The STEM Excellence and Leadership Program

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THE STEM EXCELLENCE AND LEADERSHIP PROGRAM

Recognising students with great potential and supporting them in their academic endeavours is of utmost importance, particularly for disadvantaged children from rural areas or low-income families. **Dr Susan Assouline** and **Dr Lori Ihrig**, at the University of Iowa's Belin-Blank Center for Gifted Education and Talent Development, which is part of the UI College of Education, have developed a program to support high-ability students in their transition to high school and completion of higher-level courses.

Recognising Gifted Children from All Backgrounds

While many perceive America as a land of opportunity, where all students can achieve great things irrespective of their background, statistics suggest that this is often not the case. In realty, factors such as parental income and the neighbourhood where a child is raised can have a significant impact on determining their academic progress and their chances of having a fulfilling career.

A 2014 White House report states that 'while half of all people from highincome families have a bachelor's degree by age 25, just one in 10 people from low-income families do.' Moreover, statistics suggest that compared to students from urban or suburban environments, rural students are far less likely to enrol in four-year postsecondary education courses. According to the National Center for Education Statistics, rural students in the US attend college at a rate of 29.3%, while the overall college attendance rate is 42.3%. This education gap is not only profoundly unfair – it is also an enormous waste of talent. Often, the result is bright students giving up on their studies and ultimately failing to achieve their full potential.

Currently, approximately 60 million US residents live in rural areas, 13.4 million of which are children. Offering equal opportunities to this segment of the population and supporting disadvantaged students throughout their academic journey is of critical importance.

Therefore, Dr Susan Assouline, Dr Lori Ihrig and their colleagues at the Belin-Blank Center have been working on numerous programs and initiatives aimed at supporting students from low-income families and/or rural environments in their studies and professional endeavours. One of these is the STEM Excellence and Leadership program, an academic program that allows gifted students from low-income families to take extra classes in math and science outside of their standard school hours. STEM Excellence and Leadership includes a professional development component.





The Program

Past studies suggest that students who develop positive identities around science, technology, engineering and math (STEM) subjects are more likely to pursue further education and careers in related fields.

The STEM Excellence and Leadership program offers additional learning opportunities to disadvantaged students, which could enhance their skills, confidence and preparation, ultimately encouraging them to pursue further studies and careers in STEMrelated fields. 'The STEM Excellence and Leadership program is a way for us to ensure that high-ability students in our rural communities are prepared to pursue advanced studies in STEM fields,' says Dr Ihrig. 'What we hope to do is lay the groundwork for their future success. We are deeply engaged with 10 'The STEM Excellence and Leadership program is a way for us to ensure that high- ability students in our rural communities are prepared to pursue advanced studies in STEM fields.'



rural school districts across the state. Being able to have school-university partnerships allows us to reach more students to fulfil our mission.'

From 2003 to 2009, STEM Excellence and Leadership, which was initially funded by Federal Funds for the Improvement of Education, ran as a pilot program in five rural Iowa school districts. In 2014, the program was revitalised and expanded through a Talent Development Award from the Jack Kent Cooke Foundation to include 10 new rural districts in the state of Iowa. Subsequently, the program has continued to broaden its impact through a US National Science Foundation (NSF) Advancement of Informal Learning Sciences (AISL) grant. Within three years of its inception, over 500 high-ability middle school students had taken part in the extracurricular classes provided by the program.

'The STEM Excellence and Leadership program is positioned to break down barriers and foster rural students' developing identities as students with high STEM interest, exceptional potential to succeed, and socialemotional resilience when facing challenges,' says Dr Assouline.

Extracurricular Classes for Gifted Students

The STEM Excellence and Leadership program is aimed at increasing students' aspirations, knowledge and abilities in STEM disciplines. It particularly targets high-achieving students in 5th to 8th grades who come from rural areas, supporting them in their science and math learning. 'In rural school districts, students don't have the same opportunities available to them because of rurality,' says Dr Ihrig. 'This is an extracurricular program that operates mostly outside of the school day with students taking math and science courses before and after school.'

As part of the program's selection process, disadvantaged middle school students in the 85th percentile, or above, complete a fairly challenging assessment as part of the identification process. In addition, teachers and parents can nominate other students who they believe would benefit from the program. 'Collecting all the data together, the district determines who this program may be a good fit for and sends invitations to participate in the program,' says Dr Ihrig.

Students participating in the program spend a total of 96 hours each school year taking additional science and math classes. These classes include both theoretical and practical learning experiences, which are designed to enhance students' engagement and understanding of STEM-related topics. For instance, the students might be divided into small teams and asked to conduct investigations that incorporate advanced engineering and science concepts.

