

How Technology Can Boost Productivity in Rural School Systems

Rural Education and Technology
Consensus Panel

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Rural districts struggle to deliver the same educational experiences provided by their larger suburban and urban peers and often operate with higher per-pupil costs and stretched budgets. Technology's ability to bridge distance, increase administrative efficiency, and customize experiences at relatively low cost holds great promise for rural communities working to improve outcomes for students and leverage their existing resources toward even greater impact. But in order to deliver on the promise of technology in rural education, policymakers need a better evidence base about how technology can be brought to bear on the challenges facing rural educators and what policies and systems need to be put into place to ensure they can be utilized.

This chapter reports on the results of a national consensus panel to evaluate the role of technology in rural education and identify opportunities for states to support the use of technology. The consensus panel includes a mix of experts in rural education and technology, technical assistance providers, and researchers (see Box 1).

Box 1: Technology and Rural Education Consensus Panel Members

- Laura Anderson, Associate Director, Edonomics Lab at Georgetown University, BSCP Center Partner
- Betheny Gross, Ph.D., Research Director, Center on Reinventing Public Education
- John Hill, Ed.D., Executive Director, National Rural Education Association
- Ashley Jochim, Ph.D., Research Analyst, Center on Reinventing Public Education
- Paul Koehler, Director of the West Comprehensive Center at WestEd
- Karen L. Mahon, Ed.D., President and Founder of Balefire Labs
- Marilyn Murphy, Ed.D., Director, Center on Innovations in Learning
- Dean Nafziger, Ph.D., Director, BSCP Center at Edvance Research, Inc.
- Sam Redding, Executive Director, Academic Development Institute, BSCP Center Partner
- John D. Ross, Ph.D., Technical Assistance Specialist, Appalachia Regional Comprehensive Center
- Marguerite Roza, Ph.D., Director of the Edonomics Lab at Georgetown University, BSCP Center Partner
- Mike Siebersma, Director, Northwest Comprehensive Center at Education Northwest
- Heather Zavadsky, Ph.D., Research Associate, BSCP Center at Edvance Research, Inc.

The consensus panel drew from background framing and research commissioned by the Center on Reinventing Public Education and produced by Bryan Hassell and Stephanie Dean at Public Impact. Lynn Schnaiberg helped write and edit this essay, which summarizes the panel's conversation.

First, we explore the ways in which technology can help rural schools and districts address the issues of cost and quality. Then we turn to the supports and systems that are required to put these solutions into practice, including access to broadband Internet, which remains all too limited in rural communities. Finally, we conclude by summarizing recommendations for state education agencies interested in improving rural communities access to and use of technology.

LEVERAGING TECHNOLOGY TO ADDRESS COSTS, IMPROVE QUALITY

The consensus panel identified four ways technology can be used to support rural school systems' work and advance productivity: 1) virtual learning, 2) blended learning, 3) virtual professional networks, and 4) technology-based data input, analysis, and retrieval systems. While these approaches can benefit any school system, they offer rural systems particular advantages and address some of their most pressing problems.

Virtual Learning

Compared to their urban and suburban peers, rural school systems typically employ smaller teaching forces and are challenged to offer specialized content and talent on site. Virtual education can help address these issues.

Virtual learning programs have evolved and matured so that today many are interactive, incorporate video and other media, promote collaborative and shared workspaces, and can be accessed on smartphones and other devices. While it is unlikely that K–12 system will ever shift to a fully virtual environment, rural areas can use virtual learning as a complement to traditional classrooms or to fill holes in their curricular offerings.

Rural districts may choose to more selectively deploy virtual learning, using remote teachers for hard-to-fill roles, such as STEM subjects, world languages, and Advanced Placement (AP) courses, within the physical school setting. Many rural school systems are already leveraging virtual learning for credit recovery and to provide students with access to courses the school cannot offer due to lack of specialty teachers. Through a grant from the U.S. Department of Agriculture's Rural Utility Service program, schools in the Itasca Area Schools Collaborative offer "telepresence" classes (using immersive video technology) in Spanish, Ojibwe (a nearly extinct Native American language), and chemistry. The new content became so popular that participating school systems had to align bells and bus schedules to accommodate demand.

