



# STARnet Webinar Series

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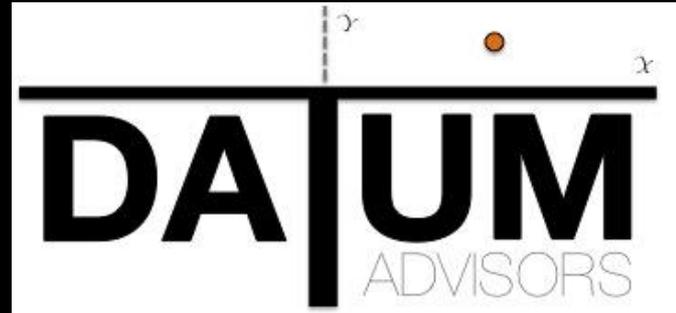
Promising Practices for Implementing STEM in Public Libraries

Host: Dr. Annette Shtivelband, Research Evaluation Consulting

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# Promising Practices for Implementing STEM in Public Libraries

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# Literature Review Background

- Project initiated in August 2015
- Search terms
- Article identification and vetting
- 40 resources identified for libraries and librarians



# Literature Review Paper

- “STEM Equity in Informal Learning Settings: The Role of Public Libraries”
- Purpose of the report



# Introduction

- STEM
- Increase in STEM careers and positions (Lacey & Wright, 2009; National Science Board, 2010)
- Decrease in students pursuing STEM majors and obtaining STEM degrees (Chen & Soldner, 2013; Dugger, 2011)



# The STEM Pipeline

- STEM Pipeline
  - A framework to understand the progression of students who engage in STEM and become equipped for and employed in STEM careers
- Multiple pathways to pursue STEM (Maltese, Melki, & Wiebke, 2014)
- What makes students more likely to engage?
  - High test scores (Schneider, Swanson, & Riegle-Crumb, 1998);
  - High GPAs (Ware & Lee, 1988);
  - Rigorous high school curriculums (Adelman, 2006); and
  - Personal interest in STEM (Federman, 2007)



# Leaks in the STEM Pipeline

- Leaks in the STEM Pipeline
  - Many student disengage from STEM at various points (Lyon, Jafri, & St. Louis 2012)
- Students more likely to disengage from STEM
  - Women, Latinos, African Americans, low SES, and students with disabilities (Gilmartin, Li, Aschbacher, & McPhee, 2005; U.S. Census Bureau, 2013)



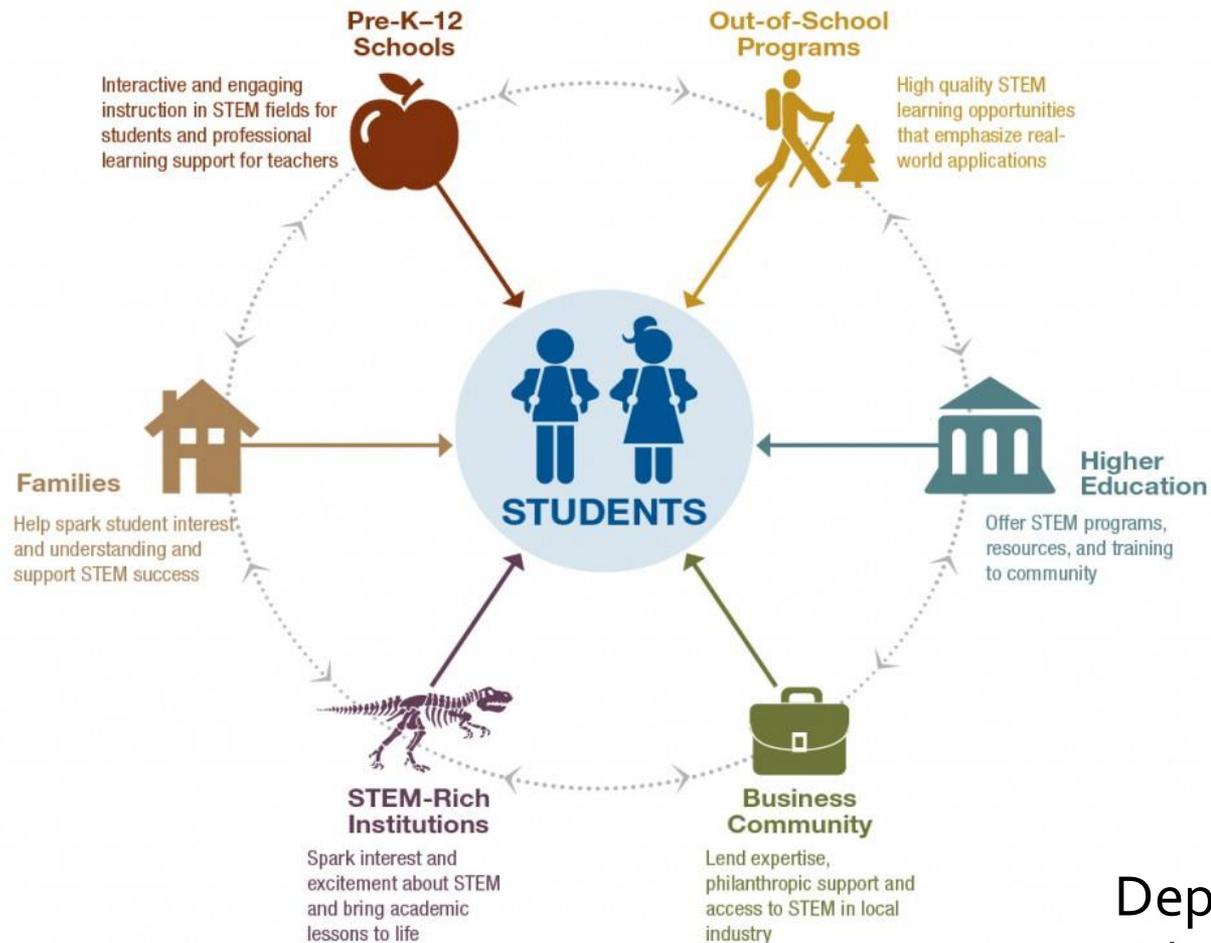
# Equity, Access, and the STEM Pipeline

- Formal education is not enough  
(Community for Advancing Discovery Research in Education, 2011)
- Obstacles and barriers may prevent STEM engagement
  - Gender, race, and class
- STEM identity
  - Some students may not form a STEM identity (Gilmartin et al., 2005)



