, learn from all the tools at their disposal, learn from mistakes, and channel their anxiety and stress into productive personal challenges. Principal Plum has noticed the improvements in the class, remarking that "During my walk-throughs where I see personally what the students are working on in their classes, this coding class is engaged and focus[ed] on the daily tasks."

Bennett does not expect AP test results until the end of the year, but can already see the tangible changes that will make them better equipped for college or future careers, which is especially relevant in Preston County where there is an 84% high school graduation rate, but only 15% of students obtain a bachelor's degree or higher. "We're trying to get them to see the value of coding and

that there's jobs available in West Virginia where they can actually use it, for them to see the importance of learning it. They're used to computers being a game and not for actual work, and that's what we're trying to instill in them."

Students will encounter different personalities and experience levels and need to learn to work with all of them in future careers. Bennett appreciates how CodeCombat made it easier for students to work together.

> **"I really liked their collaboration and that they're learning to work together and ask each other questions."**
>
> **Lisa Bennett, Technology Teacher**

Bennet adds that students are "learning how to figure things out and not be so teacher dependent."

AP students, Intro to Computer Science students, and special education students all in one class was a challenging situation that Bennett turned into a deeper learning opportunity that will continue to reward students no matter where they decide to take their skills. Next year, Bennett will have a full class of 25 AP Computer Science students and she'll be ready for whatever new challenges come her way.