Virtual content can also give rural students access to institutions beyond the K–12 system, connecting them to museums, universities, and other cultural and scientific resources. Aspirnaut, founded in 2006 by two Vanderbilt faculty

members, lets students become rural scientists engaging in hands-on, inquiry-based STEM labs led by university faculty, postdoctoral fellows, and graduate and undergraduate students. Weekly labs are streamed or video-conferenced to the rural school. Onsite at the rural school a teacher or aide, sometimes with the help of Aspirnaut high school research intern alumni, facilitates the lab session by helping students, troubleshooting, and ensuring student safety.¹

State-sponsored virtual schools in 26 states offer students a wide array of online courses such as AP and honors-level courses, foreign languages, and less common electives that allow students to explore unique interests. Concerns persist over the quality of the offerings from many online providers.²

Seven states have established “course choice” frameworks that allow and fund students to access virtual courses for credit, with varying restrictions on the type and amount of courses and course providers. Often led by a remote instructor via the Internet, these courses can either be synchronous (students and instructors interacting in real time) or asynchronous (students complete work and participate in discussions on their own timing). If top-notch teachers give these classes, students in remote locations could have greater access to great teachers in tough-to-staff subjects.

Blended Learning

Blended learning is “a formal education program in which a student learns at least in part through online learning, with some element of control over time, place, path, and/or pace.”³ Rural areas could use blended learning to improve instruction and rethink the school schedule and classroom structure, possibly saving money.⁴

Technology opens the possibility of more meaningful at-home work that students can do independent of a teacher’s physical presence. Some online setups let teachers closely monitor and respond to student progress whether students are working at school or at home. And even if the student has no Internet access at home, readily available, high-quality, stand-alone apps and content can be used off-line on mobile devices to make this scenario technologically feasible. Some examples include [Native Numbers](#), [Bugsy’s Kindergarten Reading School](#), and [Dwelp](#). Some school systems have even tried to capture otherwise wasted time on long bus rides—not uncommon in far-flung rural districts—and use it as a study hall of sorts by equipping buses with wireless Internet access.⁵

When leveraged appropriately, blended learning may allow schools to reduce the number of days students are on campus, thereby reducing transportation costs (which can be two to three times that of urban districts), and freeing up independent or collaborative work time for teachers and students. A four-day week may create child-care headaches for families, but may be workable in the upper grades where these concerns are less acute.

The Miami R-1 School District in Bates County, Missouri—a rural district about an hour south of Kansas City—shifted to a four-day week schedule in 2013 as it ramped up its technology use. Although the scheduling change was controversial, the district claims that it is working well: ACT scores are at their highest over the past decade, and teachers get time on Mondays for professional development and technology training.⁶

Unfortunately, a paucity of research exists on the overall effectiveness of a four-day school week. In general, achievement effects appear neutral. Some fiscal analysis shows transportation costs could be reduced by up to 20 percent, but overall cost savings are relatively low (one estimate provides a maximum of 5.43 percent of a district’s total budget).⁷ And savings can only be repurposed toward other activities if state policy enables flexible deployment of unused transportation funding.

Blended learning can also be an effective strategy to enhance what good teachers do already: differentiate instruction and provide students deep learning experiences.⁸ Technology enables a rethinking of the classroom where all instruction no longer comes directly from the classroom teacher (opening the possibility to leverage other resources, such as instructional aides). The teacher is not limited to playing the role of “sage on a stage” in front of a class full of students. Students use mobile devices either in a one-to-one setup or in small groups, freeing the teacher to differentiate student learning and take it deeper with more nuanced craftwork, problem solving, and troubleshooting.

Software that is able to adapt to student performance and provide a customized learning path is becoming more prevalent in schools. ST Math, Achieve 3000, I-Ready, Think Through Math, and Lexia Learning are a small sample of adaptive programs that tech-enabled and blended learning schools are using to deliver and assess content.

Rural communities may be particularly suited to using technology to differentiate instruction. Some boast deep school-to-home connections and many have relatively small class sizes, potentially keeping technology-based instruction from becoming impersonal.

