

2016-18 Executive Progress Report

Commonwealth of Virginia
Secretary of Education

Institute for Advanced Learning and Research

At A Glance

The Institute for Advanced Learning and Research will serve as a regional catalyst for economic transformation through applied research, advanced learning, and workforce and economic development.

Staffing 42 Salaried Employees, 0 Contracted Employees, 0 Authorized, and 3 Wage Employees.

Financials Budget FY 2017, \$5.82 million, 100.00% from the General Fund.

Trends Legend ↑ Increase, ↓ Decrease, → Steady

Key Perf Areas Legend

- ➔ STEM participants
- ↑ Projects with known deliverables
- ↑ Ratio of in-kind services
- ↑ Improving, ↓ Worsening, → Maintaining

For more information on administrative key, and productivity measures, go to www.vaperforms.virginia.gov

Background and History

Agency Background Statement

Applied Research

IALR's team of PhD scientists and technicians focus on applied research that has the potential to solve problems experienced by regional growers, entrepreneurs, and existing industries. Research activities in FY2017 include:

- IALR created a fourth research area, Precision Agriculture, that utilizes tools like SMART Tables and agricultural drones to explore new ways to meet the food requirement of the globe with less use of traditional tools like pesticides and fertilizers.
- IALR received a *Tobacco* (TRRC) grant to fund a Precision Agriculture project. IALR's agricultural drone will fly over 20 farms in a six-county region over the next two years. Total flights will exceed 200. The goal is to assist farmers with current "field truthing" as well as expose growers to new technologies.
- IALR's work with endophytes, beneficial bacteria, resulted in a licensing agreement signed with a major agricultural firm located in Boston, MA. This agreement prompted IALR to expand their endophyte library from 250 to almost 1000.
- IALR has pivoted its research program to actively engage regional industry to fulfill IALR's economic development mission. Several examples of this initiative include:
 - IALR chemistry staff developed a new method to test pesticide residue on tobacco leaves. This method reduced test lead-time from 4-5 week to 2-5 days; saving significant costs for the company as they better streamline their operations.
 - IALR chemistry staff developed a procedure and have been doing billable chemistry work for a Nano-technology company to assist with the development of a new remediation product funded by an NSF Phase 1 grant. Work on the Phase 2 grant is expected.

- IALR is working jointly with the Advanced Learning division to be the technical support on a new initiative placing a FarmBot in seven area high schools. The FarmBot is a robotic farming system. However, IALR's focus will be less on farming and more on being a platform to enhance learning in various disciplines including robotics, mechatronics, coding, 3D printing, team work and other educational areas.
- IALR received a *Tobacco* (TRRC) grant to continue our work to help improve grape health and growth for the growing viticulture industry. Grapevines were planted in the vineyards of five participating growers.
- Work continues to promote and enhance the competitiveness of Virginia's Asian pear market funded by a VDACS grant.
- IALR's research on English cucumber grafting expanded to include additional growers in the region. A grant from the Virginia Agricultural Council will support this work.
- IALR's research on purple sweet potatoes as a new regional crop continues. The program will include five farmers throughout the region.

Advanced Learning

The Advanced Learning Department continues to support our mission to drive positive change in Southern Virginia by providing meaningful learning opportunities to people of all ages. In FY 2017, 14,864 participants benefitted from a STEM activity facilitated by our Advanced Learning Department. The fifth annual STEM-H Summit was a success with more than 400 students, educators, and business representatives in attendance.

The STEM Mobile Learning Lab visited over 90 sites serving more than 7,600 participants. This outreach initiative truly delivers STEM throughout our region, anytime and anywhere.

