



RURAL EDUCATION

AND THE ROLE OF BROADBAND

Rural Telecom Educational Series



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“Education is all a matter of building bridges.”

– Ralph Ellison

HISTORY TEACHERS WOULD AGREE that to understand our present, we must look to the past. A brief timeline of the nation’s education system reveals that early Americans home-schooled their children, with wealthier families hiring private tutors. By the 1600s, the first public schools opened. These were primarily located in cities, and although attendance was not mandatory, the schools were only open to boys. The 1700s saw the proliferation of free schools that welcomed poor boys and orphans. By the 1800s, girls were allowed in the classroom, and there were one-room schoolhouses dotting the rural landscape. By 1918, laws were on the books making elementary school compulsory for all American children. In 1954, the Supreme Court ruled that public schools must be open to children of all races.

This paper was produced by the Foundation for Rural Service, sponsored by the Rural Telephone Finance Cooperative, and written by Rachel Brown. Rachel Brown is a freelance writer/researcher/copy editor with more than 20 years of experience working in the telecommunications industry.

Issued April 2013 © Washington, D.C.

IN EACH CENTURY, the American people saw the value and need for education; and at each turn, they sought to make it as inclusive and as accessible as possible. Fast forward to the 21st century and there would seemingly be no more hurdles to overcome. The U.S. National Center for Education Statistics reports that there are nearly 99,000 public schools serving 55.5 million boys and girls. But education experts point to an inequity faced by rural schools—the lack of broadband technology to deliver high-speed Internet access.

According to a survey conducted by the Federal Communications Commission (FCC), 20% of rural schools report that broadband is not available in their area; only 38% of rural schools have fiber optic connections (versus 46% of urban schools); 37% of rural respondents say installation costs are a barrier, while only 27% of urban districts cited cost of installation as a barrier; and less than a third of all of rural schools have average speeds greater than 10 megabytes per second (Mbps) (compared to 41% of urban schools).

“There is an inequity there—there is a digital divide,” said Aimee Howley, senior associate dean in the College of Education at Ohio University. “All schools are enhanced with broadband. It ought to be a tool that is available to rural schools just as it is a tool that is available to urban schools.”



Rural schools often focus on oral history lessons, Howley noted. “They send students out into the community with digital voice recorders to interview older people; they then take this audio tape back so they can transcribe it and write their reports,” she explained, adding that technology also allows rural students to do in-the-field projects. “They might visit a watershed and take water samples, evaluate them and plug that data into handhelds. That goes back to a central database for analysis.”

Despite these two rural-specific examples, Howley said that, for the most part, rural schools use their broadband connections to do the same sorts of things as suburban and urban schools: expand their curriculum through online classes and incorporate online components with traditional classroom teaching; offer teacher collaboration and training; and conduct online testing for student progress and analysis.

Noelle Ellerson—assistant director of policy analysis and advocacy for the American Association of School Administrators (AASA), a professional organization for education leaders and an advocacy group for public education—did not disagree that most schools use their broadband connections in the same ways, but she pointed out that broadband has a greater impact on rural schools and students. “If an urban school is offering an advancement placement [AP] course in trigonometry, that’s likely one option among many AP math classes for an urban student,” she cited as an example. “In a rural school, that may be the first AP course that’s ever been offered. Rural schools often lack the enrollment or don’t have the teachers to make it worth offering these types of courses. Broadband represents a more unique opportunity to a rural student.”

Alex Morrison—vice president of business partnerships for Discovery Education, a digital content provider for grades K-12 and community colleges—agreed that students who attend small, rural schools often do not have the same academic opportunities as students who go to suburban or urban schools. “Broadband allows rural schools to offer supplemental courses—maybe even learn Mandarin from a professor in China, or advanced science courses from a university professor hundreds or thousands of miles away” he said. “Sometimes community colleges offer these types of courses, but the nearest one may be 400 miles away.”

Defining “Rural”

ru*ral (roor’el), adjective [from the Latin *ruris* the country]

1. of or characteristic of the country (as distinguished from cities or towns), country life or country people; rustic: opposed to urban. **2.** living in the country. **3.** having to do with farming: agricultural.

Say the word “rural” and it’s easy to imagine various scenes that people envision. Some may picture a sleepy hamlet with a steepled church; some may conjure up rugged mountains and meandering streams; others might think of fields of corn or wheat as far as the eye can see.