Although independent studies of blended learning effectiveness are few,⁹ software firms have funded academic studies and published data that show students using their products are faring better than those who are not.¹⁰ In addition, practitioners and qualitative researchers have documented blended learning users who perceive a profoundly positive impact on student learning: Students, teachers, and administrators often express that blended learning is so advantageous they cannot imagine going back to the old way of doing things.¹¹

Virtual Professional Support and Development

Technology can also be tapped to connect rural educators and provide professional development. Rural teachers often feel professionally isolated, sometimes lacking subject or grade-level peers in their community. Online professional learning communities, online training, or online resource banks that allow teachers to share and review instructional materials may be especially helpful for a rural workforce.

Teachers are already reaching out online to develop their own “professional learning networks.” In a February 2013 survey of more than 20,000 teachers, 65 percent reported that they seek out professional advice online, and 57 percent use technology to collaborate with teachers they wouldn’t otherwise know.¹² Online communities of practice, like ConnectedEducators.org, enable rural educators to connect with other educators and share what works.

The Wabash Valley Education Center in West Lafayette, Indiana, helps communities of schools learn from each other, enabling a rural algebra teacher to connect not just with other algebra teachers, but with those teaching in similar rural settings. About once a week the center facilitates a virtual teacher meeting using Elluminate (virtual conferencing software).¹³

Technology offers promise for professional development, too. States and districts should be careful that rigid requirements around professional development do not require educators in rural areas using online resources to jump through multiple hoops to deliver online training or be forced to settle for less convenient or less effective training.¹⁴ For example, in some districts, professional development is delivered online, but teachers must drive to the central office after completing a module to sign a form confirming their “attendance.” Moving professional development online will have its greatest advantage when these programs fully leverage the potential of the online environment.

Online professional development can give rural educators access to timely learning experiences while reducing travel and facility costs.¹⁵ Arkansas created a state-funded portal in 2006 providing thousands of free online professional development courses; teachers earn 19 hours on average.¹⁶ The Teach LivE program, developed at the University of Central Florida and now used in 42 sites across the nation, populates virtual classrooms with student “avatars” to help teachers learn new skills and hone their instructional practice. The University of North Carolina at Chapel Hill’s LEARN NC charges nominal fees for online workshops and helps rural schools deliver state-mandated training if they lack capacity themselves.¹⁷ Nearly 70 percent of the state’s rural schools use www.learnnc.org. Research suggests quality online professional development is a viable option. A rigorous 2013 study found online professional development has the same effect on student learning and teacher behavior as more traditional in-person models.¹⁸

Technology can help hold teachers more accountable for professional development outcomes, too. Often, accountability in face-to-face workshops simply means signing an attendance sheet. Technology enables measurement of changes in knowledge (like a simple pre/post training survey), changes in teacher practice (sample lesson plans, digital recording of a live lesson), and changes in student performance (digital portfolios, online assessments) that are embedded within or linked back to online professional development opportunities.¹⁹

TECHNOLOGY-BASED DATA INPUT, ANALYSIS, AND RETRIEVAL SYSTEMS

Most states are scurrying to simplify compliance reporting for districts—a particular concern for time- and capacity-strapped rural administrators forced to wear multiple hats. Early efforts to find software solutions to streamline such reporting have run up against roadblocks (every state and federal funding stream has its own application and reporting requirements); this area seems ripe for development.

Systems like WestEd Tracker, a web-based data and information management system used in seven states, streamlines compliance reporting and school improvement efforts. Sometimes, however, simplifying compliance reporting comes in the form of a self-designated “champion” of sorts within the SEA who has the leeway to reduce crossover reporting requirements. SEAs could formalize these “champions” so reduced burdens become a matter of course rather than luck.

Programs like [Indistar](#), a product of the Academic Development Institute, helps districts organize school improvement data, easing the work of school and district staff working to drive improvement in student outcomes. Used in 22 states, Indistar is a web-based system implemented by a state education agency, district, or charter school organization for use with district and/or school improvement teams to inform, coach, sustain, track, and report improvement activities. The system is customizable for reporting to several SEA departments through a single portal, resulting in less duplication. Several states use it as their sole school improvement planning system, including things like Title I reports.

Rural school systems also need access to data systems and platforms to track how students are performing and act on student-level data. In 2009, the Georgia Department of Education created a “tunnel” that links data from a single state system directly to district-level student information systems, helping districts better identify best practices. Texas created a set of dashboards for teachers to deliver more timely data and allow them to better monitor and act on a student’s progress. Delaware used Race to the Top money to aggregate data to provide teachers, principals, and other staff a comprehensive view of each student and school. After building a statewide

longitudinal data system, Oregon invested in training teachers how to use data in making decisions—an effort that has paid off for teachers and students alike.²⁰

WHAT WILL IT TAKE TO PUT THESE SOLUTIONS INTO PRACTICE?