IALR received a one-year grant award of \$217,268, with eligibility for renewal for up to two years pending the availability of federal funds, from Virginia's Office on Volunteerism and Community Service (OVCS) for the Dan River Year AmeriCorps program. The grant supports 26 member positions. In addition, the members will leverage an additional 493 community volunteers. Full-time members have been placed at Boys and Girls Clubs of the Danville Area, Pittsylvania County Schools, Danville City Schools, Goodwill Industries of South Central Virginia, Inc., New College Institute, Southern Virginia Higher Education Center, and IALR. For the first year of the grant, the twenty-six AmeriCorps members are eligible to receive over \$97,000 in tuition assistance. The state AmeriCorps grant funds were matched with a grant from the Danville Regional Foundation.

IALR coordinated the fourth annual Southern Virginia Career Choice Youth Expo. The Expo is a two-day event that provides hands-on career exploration throughout demonstrations and planned activities led by employers to students from six school divisions in the region. In 2016, over 3,900 middle and high school students from the cities of Danville and Martinsville and the counties of Halifax, Henry, Patrick, Pittsylvania, and Caswell (NC) attended the Expo at the Olde Dominion Agricultural Center. Over 325 employer representatives, school administrators, and volunteers supported the event.

Collaborative Partnerships:

Global Center for Automotive Performance Simulation (GCAPS): The Institute continues to partner with GCAPS in vehicle related research at the Virginia International Raceway (VIR) in Alton, VA. As the premier force and moment tire test facility, GCAPS specializes in testing to complement activities performed by global tire and vehicle manufacturers. GCAPS also serves as IALR's primary industry voice as the Advanced Learning department looks to develop a career pathway in engineering that leads to advanced degrees for Southern Virginia.

Gene Haas Center for Integrated Machining: The Gene Haas Center for Integrated Machining is a progressive precision machining training model that answers industry expressed needs for a highly skilled 21st century workforce. The program is a partnership between IALR and Danville Community College. A key component of this project is a revolutionary concept that incorporates workplace experiential learning in an educational setting by enabling students to train in a full-scale manufacturing work flow cell to support a realistic, fully-integrated learning experience. This first-of-its-kind model of immersive workforce training is derived from a partnership between business, industry, and academia. The program aims to integrate a "real-world" lean flow-cell manufacturing environment with such skills as tool management, advanced testing and measurement, electrical discharge machining, computer numerically controlled grinding, computer numerically controlled milling, computer numerically controlled turning, and business processes.

Dan River Region Collaborative: The Institute for Advanced Learning and Research provides project management services and serves as the fiscal agent for the Dan River Region Collaborative. The Dan River Region Collaborative was founded in 2008 to address workforce development in the Dan River Region of Virginia. Utilizing a sector strategy approach, the Collaborative promotes regional partnerships of employers, educators, workforce developers and other stakeholders to address the skills needs of regional employers. Within the industry partnerships, the Collaborative's efforts focus on capacity building, systems change, and policy advocacy.

Southern Piedmont Technology Council (SPTC): IALR also provides project management services for the Southern Piedmont Technology Council (SPTC). IALR and SPTC coordinate and offer technology classes onsite and throughout the region to meet the demands of the current and future workforce.

Southern Virginia Regional Alliance (SVRA): The Institute continues its commitment to a strategic focus on economic development through its partnership with and leadership of the Southern Virginia Regional Alliance (SVRA) to promote Southern Virginia both nationally and globally.

Conference Services

IALR's Conference Services and capabilities is an instrumental part of IALR's mission to drive economic development to Southern Virginia. In FY

2017, Conference Services supported 429 events and hosted 23,348 guests. Many of IALR's guests for special events are traveling from other localities and states positively impacting the local and regional economy as they shop in stores, eat at restaurants, and require lodging.

New event during the year include:

- Machining Symposium first of its type, brought industry experts representing a wide range of manufacturing disciplines, primarily the precision machining with 32 companies and 90 participants for the (2) two day event.
- New Opportunity Recruiting event for new businesses to the region.
- New Health and Nutrition Program for school nutrition directors and staff

Through a team effort, IALR is focused on serving Southern Virginia. IALR staff are strategic in all efforts as we strive daily to be recognized as a valued regional leader by successfully leveraging resources and partnerships.