Whatever the vision may be, rural policy experts note that rural areas are different across the country, and this translates into different solutions and methods when it comes to broadband delivery and policy. “Rural schools struggle for various reasons,” explained John White, deputy assistant secretary for rural outreach for the Department of Education. “In some cases, it’s because they’re in sparsely populated areas or they’re in mountainous areas. In Vermont, there are hilly terrain issues. Out in places like Wyoming, Montana and South Dakota, you’re dealing with vast distances. In Alaska, the ground is frozen for most of the year, so it’s not possible to bury fiber.”

Tim Marema—vice president of the Center for Rural Strategies, a nonprofit organization—noted that there are pockets of the

country where geography and poverty conspire to make broadband access more difficult. “Any area of the country that combines rural and poor will have trouble,” he said, citing central Appalachia, Indian country and frontier counties (very sparsely populated counties) as three particularly hard hit areas. “The reaction among Washington lawmakers is often: ‘Well, these people need to move. What are you doing living out there? You need to move to the big city.’ That cannot be the mindset.”

Noelle Ellerson—assistant director of policy analysis and advocacy for the American Association of School Administrators (AASA), a professional organization for education leaders and an advocacy group for public education—agreed. “Rural doesn’t have to mean remote when it comes to education,” she said, arguing that a child in a rural school should have the same connectivity as a child in an urban school. “Rural can be modern. It doesn’t have to mean that everyone there is 5 to 10 years behind the rest of the country.”

Bob Wise—former governor of West Virginia and president of the Alliance for Excellent Education, a national policy and advocacy organization—noted that the country’s education policy should be to offer rural students the same level of connectivity and coursework as urban and suburban students. “Broadband will preserve our rural schools more than any other initiative,” he said. “Broadband solves equality issues when it comes to geography.”

Another area of inequity that comes to mind for AASA’s Ellerson is the Obama administration’s goal to have online standardized testing at every public school. “We are nowhere near meeting that requirement because in some areas, basic connectivity is lacking; and that means that schools will be precluded from online assessments,” she

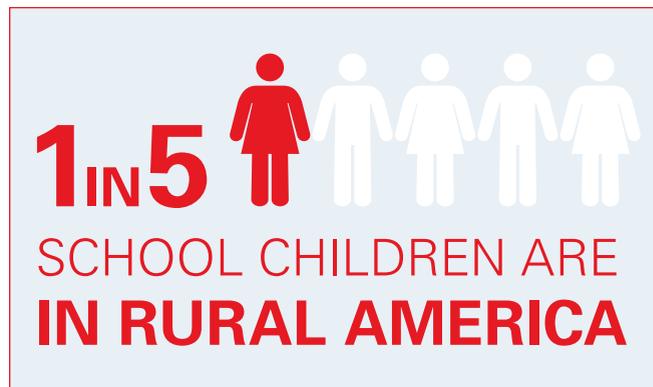
said, explaining that rural schools can resort to paper and pencil testing, but they won’t get the benefit of immediate comparisons and assessments. “It comes down to rural students being a little bit behind and not having the same access that urban and suburban schools have.”

Tim Marema—vice president of the Center for Rural Strategies, a nonprofit organization—noted that inequities in education hurt rural students and the nation as a whole. “Americans believe that opportunity and hard work are the essential ingredients to building a better life,” he said. “Rural students are among that group of Americans who face obstacles and can be left out of these opportunities. It perpetuates itself generationally and within regions, and it holds everyone back.”

UNDERSTANDING THE DEMOGRAPHIC

A snapshot of the rural student population confirms Marema's assertions. According to the Rural School and Community Trust, a nonprofit advocacy organization, students who attend rural schools make up one-fifth of all public school children. "That's 11 million K-12 children," said Robert Mahaffey, director of communications and marketing for the Rural Trust, adding that while the adult rural population is declining, the number of rural children is growing." One in four rural students is a child of color, and 40% of rural kids live at or below the poverty line."

Mahaffey agreed with the other education experts that all schools use broadband for distance learning, AP offerings and whiteboards in classrooms. "But in high-poverty, low-populated areas, the schools are much more reliant on these technologies to enrich the curriculum," he said, pointing out that wireless technology is not the solution. "Even with wireless, we still need towers; we still need fiber."



