Online schooling is exploding in US from *New Scientist* 2881, 5 September 2012

EIGHT-YEAR-OLD Julia Ratten and her brother Jack, who is 7, won't be going back to their local school this month. After the school district in Beaverton, Oregon, announced its latest round of budget cuts, teacher lay-offs and increases in class sizes, Jack and Julia's parents decided to enrol them in the state's full-time online school, Oregon Connections Academy.

"I thought it was weird to send your kids to online school," says their mother, Kristin. But facing class sizes of more than 30, she says she and her husband Jason saw little to lose in trying something different.

As schools around the US come back from their summer break, the Rattens are one of a small but rapidly growing number of families who are turning to the internet as an alternative to chronically under-resourced brick and mortar institutions.

Proponents say online primary and secondary education, whether full-time or as part of a "blended" programme of online and face-to-face education, could usher in a new era of personalising education that will give each child the best chance of success.

Critics argue that there is little evidence online learning is effective. But as state-run schools, for-profit schools and even free alternatives such as video lessons set up shop online, more and more US students are ditching the traditional classroom.

Florida Virtual School, the first internet-based, state-run high school, opened its virtual doors in 1997. But in the last few years, as the US economy has faltered, some 35 states have cut budgets at all stages of education, from kindergarten to 17 and 18-year-olds in 12th grade, collectively known as K-12. Driven by the promise of reduced costs per student, states have increasingly turned to large-scale online learning programmes. Today, 30 states offer full-time online schools. Some, like Tennessee, require all students to take at least some online classes.

According to the Evergreen Education Group, an educational consultancy based in Durango, Colorado, around 250,000 students attended online-only schools in the 2010-2011 school year. That's only about 0.5 per cent of the approximately 55 million K-12 students in the US, but it's a jump of 25 per cent over the previous year and the numbers are likely to keep rising (see graph).

"We anticipate continued growth until around half of courses are taken online in high school," says Kerry Rice, an education researcher at Boise State University in Idaho. A 2009 analysis by Clayton Christenson of Harvard Business School in Boston, suggested this could happen as early as 2019.

The "flipped" classroom model in particular has grown tremendously in the past year, says Jon Bergmann, an educational consultant based in Lake Forest, Illinois. Teachers record video lessons for students to watch at their own pace, usually outside class. The idea, says Bergmann, is to free up class time for collaborative projects and individual attention. "It personalises the learning for each kid," he says.

Greg Green, principal of Clintondale High School in Clinton, Michigan, put the practice to the test during the 2010-2011 school year with his entire school of around 600 students, many of whom were at risk of failing or dropping out of the school system. He says the move quadrupled the amount of time his teachers were able to spend with each student, leading to a reduction in classroom failures, fewer discipline problems, and increases in college entrance and standardised test scores. "We were removed from the [state's] persistently lowest achieving list, which people said would never happen," he says.

Technology boost

It is not just lessons that are getting a boost from technology. Schools are increasingly turning to learning management systems, such as Blackboard or Moodle, to track students and facilitate online learning. These software packages typically provide an interface for students to keep track of assignments, watch videos or read course content, and participate in discussion groups and forums. They can also include video-conferencing and real-time chat with teachers and other students.

So does online education work? A 2009 meta-analysis of over 1000 studies of online learning, conducted by the US Department of Education, found that students participating in either fully or partially online courses scored higher on average than 59 per cent of their traditionally educated peers on performance tests. Students in blended education got better marks on average than online-only students. The majority of these studies looked at higher education, however, and while the few that focused on K-12 showed small gains over traditional classrooms, there were not enough examples to draw firm conclusions. "The research literature is extremely thin," says David Figlio, an education and social policy researcher at Northwestern University in Chicago.

There are concerns that some firms offering online learning programmes may not be providing education of a high-enough standard. In July, the National Education Policy Center, a non-profit research organisation affiliated with the University of Colorado in Boulder, said that only 28 per cent of the virtual schools operated by the company K12 - the largest private provider of online educational services in the US - met federal Adequate Yearly Progress measures, as determined by standardised test scores in 2010-2011. The figure is 52 per cent for physical schools across the country.