Technology Infrastructure

More than 70 percent of the 26 million people without high-speed Internet access live in rural areas. Fixing this inequity is paramount for rural schools and communities to be able to fully leverage technology.²¹ Connection speed and bandwidth can determine whether or not students can access critical educational opportunities. A 2011 national survey found two-thirds of U.S. schools operate at speeds slower than 25 Mbps, the Federal Communications Commission's (FCC) new minimum definition (as of 2015) of what qualifies as “broadband Internet.” Under the FCC's new standard, one-fifth of Americans lack access to “high-speed” Internet, which is a far lower transmission speed than broadband.²² Fewer than 50 percent of educators nationwide have an Internet connection that meets their teaching needs.²³

Flexibility to Try Alternative Teaching and Learning Models

Several of the ideas presented above would require fundamental changes in staffing patterns, student assignments to classrooms, and how schools spend money on personnel, facilities, and technology. Depending on the state policy context, these strategies might be difficult or impossible to implement within state constraints on school spending, teacher compensation, class sizes, seat-time, paraprofessional roles, and other matters.²⁴ For example, though well intended, state policies such as class size and line-of-sight restrictions—policies that dictate the number of students who are in a classroom or are within eyesight of a certified teacher—make it challenging for local schools to group students in ways that incorporate digital learning time facilitated by a paraprofessional.²⁵ Similarly, digital learning models that change the traditional classroom challenge efforts to incorporate value-added measures, which require a consistent set of students be assigned to a teacher, into a teacher's evaluation.

Effective Training for Teachers and Administrators That Incorporates Technology

Teachers' lack of comfort and familiarity with technology-based education solutions is a key barrier to more effectively leveraging them in schools.²⁶ Anytime we ask a teacher to adopt a new practice, their learning must be supported. Keeping teachers up to date with fast-changing technology requires thoughtful, ongoing training, not just a one-time static approach. Similarly, administrators may have a limited understanding of technology's true potential

to meet teacher and student needs and require guidance in their technology leadership. Many focus on using technology for drill-and-practice, credit recovery, and student testing. In focus groups, for example, rural Tennessee administrators often equated online learning solely with credit recovery programs.²⁷

Access to High-Quality Content and Materials

While technology-based content—including apps, virtual schools, and distance learning programs—has the potential to revolutionize rural education, if it's not high-quality content, its benefits are moot. Research suggests that quality varies tremendously.²⁸ Rural educators will need help identifying online instruction and/or software that can yield solid results. Roughly one-third of teachers spend an hour or more each week searching for educational technology, and 91 percent use technology to find and share lesson plans.²⁹ Many feel overwhelmed by the array of digital offerings and need help sorting out which are effective and how they might be used.³⁰

Access to Skilled Technology Staff

Rural areas often have a harder time attracting skilled, certified technology staff (like technology coordinators and certified network personnel) than higher-paying urban-suburban areas. Rural areas have to be resourceful, deploying as tech staff teachers or others who may be self-taught in technology but have gaps in their education and training (e.g., the former tech-savvy classroom teacher that, over time, becomes the network administrator). Groups like the Consortium for School Networking give guidance on job requirements, skills, and knowledge that tech staff should have, but finding such a person in a rural area can be challenging.

HOW CAN SEAS HELP?

Respect Local Context

Recognize that the state plays a limited but critical supporting role. While many smaller, rural districts appreciate state support, universal mandates are less likely to be responsive to local needs and can become a political lightning rod. Idaho's state school superintendent Tom Luna in 2011 pushed through the legislature a set of state-mandated digital learning requirements, including online courses. The teachers union maintained teacher jobs would be lost to pay for these requirements and successfully rallied voters to reject the package.

Prioritize Broadband Internet Access

Access to broadband Internet is by far the largest challenge for rural communities both in the school and in the home. Until this digital divide is closed, rural schools and communities cannot fully integrate technology and bolster productivity. States must prioritize broadband Internet access.