Building that infrastructure is more costly in rural areas because the cost per customer is so much higher. That's why rural telecommunications companies are so crucial."

John White, deputy assistant secretary for rural outreach for the Department of Education, noted that he's seen many successful partnerships between rural schools and small telephone companies and co-operatives. "Some of the larger telecommunications companies won't even go

students to make sure they are getting the concept," he said. "It's a much more efficient use of their time."

From the students' perspective, it allows them to have a more interactive, interesting learning experience, Monjan said. "Modern-day kids are wired differently," he said. "They are born ready to multitask. They like interacting with technology and different media; they like collaborating with their peers and working one-on-one with the teacher; they want to create their own stuff. The flipped model allows for all of that."

The flipped classroom model also helps prepare students for their future jobs, whatever those may be, Monjan said. "Looking ahead, we have no idea what type of new jobs may be out there," he said, adding that Facebook wasn't around 10 years ago. "How do you teach a workforce when you don't even know what those jobs might be?"

The answer to that riddle is to teach the skills, Monjan said. "You teach them how to use technology; you teach collaboration so students learn how to connect with others," he said. "Very likely in future jobs, they'll have to connect with others outside their home states and even outside the country."

into a region because of the lack of the customer base," he said. "For that reason alone, small utilities play an important role."

White also pointed out that while many rural schools have some form of Internet access, it's often outdated and insufficient. "A lot of schools have DSL or T1 lines, but fiber is more robust and allows for higher speed and greater bandwidth," he said, explaining that education applications are typically rich in video and audio. "These require enormous bandwidth."

The demand for bandwidth will only increase in time, White added. "The challenge going forward is making sure that schools have fiber connections because this allows for high-speed Internet access," he said.

FUNDING FACTS

While the nation does face a challenge in this area, White said he's optimistic that the country is moving in the right direction, adding that the United States Department of Agriculture is making a great deal of progress in terms of getting funding and resources to bring Internet connections to rural schools.

Education and rural policy experts don't discredit these federal agencies' efforts, but they point out that the federal government only spends 8 to 10% of its budget on education. "The rest comes from state and local taxes, and many rural areas don't have the population or property values to bring in the taxes needed to adequately support the schools," said Mahaffey.

Adding to this disparity is the nature of public funding formulas. Under the Title 1 (of the Education and Secondary Education Act), the Department of Education allocates funding for low-income school districts, but these federal dollars are concentrated around larger population centers. "The way education funding works is that poor rural students receive less funding than poor urban pupils," Mahaffey explained. "The reality is that low concentrations of poverty are just in as much need as high poverty areas."

"What I most like about having Internet in my school is being able to study and do research reports on the computers in the library. Many of my classes use the Internet on a regular basis to teach or review. It's allowed us to learn without having to carry around so many heavy textbooks."

—Krysten Ayers, junior at Moorefield High School
Hardy County, W.Va.

Flipping the Classroom

Perhaps one of the most innovative educational developments to spring from the availability of broadband is a new method of teaching termed "flipping the classroom." The "flip" is that instead of a teacher introducing a lesson or new concept and then assigning students homework, students are introduced to the concept at home via video or another interactive technology and then they use their classroom time to do their homework with instructor supervision.

Educational experts peg the origins of this new model of teaching to around 2007 because that's when it became possible to add audio and video files to PowerPoint presentations and share them online; it was also the beginning of YouTube.

This style of teaching is beneficial to teachers and students, said Matt Monjan, vice president of educational partnerships with Discovery Education, a digital content provider for grades K-12 and community colleges. "Rather than the teacher standing in front of the class and giving a lecture, now he or she can walk around and facilitate and mentor and work with



Wise pointed out that a one-time infusion of federal dollars is not the answer. “That capital investment is important, but with technology, you must constantly upgrade it,” he said. “Rural schools that got Internet connectivity 5 or 10 years ago are now running at speeds that the average home gets. Even a school running on 100 Mbps right now, in three to four years, that likely won’t suffice. There’s an insatiable demand for broadband.”

AASA’s Ellerson agreed that it’s necessary to do regular, ongoing upgrades, adding that there’s often a disconnect on this at the state and local levels. “Most people have a cell phone plan or pay for their Internet or TV on a monthly basis, but they don’t think about the fact that schools also have to pay those bills every month,” she said. “It’s an important expense to consider and build around.”