Major Products and Services

Services provided by the agency include:

- Workforce and Career development including Capstone Precision Machining
- Internships for high school and college students as well as educators
- Scientific research and development
- Researchers' expertise and lab equipment available to small business owners through consultative services and contract research
- Program management services (commercialization, applied research & educational)
- STEM Inspirational Lab travels to schools and organizations
- Advanced Learning loaner equipment program for educators
- Summer Camps to increase students' exposure to STEM
- Economic development support provided by competent experienced personnel
- Programs that focus on the adult learner
- Distant learning classrooms
- Conference Center space and services
- Dan River Year AmeriCorps Program
- Regional STEM and Career Development

Anticipated changes to services include:

- Funding limitations will reduce the number of research and advanced learning programs the agency is able to provide and significantly restrict the agency's ability to partner with other institutions to develop and provide new research related initiatives as well as educational and workforce development programs
- Lack of additional space will restrict research and development projects

Customers

Customer Summary

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Customer Summary

The Institute for Advanced Learning & Research (IALR) develops intergenerational educational programs that provide opportunities for a continuum of learning. The development of lifelong learning programs for older adults is especially important to address the "Age Wave" demographic shift identified in the Council on Aging 2011 annual report. The report stated "the number of Virginians over the age of sixty will increase from 1.4 million (17.8% of population) in 2010 to 2.3 million (23.9%) in 2030."

Science, technology, engineering and mathematics (STEM) interest is increasing regionally as well as on a state and national level. The IALR has upgraded technology in the STEM Mobile Lab and is has expanded to the new Inspiration Lab enabling a greater number of students in the

Lab at any given time. The STEM Mobile Learning Lab allows the agency to reach the service region and beyond, while providing learning opportunities for individuals of all ages.

IALR's efforts with applied research make it necessary for the organization to collaborate with basic research organizations, both public and private. IALR has definitive working applied research relationships with three of the colleges/institutes within Virginia Tech, and a number of private enterprises. IALR is working toward similar relationships with departments within the University of Virginia, Virginia State University, George Mason University and other research and commercial organizations.

IALR will continue to intensify outreach to business customers by providing creative and engaging opportunities. IALR's contribution to economic revitalization in the region will remain focused on partnerships, collaborative projects, and intern opportunities with area businesses, colleges, and school systems. The agency is also completing an assessment of area businesses to identify opportunities for providing technical and research resources that may otherwise not be available to smaller companies. Through its economic development activities, IALR will work to recruit prospective industries to the region.

The challenge confronting IALR is encompassing the diversity of customers within our expansive footprint.

Customer Table

| Predefined Group | User Defined Group | Number Served Annually | Potential Number of Annual Customers | Projected Customer Trend |
|------------------|----------------------|------------------------|--------------------------------------|--------------------------|
| State Agency(s), | AmeriCorp Members | 32 | 27 | Stable |
| Student | STEM-Related Events | 14,864 | 16,000 | Increase |
| Consumer | External Conferences | 21,348 | 25,000 | Increase |

Finance and Performance Management

Finance

Financial Summary

Fund Sources

| Fund Code | Fund Name | FY 2017 | FY 2018 |
|-----------|--------------|-------------|-------------|
| 0100 | General Fund | \$6,115,247 | \$6,115,247 |

Revenue Summary

For the fiscal year that concluded June 30, 2017 (FY 2017) the Institute for Advanced Learning and Research's (IALR) primary source of funding was the State appropriation of \$6,115,383. Additional revenues during this fiscal year include allocations from the State Maintenance Reserve Fund and the Higher Education Equipment Trust Fund, rental income, fees for conferencing services, grants from private foundations.