In late 2014, the federal government dramatically overhauled the E-rate program, which grants discounts to schools and libraries for advanced, affordable telecommunications services, Internet access and internal connections. The changes prioritize expanded support for broadband Internet and wireless connectivity (making online learning faster and more reliable) and add \$1.5 billion in new funding for a total of \$3.9 billion. Several new rules that could benefit rural schools will take effect in 2016. States can help ensure their rural systems maximize the revamped federal program.³¹

In the past, for example, schools have been barred from using the E-rate to build their own fiber-optic networks. Rural districts have found this especially difficult, since more than a quarter of them cannot find more than one bidder for broadband connectivity services on the private market.³² The new rules will ease that challenge by allowing for “self-provisioning” when no other affordable high-speed option is available. In another change, schools can apply for E-rate funding to use so-called dark fiber (cable not currently used), which the FCC thinks will help small and rural districts.

The prices and terms providers charge schools will be published for E-rate supported services starting in 2016, helping systems negotiate lower prices. Rural areas pay more for connectivity and tend to have less competition for E-rate bids than larger urban or suburban systems, with vast price tag differences even among rural areas.³³ The new rules also encourage more purchasing in bulk and through consortia. States are well positioned to help connect rural systems to create these bulk orders and/or consortia.³⁴

To control costs and fund broadband Internet expansion efficiently, states and districts need to clearly understand actual broadband supply and demand to prioritize improvements. Using tools such as the National School Speed Test, state education leaders could develop a school-by-school inventory of current Internet infrastructure. Combined with a survey to assess readiness to implement blended and virtual learning, speed testing can help states target broadband expansion to areas where demand is greatest but broadband capacity is weakest.

State education agencies can also partner with existing research and education networks (RENs) to bring broadband Internet to K–12 school districts. For example, North Carolina’s School Connectivity Initiative is working to bring the benefits of its REN, originally designed to serve higher education, to school districts and charter schools across the state. The initiative is working to expand the number of schools with broadband Internet, selectively build out networks to rural and under-performing schools, and develop a scalable model for statewide implementation.³⁵ North Carolina’s state education agency also provides local districts with comprehensive support to ensure maximum access to E-rate funds. Since 1998 the agency has helped local districts secure more than \$650 million in E-rate discounts. States like Idaho, West Virginia,

Maine, Nebraska, and Utah have developed statewide broadband networks.³⁶ Virginia and Arkansas are working with the nonprofit [Education Superhighway](#) to coordinate statewide connectivity infrastructure and clear barriers.

Connect Rural Educators to Quality Professional Support and Content

States can connect local education agencies (LEAs) to existing curated technology-based content and professional development: they should not reinvent the wheel. States should recognize that teachers do not have the time or expertise to be curators themselves.

Existing resources are plentiful. For example, [Balefire Labs](#) offers free access to more than 3,500 reviews of educational apps, professionally and independently evaluated according to best practices of instructional and usability design. [The Learning Registry](#) shares data on how learning resources relate or align to Common Core standards, ratings and opinions from educators across multiple states, and descriptions of resources from multiple education portals. The Center on Innovation and Learning, a federally sponsored content center specializing in innovation in education, curates a collection of technology resources for educators on [EdShelf](#) and includes descriptions and educator reviews of different resources.

States can connect LEAs with the International Association for K–12 Online Learning (iNACOL) and the state and national affiliates of the [International Society for Technology Education](#) (ISTE), which offers regular webinars and other professional development around teachers and technology. iNACOL's 2013 annual report emphasizes the need for systematic, ongoing professional development on integrating technology in the classroom.³⁷

Many sectors outside education require their workforce to use technology and have dedicated information technology people who help with tech mentoring and/or training. States can support tailored training for teachers to help them adapt technology tools for use in their own classrooms. SEAs could work with districts and technology providers to ensure that such technology training counts toward continuing education requirements for certification renewal. Some consensus panel members identified the need for a “Geek Squad” equivalent (tech setup, install, and support) to help teachers better understand how the technology products they are expected to use actually work and give them more fluidity and comfort in using them.

Ensure Virtual Content Providers Are Held to the Same Standards as Brick-and-Mortar Schools

Quality varies significantly among virtual education programs.³⁸ While providing information to school districts about quality is an important first step, states can and should ensure that virtual education providers are held accountable to the same standards for student achievement as brick-and-mortar schools.