Another key funding issue to consider is flexibility. “Many state and local budgets are hard pressed, but when they do allocate funding, it should be as flexible as possible to meet the common goals,” Ellerson said. “In urban schools, they might use those funds to have better interconnectivity within the school itself. In rural districts, they might need those funds to pay for the final mile.”

THREE STRAIGHT-A EXAMPLES

Despite the steep logistical and economical hurdles involved in bringing broadband to rural schools, many of the nation’s small telephone companies and cooperatives are stepping up to that challenge.

In Lost River, W.Va., Hardy Telecommunications Inc., a telecommunications cooperative, first began bringing area schools online in 1999. “By 2008, we were providing Internet service to six schools; by 2011, all of them were on fiber networks,” explained Derek Barr, marketing and human resources director, adding that the co-op also was able to deliver a fiber network to a local community college in 2010. “This has allowed the students access to courses they’d never get. It has given them whiteboards in the classrooms.”

More than that, broadband has opened up doors to the students, Barr said. “In a city, students might study a historical event and then pop down to a museum or go visit a landmark,” he said. “Rural students never get that opportunity, but they can take a video tour.”

Barr pointed out that most of the co-op’s employees have children in the local school system. “This is part of our mission,” he said. “We are involved and want to help the schools.”

Talk to other telco and co-op executives and they express the same sentiment. Tom Maroney—chief executive officer of Halstad Telephone Co. in Halstad, Minn.—said his two children (now both in college) came up through the local schools. “When they were in high school, they both took college courses online,” he said, pointing out that small schools cannot afford specialized teachers. “You can’t have a teacher for two kids. It just doesn’t work that way.”

The schools in his part of rural Minnesota are indeed small. “In some cases, we’re talking about 150 kids in a K–12 school,” Maroney said, adding that Halstad started building fiber networks to the area schools six years ago, and also connected the University of Minnesota. “We’ve got fiber to all six school buildings and made it possible for them to have inter-building communications also.”

Maroney noted that Halstad is part of the Northwest Minnesota Special Access, a network formed in 1997 composed of 18 local exchange carriers in the state. Together, they provide the transport network for Internet and video services to participating schools and libraries, serving a customer base of approximately 90,000 users. “It’s important to be able to work with neighboring companies because it’s a joint effort to get this accomplished,” he said. “The big boys don’t have these relationships, but we’re looking toward the future.”

Hardy’s Barr agreed that rural providers have a different mindset. “The big players don’t even want to come here,” he said. “We have such a small population; and with them, everything is dollars and cents. Why build a network out here, when you could make more money by just offering another service to the urban customers?”

Michael Burrow—vice president and general counsel at NineStar Connect (Greenfield, Ind.), which is a merged company between a telecommunications co-op and an electric co-op—said his motto and one that his company shares is: A rising tide lifts all ships. “We are a community-based company,” he said, noting that the telephone side of NineStar has served Hancock County for more than 100 years. “We believe that the more we do to raise the quality of life in our community, the more we



will prosper as a company. This is not AT&T’s business model. They are looking at customer density and maximum profit for shareholders, so there’s no investment in the community.”

NineStar’s investment in its community is extensive. The co-op started building new fiber networks in 2001; by 2006, it started converting its copper lines to fiber. Eventually, this led to NineStar building fiber networks to cover all four school districts and delivering broadband services to more than 25 school buildings, with all of them interconnected.

THE POPULATION OF RURAL CHILDREN IS **ON THE RISE**



Overall, public school enrollment on a national level has increased by 1% in the past few years



but enrollment in rural public schools has **risen by 15%**.



While these school districts experienced the same sort of educational benefits as the other rural schools with broadband, Burrow said he was most surprised by how the schools were able to use their fiber networks to save money on their day-to-day operational expenses. “When the schools first wanted Internet access, they had to use T1s,” he said. “This only provided 1.5 Mbps, and each one cost \$600 to \$700 a month. A high school alone needed three or four T1s, so it wasn’t uncommon for a school district to be paying as much as \$10,000 to \$20,000 a month just for Internet service.”