Although a hybrid entity, IALR's goal is to make a difference in the lives of those residing within the region. The challenge, as well as the inhibitor, is obtaining adequate funding to allow IALR to move forward with new and innovative programs and services such as Capstone, the Academy of Engineering and Technology (AET), workforce development programs and the mobile Inspiration Lab.

IALR is an innovative organization working to provide economic benefit to the region. The agency's strategic plan emphasizes the creation, development and commercialization of technology critical to Southern Virginia's economic prosperity. The agency is aligning its research programs with the strategic economic plans of the Southern Virginia Region and of the Commonwealth. To reach sustainability in all areas, it is critical that IALR receive an increase in appropriated funding. Even a modest increase to the base budget would make a difference.

Factors that are likely to affect the agency's budget include state revenues, further economic downturn, lack of capital for companies to grow, and ability to collaborate with other agencies on grant applications.

Performance

Performance Highlights

The Institute for Advanced Learning & Research (IALR) is an innovative organization working toward providing economic and social benefit to our community. We are working to align IALR research programs with the strategic economic plans of our region and of the Commonwealth.

The Institute continues its commitment to a strategic focus on economic development through its partnership with and leadership of the Southern Virginia Regional Alliance (SVRA) to promote Southern Virginia both nationally and globally. IALR has worked with local economic developers to identify and support projects that local economic developers and prospects have developed into positive announcements with outcomes that have impacted the tax base with three new company announcements and five existing company expansions leading to 128 jobs and over \$52.195 million in capital investment in the region. There has also been a significant increase in prospect activity and marketing of the region at regional, state and international levels with enhanced partnerships with the Virginia Economic Development Partnership.

The agency's conference center is an essential element for IALR's mission to drive economic development in Southern Virginia. Our Danville

location highlights the surrounding area, accessibility to major expressways while offering exceptional conferencing services. IALR's conferencing services is a technologically advanced setting having options that will satisfy any event needs from executive and professional training to workshops, trade shows, receptions and single and/or multiple day conferences.

Selected Measures

| Measure ID | Measure | Alternative Name | Estimated Trend |
|-------------|--|----------------------------------|-----------------|
| M885AG12004 | Number of science, technology, engineering and mathematics (STEM) participants | STEM participants | Maintaining |
| 885.0005 | Number of known deliverables for active economic development, business development and applied research projects | Projects with known deliverables | Improving |
| 885.0004 | Ratio of dollar value of "in-kind" services provided to the region in the advancement of the Institute for Advanced Learning and Research's mission of economic transformation (numerator), over State Appropriations (denominator). | Ratio of in-kind services | Improving |

Key Risk Factors

Risk factors that are having a significant impact on the agency and will continue to do so in the near future include:

RESEARCH: Research funding via contract research grants and other sources is becoming more competitive, which impacts IALR's ability to expand the program. Additionally, during the past year IALR engaged in an overall reorganization of the agency to better align the department with regional needs. This led to unavoidable delays in hiring a polymer engineer and a natural products chemist which slowed the progress in some research initiatives such as bio-based film development, plant-derived molecule development as well as the spinning-tube-in-tube (STT) program development.

ADVANCED LEARNING: The 6 county, 2 city region that IALR serves is experiencing high unemployment and a high poverty level, which together have contributed to a declining population. With a declining population comes a reduction in the potential participant target for advanced learning programs. Increased options for online learning reduce the need/demand for face-to-face programming. A risk factor of lesser degree is the fact that IALR is not located on a bus line which hinders growth in community participation.

ECONOMIC DEVELOPMENT: The areas of training and workforce development are impacted by the national economy and global trade. More locally, threats to the region through environmental issues (coal ash spill, for example) are impacting efforts to recruit new businesses to the region. While not at risk at this moment, the success of regional economic development efforts depends heavily on continued support (both financial and organizational) on the part of local partner organizations as well as regional and state funding partners (e.g. Tobacco Indemnification Commission, Mid-Atlantic Broadband).