# STEM Ecosystem

## STEM Learning Ecosystem



# The Case for Public Libraries

- Public libraries
  - 17,000 public libraries (Swan et al., 2013)
  - Accessible (Dusenbery & Curtis, 2012)
  - Existing resources (Koester, 2014)
  - Places for community learning (Association of Science-Technology Centers, 2014)
  - Lifelong, life-wide, and life-deep learning experiences (Bell et al., 2009)



# STAR\_Net Study Results

- STAR\_Net study (Hakala, MacCarthy, Dewaele, & Wells, 2016)
- 455 library professionals
- Offer STEM programming
  - 30% - occasionally
  - 29% - frequently
  - 26% - monthly
  - 8% - summer only
  - 7% - once



# Examples of STEM in Public Libraries

- STAR\_Net libraries (Evaluation and Research Associates, 2013)
- YOUmedia Learning Lab Network (Association of Science-Technology Centers, 2014)
  - Learning ecosystems that engage teens, provide mentors, and offer a physical space
- Chicago City of Learning (CCOL, 2016)
  - Interactive learning projects
- Learn, Explore, and Play (Bevan et al., 2010)
  - Science is Fun! is a library program focused on connecting STEM subjects to everyday experiences for students ages 8 to 13

# Suggestions of STEM in Public Libraries

- Anderton 2012
  - Promote STEM program to educators and parents;
  - Create STEM booklists, include STEM-related items in general booklists;
  - Advertise your STEM resources on blog or social media;
  - Apply for a grant;
  - Involve other departments, employees, and administrators in your organization;
  - Involve others in your community;
  - Host an in-house STEM program;
  - Build slowly; and
  - Ask teens to help you



# Suggestions Continued...

- Hopwood (2012)
  - Hosting open-book trivia contests with STEM content;
  - Creating STEM displays;
  - Offering Legos activities;
  - Providing family science nights;
  - Offering STEM-related storytimes;
  - Providing video gaming technology;
  - Hosting cooking programs;
  - Providing sports activities that integrate statistics; and
  - Showcasing technology so that patrons can take a closer look at tablets, e-readers, and cameras.



# Girls and STEM

- The Institute of Education Sciences (2007) recommended the following strategies:
  - Empower girls' self-concepts of their abilities in STEM;
  - Change girls' perceptions of STEM careers; and
  - Support girls' interest in STEM
- Focus on engagement, capacity, and continuity (Campbell, Jolly, & Perlman, 2004)



# Promising Practices for Public Libraries

1. Collaborate with STEM stakeholders
2. Form partnerships with organizations that serve youth
3. Target historically underrepresented K-12 youth
4. Make STEM programs accessible and equitable to all youth
5. Develop strong, lasting, caring adult relationships
6. Provide training opportunities to librarians
7. Evaluate STEM programs and monitor and track outcomes
8. Share results with stakeholders

# Collaborate with STEM Stakeholders

- STEM professionals, community leaders, community-based organizations, schools, and universities
- Formal and informal STEM education institutions
- Builds capacity to offer STEM education and programming
- Builds “STEM ecosystem”



# Form Partnerships with Organizations that Serve Youth

- Can strengthen public libraries' capacity to serve youth while mitigating barriers
- Program that utilize best practices for youth development programs are more effective
- Provides a social network to support youth in STEM



# Target Historically Underrepresented K-12 Youth

- Historically underrepresented K-12 youth have been identified as a national priority in STEM education and programming
- Public libraries are well-positioned to address the educational disparity
- Public libraries are viewed as a safe, trusted, and welcoming environment



# Make STEM Programs Accessible and Equitable to all Youth

- Programs and services are typically free; whereas museums, zoos, aquariums are not
- Friendly and knowledgeable staff
- Connect with parents and caregivers
- Offer materials in the languages of your community



# Develop Strong, Lasting, Caring Adult Relationships

- Network of social support in “STEM ecosystem”
- Consistency is critical
- Key theme in informal education, informal STEM education, and public library literature



# Provide Training Opportunities to Librarians

- Library professionals need to feel empowered
- Provide PD and training that focuses on youth development and programs, STEM-specific activities and program facilitation
- Lacking familiarity in STEM subjects is an asset not a deficit



# Evaluate STEM Programs and Monitor and Track Outcomes

- Start with outputs, then outcomes
- Work with evaluators and academics
- Use the data you collect to improve programs, make decisions, and demonstrate your impact



# Share Results with Stakeholders

- Tell your story with your community
- Share successes, lessons learned, and impact
- Strengthen STEM programs and initiatives
- Supports sustainability



# Lessons Learned

- Momentum is growing for STEM education and programming in public libraries
- The case for public libraries in the informal education landscape is solid
- Promising practices from the youth development literature can be applied
- The STEM ecosystem and focus on rural youth are likely future directions
- More research and evaluation is needed regarding STEM in public libraries

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