Teachers at schools involved in the program receive extra funding to purchase science and technology equipment or resources, such as supplies for experiments or classroom projects. Once a year, they are also invited to tour the UI campus along with their students. During these tours, rural students enrolled in the program can visit the science labs on campus and meet college students specialising in STEM subjects.



Evaluating the Program

So far, the STEM Excellence and Leadership program has yielded highly promising results. Although the program is relatively new, feedback from participating students and teachers has been overwhelmingly positive.

'I love being in STEM because I believe it is helping set me up for my future career path,' said one of the students who participated in the program. 'It teaches so many things while also being fun. I am so thankful that my school is able to have a STEM program and I hope it continues not only for me but also other students to come in the future.'

Teachers at participating schools have collected and examined their students' test scores, to document their performance in STEM subjects. Andrea Reilly, a science teacher at Atlantic Middle School, observed notable improvements in her students' scores on I-Excel, the main assessment tool for program identification, and ACT, a standardised test used for college admissions, which is administered to junior high students as a post-program instrument.

'I've seen some students make 180-degree turnarounds in terms of their classroom attitude and behaviour,' said Reilly. 'The program gives them access to opportunities they wouldn't have otherwise, as there are less resources in rural areas compared to cities. I have parents ask me how they can get their kids into the program. It's seen as a tremendous asset.' According to Reilly, the extra classes provided to participating students are a chance for them to build relationships that they would not develop in ordinary classrooms. Outside these classes, the students also benefit from one-on-one time with their teachers.

Atlantic Middle School's principal, Josh Rasmussen, feels that the program has helped students to recognise the benefits

of college education from an early age. For instance, it has prompted greater conversation about the classes that they would like to take in high school, in order to meet college entrance requirements.

Supporting Students Throughout their Academic Journey

The STEM Excellence and Leadership program is a remarkable example of how academic institutions can support gifted children from all backgrounds in realising their full academic and professional potential. With the recent grant awarded by the NSF, Dr Assouline, Dr Ihrig and their colleagues hope to strengthen the impact of the program by examining its strength and limitations.

'The NSF is counting on us to build on our expertise in student programming, professional development and rural education to offer a template for other professionals involved in afterschool programming,' says Dr Ihrig. 'We want to understand what threads of commonality exist among districts, including aspects that are unique and effective as well as those that pose special challenges. Talent in our rural communities is too important to neglect.'

According to Dr Assouline and Dr Ihrig, initiatives such as the STEM Excellence and Leadership program could help to significantly reduce the current disparities in education. In the future, their program could inspire other academic institutions to invest in new generations of gifted rural students, paving the way towards equal opportunities in education.

'You can compare increasing students' interests and aspirations to running a marathon,' adds Dr Ihrig. 'If you motivate and excite people to run a marathon, but don't prepare them for that task, you can imagine how they will not be successful.'

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Meet the researchers

Dr Susan G. Assouline Director **Belin-Blank Center** University of Iowa Iowa City, IA USA

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Dr Susan Assouline is the director of the UI Belin-Blank Center for Gifted Education and Talent Development. She holds the Myron and Jacqueline N. Blank Endowed Chair and is also a professor of school psychology. One of her key research interests is twice-exceptionality, particularly gifted students with autism spectrum disorder or with a specific learning disability. Dr Assouline has worked on identifying academic talent in elementary students, as well as implementing academic acceleration interventions for advanced students. In collaboration with Nicholas Colangelo and Ann Shoplik, she developed the Iowa Acceleration Scale, a tool designed to guide educators and parents through decisions about grade-skipping students. In 2015, Dr Assouline and colleagues, Nicholas Colangelo, Ann Shoplik, and Joyce VanTassel-Baska, published A Nation Empowered: Evidence Trumps the Excuses Holding Back America's Brightest Students. She has received numerous awards for her work, including the National Association for Gifted Children (NAGC) 2016 Distinguished Scholar Award.

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Lori Ihrig graduated with a BS in Science Education in 1999 from the University of Iowa and taught grades 7-12 science for the Williamsburg Community School District. She earned her MS in Science Education from the University of Iowa in 2002. In 2007, she began working at ACT, Inc, writing science curriculum and facilitating science teacher professional development for Quality Core, a project in partnership between ACT, the Gates Foundation, and the National Governors Association. In 2014, she earned her doctorate in Curriculum and Instruction from Iowa State University with an emphasis in Science Education. She is the program director for the STEM Excellence and Leadership program, lead administrator for the Secondary Student Training Program, co-administrator for the Invent Iowa program, and the co-director of the Iowa Junior Science and Humanities Symposium. Her research interests include STEM academic talent-development in high-ability rural students.

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