ADMINISTRATIVE AREAS: Like many agencies, IALR struggles with containment of benefit costs, funding for positions and training/employee development. Difficulty in identifying and attracting competent staff skilled in science, technology, engineering and mathematics (STEM) poses a risk to IALR. IALR is continually assessing demands placed on aging technology equipment due to high-usage and is concerned with the possibility of critical equipment failures. IT upgrades are contingent upon funding and prioritized based on the degree of funding received by the agency.

FACILITIES: The agency's main campus building and building systems are beginning to age, having been completed in 2004. IALR's current buildings are nearing capacity which places limitations on expansion of research and educational endeavors.

Agency Statistics

Statistics Summary

A highly skilled workforce is critical to any area's economic development. IALR is committed to partnering with businesses, colleges, and school systems to provide encouragement and opportunities that foster education, especially in science, technology, engineering and mathematics (STEM) fields. IALR also supports the Certified Work Ready Community program.

IALR has a long term commitment to serve as a catalyst for the region and holds a strong belief that transformation occurs through collaborative projects and partnerships. The agency formed 8 new partnerships during fiscal year 2014 (FY2014) and continued collaborating with existing partnerships.

One new commercialized business was launched during FY2014. Dan River Plants is still in their start-up phase but the business model remains strong. The agency anticipates that this new business will see added employees and increased revenue in FY2015.

Scientists employed at IALR eagerly share their knowledge and expertise when provided the opportunity. Research presentations were provided to area businesses and organizations as well as at national and international conferences.

Statistics Table

| Description | Value |
|--|-------|
| Number Research & Development consultations & evaluations provided to industries | 10 |
| Number Research & Development revenue sources from non-State sources | 10 |
| Number of new partnerships formed | 7 |
| Number of economic development projects worked | 59 |
| Number of economic development site consultants & industry visits | 48 |
| Number of new businesses launched | 3 |

Management Discussion

General Information About Ongoing Status of Agency

The integrated mission of the Institute for Advanced Learning and Research (IALR) includes research, advanced learning and economic development. These components build upon existing regional strengths. The IALR is working on ways in which talent and resources can be used especially through collaborative efforts. These efforts are of special importance as the IALR works toward providing local manufacturers with opportunities that will enable them to compete in a global marketplace.

The agency will utilize the unique resources in our business and research community to optimize its polymer/chemistry and agricultural research venues. IALR's research efforts are geared toward creating opportunities for business and workforce development in these areas. During fiscal year 2014 IALR explored bio-composites (blending our assets in agriculture and polymers/chemistry) and agriculture research that included work with high value horticulture in conjunction with Virginia Tech, one of the agency's founding institutions. Research work continues on energy crops including Miscanthus and Arundo Donax.

Research work is also being performed with plant proteins as a source for polymers and enhanced crop performance to provide natural molecules that can be an alternative for those derived from petroleum. IALR's research labs have expanded from those dedicated to plant science to include those focused on polymer characterization and processing. During fiscal year 2014 IALR labs supported existing grants, internal research and local industry support.

Moving forward, IALR research endeavors will focus on application and commercialization of the products, technologies and processes developed by our scientists and technicians. While serving existing industry is an important aspect of the applied research mission, significant investment is being made in new product development that builds on technology and knowledge created within Virginia's basic research institutions, universities, NASA Langley, and Jefferson Lab to name a few. IALR's applied research organization expects to supplement the state budget allocation via commercial contract research awards, Federal or other institutional grants and business fee-for-service activities.

Advanced learning, where education meets experience, is integrated into every IALR research project through activities such as teacher internships as well as high school and college student internships, Governor's School student projects, researcher development and technical team development. The agency provides educational access via the Piedmont Governor's School, distance learning classrooms used by Virginia Tech and Averett University, and technical equipment made available to Danville Community College, Southern Virginia Higher Education Center and Virginia Tech. New programs initiated during fiscal year 2014 include the Academy of Engineering & Technology in partnership with the New College Institute, a Research-to-Commercialization Learning Agreement with the New College Institute, Workforce Forward with the Southern Virginia Higher Education Center and New College Institute, and public school system focused Aerospace Education with the Virginia Space Grant Consortium, NASA and the National Institute for Aerospace. Additionally, the STEM (science, technology, engineering and mathematics) program, that takes the science mobile lab to classrooms in schools throughout the footprint, continues to be very successful.