The report cited higher drop-out rates from schools run by K12 and called for school districts to slow their adoption of the company's programming until it demonstrates better academic results.

The company, which is based in Herndon, Virginia, responds that many online-only students were performing below grade level when they started at K12 schools - which for the most part are publicly funded. Therefore traditional metrics, such as performance in mathematics at age 16, do not capture the growth in scores that its students made over the course of the year.

This doesn't necessarily mean that virtual and blended schools aren't working, says Rice. Part of the problem may lie in the difficulty of comparing online learning and face-to-face instruction when there is such a variety of school populations and teaching approaches. "There are really good face-to-face schools and there are really bad face-to-face schools. And there are really good online schools and there are really ineffective online schools," she says. "What we really want to know is 'what is effective in each type of environment?'"

Cathy Cavanaugh, an education technology researcher at the University of Florida in Gainesville, says that one approach that seems to have promise is awarding credits based on mastery of specific skills, such as algebra, rather than how much "seat time" a student has put in. The majority of US schools measure students' progress through the education system using Carnegie units, a measure of time spent either in a classroom or studying at home. This can be discouraging for students who master concepts more quickly or slowly than the pace set by the school.

Mastery-based instruction allows students to progress at their own pace, rather than in lockstep with the rest of their cohort, says Cavanaugh. Although this has always been possible with the books-and-paper model of traditional schools, technology makes it easier for teachers to keep track of how each student is doing and to provide appropriately challenging curricula. Some states are adopting regulations to allow for this shift. New Hampshire, for example, recently redesigned its high-school programme to do away with seat time in favour of mastery-based credit.

Cavanaugh says these approaches might make education function more like healthcare, allowing people to be treated as individuals. "Brains are at least as different as bodies, but as an education system we have struggled to find ways to personalise learning," she says.

As more students head online, Cavanaugh sees "school" transforming from a building to a service, some of which takes place in the presence of teachers and other students, and some of which happens online. As technology allows more students to benefit from personalised instruction, she says, classroom-only approaches will become less common. "Every type of learning environment will be in the minority," she says. "There will be so many varying approaches that no single approach will prevail."

But academic performance is only one reason why kids go to school, and critics of online learning - and virtual schools in particular - say that students miss out on building social skills because they don't interact with their peers in person.

It's a concern that the Rattens share, although they are encouraged by the number of clubs and extracurricular activities offered as physical complements to the online school. They argue that traditional classrooms are not a good place to practise modern social skills, which increasingly involve email, chat and video conferencing. "There are not a lot of classrooms in the real world," says Jason.

What works best for students

"Big data" is a well-known term in the realms of science and business, but educators are just beginning to explore how to use the flood of information generated by students taking online classes.

Kerry Rice of Boise State University in Idaho says that traditional metrics of attendance, disciplinary actions and grades are coarse compared with the information that online learning management systems can provide from clickstreams, time spent watching video, and records of students' progress through various topics. By using machine learning to understand these trends, computers could one day customise curricula automatically.

For example, the not-for-profit Khan Academy, which hosts thousands of instructional videos and automated practice exercises, provides teachers with detailed analysis of what videos their students have watched and which concepts they got stuck on.

And Silicon Valley-based start-up Knowmia, launched in August, is building a recommendation engine for the ever-expanding collection of free online educational videos. The site aggregates teacher and professionally produced material from sites like YouTube and creates custom collections based on feedback that students give on how they learn best. Some students may like to be able to see the teacher in a video, for example, while others prefer flashy graphics.

At the moment, these collections are managed by human curators, but co-founder Scott Kabat says that as the company collects more viewing and rating data, it will add automated recommendations that will match students with teachers who use their preferred learning style. "When you find the right teacher and teaching style, there's a magic that happens," Kabat says.