Now, with a fiber network and a centralized Ethernet connection, the schools are able to purchase more bandwidth at a lower price; and they can parcel it out to the different school buildings on an as-needed basis, Burrow explained. “They’re now paying \$1,000 to \$1,200 a month, and the rate is 20 to 25 Mbps,” he said. “That’s a real cost savings.”

The Indiana schools have also saved money on their regular landline telephone systems. “Each district needed 70 to 80 phone lines for administrators, secretaries, athletic directors; but now the Ethernet connection can provide phone service, so the total cost has gone down,” Burrow said, adding that the schools’ IT and maintenance personnel have also benefitted from broadband. “They use the fiber

network for security monitoring, and they’ve got sensors on heating and cooling systems. That means no one’s driving out to each school to check on boilers. Instead, there can be alarms sent to a monitor on someone’s desk.”

In addition, the teachers in Hancock County no longer have to make the 30- to 40-minute drive to Indianapolis to take their continuing education courses necessary to maintain their teaching licenses, Burrow noted. “Before, they had to be reimbursed for mileage. It was disruptive and costly,” he said. “Now, they can take these courses online thanks to broadband.”

HOMEWORK MEANS BROADBAND AT HOME

As critical as it is to have broadband at school, rural education and policy experts note that it’s just as important to have it at home. “The lack of connectivity at home prevents learning,” Marema asserted. “It’s almost the same as denying student textbooks—it’s that essential now.”

The Trust’s Mahaffey agreed that rural students need broadband services not just at schools and libraries but at home as well. “Department of Education Secretary Arne Duncan said that students need their online learning environment to be available to them 24/7,” he said, adding that it allows greater collaboration amongst students.

“Kids can meet in groups at a park and sit around a laptop and study together.”

Students who have broadband at home can do research and even read digital textbooks, explained Discovery Education’s Morrison.

Those students who don’t have broadband at home often have to stay after school to complete their homework because some of it may have an online component to it or there may be online participation or testing, Marema said. “It’s an extra hurdle for kids who already have enough hurdles,” he said, adding that lack of home connectivity is a problem for teachers as well. “A community college professor had to record all of her grades online. She struggled for hours with her dial-up connection at home, and then it timed out, and she lost all of her work.”

Talk to the local telco and co-op executives about the importance of broadband at home and they echo the sentiments of the education experts. “Internet connection at home is important because learning is not just from 8 to 3,” Halstad’s Maroney said, adding that 70% of his company’s customers have broadband service. “But it’s available to all of them.”

Burrow added that Ninestar is working hard to build fiber to the home in all of its school districts. “The demand is there and so much of it is student driven,” he said. “We hope to soon have broadband to 85% of our students and in the next few years, make it virtually 100%.”

Hardy Telecommunications has similar goals for broadband delivery to the home. “For students, they can hear about something at school and expand on it at home,” Barr said. “It’s possible to find anything on the Internet.”

While these are all impressive endeavors, the local telecommunications executives are quick to give credit and thanks for a host of funding mechanisms—everything from the FCC’s Universal Service Fund (USF: a program that makes telecommunications services more affordable to residential and commercial users in rural and remote areas) and E-Rate program (the public school and libraries arm of USF) to the federal stimulus funds, and to grants from private charitable foundations.



“The high-speed Internet has provided me with what I call a better toolbar. By that, I mean can have several websites going at once without the fear of it freezing up or loading super slow. That helps me compare many sources of information to see if it’s applicable to my assignment or to find the most correct answer to my questions.”

—Josh Ograbisz, freshman at Moorefield High School, Hardy County, W.Va.



Going Digital

In the very near future, nearly one of out every five textbooks sold will be digital, according to Edudemic, an education technology site to connect teachers, administrators, and students. Not only do these literally take the burden off students’ backpacks, digital textbooks are also an appealing offering because they typically cost 53 percent less than new print books. Going forward, e-texts will focus less on the printed word and instead build multimedia experiences around particular concepts. Features will include interactive quizzes, animated content, educational games, and online study groups.

Broadband Delivers Music Lessons

Robert Lacey—a young music teacher at Valley High School [student population: 121 in grades 7–12] in Orderville, Utah—is helping to bring after-school music lessons to all 18 of his orchestra students. Typically, students who play classical string instruments—such as the violin, viola, cello, and/or bass—take private lessons to supplement their music class instruction.