IALR's economic development department is responsible for aligning the agency's efforts with the need for economic and community transformation. IALR is committed to assisting local and State economic developers in any way possible as evidenced by the agency's renewed focus through a partnership with the Southern Virginia Regional Alliance (SVRA). The agency's first commercial spin-off, Dan River Plants, was launched July 1, 2013. Nine employees were initially trained around technology developed at IALR. This start-up business is projected to create at least 30 jobs by 2016. Seed funding was provided by the Danville Regional Foundation and IALR's Foundation.

Every initiative undertaken by IALR is evaluated on whether the project/action/activity will have an economic impact in measurable meaningful ways.

Information Technology

Synopsis of current IT state:

Technology enhancements for IALR's instructional and meeting rooms continues to be refreshed using interactive touch screen technology integrated to standard display equipment of projector or computer, significantly improving the overall meeting, presentation and learning experience. During fiscal year 2014, IALR completed the upgrade to a real-time integrated Financial Accounting System, enabling greater efficiencies in the financial operations.

Other information technology solutions include beta testing cloud technologies using third party service providers for backup/recovery of data storage and intranet file sharing reducing the number of physical servers. IALR continues to research, test and evaluate technology solutions for multiple users' desktop and research lab data capture/retrieval.

The agency's most significant future technology needs include:

- Upgrading classroom and conference space wiring and audio/video equipment to digital format enabling webcasting, interactive distance learning classes and rebroadcasting of instruction using internet protocol
- Evaluation, implementation and training users on a software system that captures metrics in an efficient and productive manner

Workforce Development

A significant number of managers will reach retirement age within the near future at the Institute for Advanced Learning & Research (IALR). 72.7% of managers are age 50 or older; 36% of managers are within 5 years of retirement. The wide disparity with the age of the current workforce (69% age 40 or older; 19% ages 30 to 40, and 12% below 30 years of age) makes it challenging to adequately implement a succession plan. Management is identifying key and hard-to-fill positions, scanning existing workforce for potential, and establishing steps needed to provide professional development. Development, skill and competency needs are incorporated into the performance review process and continuing education is encouraged.

Recruiting/retaining challenges include finding experienced, qualified individuals in the region's available workforce, especially in the science, technology, engineering and mathematics (STEM) fields. Efforts are focused on enhancing knowledge and skills throughout the organization. Through partnerships with the CSIIP (Commonwealth STEM Industry Internship Program) and local organizations, IALR sponsored internship programs working with 8 high school and college level students in STEM-related training as a potential solution to recruitment issues.

The IALR researchers are engaged in a collaborative discussion with corporate businesses (locally, state-wide and nationally) to strengthen the research efforts through expanded research and contractual services, and with presentations at national and international conferences.

Due to IALR's unique structure the state does not appropriate positions for the agency. Because IALR operates with a small, highly skilled, specialized workforce, the primary challenge the agency is facing is providing pathways for upward mobility.

Physical Plant

The Institute for Advanced Learning and Research's (IALR) Main campus building contains administrative offices, research areas and a conference center along with leased space to entities engaged in research related activities. IALR Main is ten years old and is beginning to need increased maintenance.

A modification and expansion of uninterruptible power supply to support disaster recovery and prevent loss of data is required to bring the IALR into full compliance with Virginia's Continuity of Operations Plan (COOP) and disaster recovery standards.

Long term growth needed for the IALR's applied research programs to attract additional high technology enterprises requires extra space to house funded research projects and research services.