One way to ensure high-quality virtual content is via performance-based state finance formulas. New Hampshire funds its virtual online academy to help ensure quality online instruction; the academy is not paid for by the number of students enrolled, but by the number of course completions. Completion, in turn, is not determined by seat time, but by demonstrated mastery of a course-specific set of competencies.

Seed Regional Collaboratives to Foster Technology-Based Economies of Scale

Collaboratives can leverage small rural districts' buying power to support technology use. The Ohio Appalachian Collaborative in 2013 received a \$15 million, four-year innovation grant from the Ohio Department of Education to develop a networked 6th to 12th grade blended learning and dual-enrollment system spread across 27 school districts.³⁹ The rural collaborative's work ("developed by districts, for districts") impacts more than 48,000 students in the region. The state seed money has helped purchase technology (iPads, laptops) to enable more blended learning classrooms and build the infrastructure (video conferencing equipment, projectors, smart boards) to share teaching across the collaborative. Stated goals and work include establishing a sustainable rural education collaborative, giving teachers support and professional development around new standards and assessments, and granting them the ability to network with other rural educators. The collaborative intends to boost student aspiration for postsecondary education, reduced higher-education costs through college credit earned in high school, and contribute to rural economic development by preparing more qualified workers to attract business to the region. Districts saved more than \$260,000 via pooled purchasing in 2014, a savings of nearly \$6 per student across all districts.

Eliminate Regulatory Barriers to Using Technology in Rural Schools

In response to district plans to use flexible technology, SEAs can identify and advocate for barrier-clearing policies that allow re-grouping of students, either through relaxation of constraints, or waivers and exemptions. Local innovation is facilitated when a district has the ability to shift funds for textbooks, materials, or non-essential staff positions to lease or purchase laptops,

establish a more powerful data system to personalize instruction, or provide much-needed training to staff as they implement blended learning techniques. For example, the Mooresville Graded School District in North Carolina is achieving notable outcomes after making a district-wide shift to technology-based classrooms within current budgets.⁴⁰ Texas, one of the earliest adopters of digital textbooks, changed state law to enable districts to use textbook money on digital resources.⁴¹ SEAs can support this type of local innovation by advocating for funding models that give districts greater control over how they use state funds, particularly funding that is tied to specific input categories or position types. If a district is able to offer students a better instructional program using online resources or a new combination of teachers and class sizes, they should not lose access to state funds that are locked into non-strategic categories.

SEAs can also help districts take advantage of existing flexibility in the Elementary and Secondary Education Act to more creatively utilize federal dollars. While the amount of money associated with Title I, Title II, or Title VI may be small for a small district, combining them could enable them to, for example, create a mobile lab that serves all the targeted program beneficiaries.

Make Clear Who at the State Level Owns Technology Issues

Responsibility and accountability must be clearly defined. As technology use takes root and grows in schools, states need to make clear who is responsible for technology issues and ensure that those individuals understand and can support the particular needs of rural communities. States interested in better supporting technology can turn to the [Center on Innovations in Learning](#), one of seven national content centers funded by the U.S. Department of Education, which established the League of Innovators to identify problems related to technology use in member states and work on solutions. Technology-oriented professional societies including CoSN, SETDA, and ISTE also can help connect SEA staff to quality professional development and support.

CONCLUSION

States have a strong supporting role to play in helping rural schools leverage technology. The actions suggested here can ensure that rural communities can use technology to its fullest potential, simplifying the responsibilities of rural administrators, better supporting rural educators in their work, and enabling students to access diverse curriculum. States have an essential role to play in closing the digital divide, leveling the playing field for rural schools and communities to access the best instruction and content available for students and teachers alike.

ENDNOTES

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39. Ohio Appalachian Collaborative, “OAC Straight A Grant Early Returns on Investment,” (Ohio Appalachian Collaborative, 2014).
40. Mooresville is widely touted to rank 100th in the state for per-pupil spending but third in the state for student outcomes. See A. Alan Schwarz, Mooresville’s Shining Example (It’s Not Just About the Laptops), *New York Times*, Feb. 12, 2012.
41. Dylan Scott, “States Continue Plugging Into Digital Textbooks,” *Governing*, Sept. 24, 2012.