“Because this is such a rural area, the nearest private instructors are an hour and a half drive away,” Lacey explained, adding that the three-hour round trip did not include the cost of the lesson (anywhere from \$50 to \$100).

Solving this problem of time and money and travel came to Lacey when he was working to complete his own master’s degree. “My music professor had to discontinue our lessons because he was moving to Maine,” he explained. They decided to continue their lessons online via Skype. “Granted, you don’t have the hands-on element, but it’s still an effective lesson.”

As technology improved in terms of latency and lag times, Lacey said he soon realized that this could be a solution for his own students. “We paired the high school students with college music students from Brigham Young University, so the college students deliver half-hour to 45-minute music lessons online,” he said, explaining that a grant from the Foundation for Rural Service helped to get the program started by providing a small income to the college students. “This helps the college kids, but it also means there’s no cost to the high school students.”

The high school students can take their lessons at home if they have broadband at home, Lacey said. “Or they can find a Wi-Fi connection nearby or use their smartphone if they have a 4G connection or stay after school and use the connection here,” he said. “This allows our students to have the same level of instruction; the technology makes it possible.”



In rural areas, the schools are the heartbeat of the community, Mahaffey with the Rural Trust said. “By connecting to the schools, you are connecting to the community.”

The Rural Trust’s Mahaffey doesn’t dispute that funding is important, but he said that money alone is not the answer. “The real investment is in terms of community involvement, building relationships and human capital,” he said, adding that small telco execs sit on school boards and join their local Parent-Teacher Associations. “In that light, the small telcos and co-ops are indispensable. It’s not possible to put a value on their role.”

Discovery Education’s Morrison agreed that rural telcos support their schools. “They know everybody, and everybody knows them,” he said. “They are tied into their communities in a way that the big broadband providers can never be. Half the battle is building the network; the other half is helping the community use it.”

Historically, the practice of giving low-interest loans to cooperatives and locally owned small business has worked well, explained Marema with the Center for Rural Strategies, adding that this is just a start. “The government could do more—not just through investments but through policy and regulation changes. Let rural regions try something new. Open it up to innovation.”

Rural markets work differently, Marema stated. “If you want rural in the game, you have to accommodate that,” he said, adding that the nation needs rural in the game. “To succeed as a country, we can’t write off more than a fifth of our young people. When rural America succeeds, the nation as a whole does better.”

Former Gov. Wise concurred that it’s in our national interests to promote and preserve rural America. “When you flip on a light switch, thank a natural gas provider or a coal miner,” he said. “When you go to the grocery store, thank a farmer.”

In rural areas, the schools are the heartbeat of the community, Mahaffey with the Rural Trust said. “By connecting to the schools, you are connecting to the community,” he said.

BUILDING THE BRIDGE TO OUR FUTURE

To successfully map out our future, we must look to the past, Mahaffey suggested. “Historically, our country has made the commitment and the investment in other infrastructure projects,” he said, citing examples like the interstate highway system, rural electrification and the nationwide landline network. “We need that same level of commitment for high-speed Internet—in the schools, in the libraries and at home too.” As the country moves further into this century, let’s embrace the belief that education is a matter of building bridges—necessary infrastructure that leads all of us into a more successful future.





**Foundation
for Rural Service**

The Foundation for Rural Service is a 501(c)(3) nonprofit organization based in Arlington, Va., that serves rural communities across the United States. Established in 1994 by the National Telecommunications Cooperative Association, their mission is to sustain and enhance the quality of life throughout rural America by advancing an understanding of rural telecommunications issues. FRS educates the public about the benefits of a nationwide telecommunications network and promotes rural connectivity as an essential link in this network. FRS believes that rural communities—regardless of their size or location—deserve the same connection to the world as do residents of urban areas. FRS provides a variety of programs, ranging from youth-based initiatives and educational materials to consumer awareness and rural economic development.

For more information on FRS, go to www.frs.org



The Rural Telecom Educational Series is funded by the Rural Telephone Finance Cooperative.

RTFC is a privately funded, member-owned cooperative finance organization that provides financing exclusively to America's rural telecommunications industry. RTFC offers loans and financial services to creditworthy telecommunications systems eligible to borrow from RUS, as well as affiliates of these systems.

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