

New England Auto Museum Bibliography Jan. 2015

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Rick Walker, MA Trinity College www.collegeresearchsharing.com

NEAM Member, Board of Directors; Education Advisor

Adjunct Prof Charter Oak State College, CT - IDS 101

This bibliography contains material easily accessible via the WWW and is therefore not meant to be in-depth scholarship. It is an exploration of the status of the STEM-focused educational environment today, including the importance of informal learning for creativity and inspiration and going beyond the classroom. It is also not a list of sources on education reform. In the world of education reform one may explore indefinitely it seems, reading the likes of John Taylor Gatto, Diane Ravitch, Howard Gardner on “The App Generation” or so many others. Today 1/22/15 I’m excited about the Winter 2015 *The American Scholar* cover story by Mike Rose “School Reform Fails the Test: How Can Our Schools Get Better When We’ve Made Our Teachers the Problem and Not the Solution?” Subsequently read therein “Habits of Mind: Why College Students Who Do Serious Historical Research Become Independent, Analytical Thinkers” by Anthony Grafton and James Grossman.

Marketing Materials Direct & Indirect

PowerPoint NEAM Overview 24 Belden Ave. (viewable at www.collegeresearchsharing.com) Nick Ord, NEAM Board Member, Marketing Director.

Brochures (two versions, need updating)

America After 3PM, Afterschool Programs in Demand. Afterschool Alliance. 2014. (Published since 2004) Made possible by the generous support of the Charles Stewart Mott Foundation, the Robert Wood Johnson Foundation, The Wallace Foundation, the Ford Foundation and the Noyce Foundation, with additional support from the Heinz Endowments, The Robert Bowne Foundation and the Samuelli Foundation. Both the percentage and the total number of children in the United States participating in an afterschool program are **on the rise**. In 2014, 10.2 million children (18 percent) participated in an afterschool program. Nearly 1 in 4 families (23 percent) currently has a child enrolled in an afterschool program. In 2014, approximately 19.4 million children (41 percent) not currently in an afterschool program would be enrolled in a program if one were available to them, according to their parents. More than half of parents (53 percent) said that STEM learning opportunities were very important in their decision. Coming up in 2015 is a STEM report. <http://afterschoolalliance.org>

Teaching History With Museums: Strategies for K-12 Social Studies. Alan Marcus, UConn, Jeremy Stoddard, College of William & Mary, Walter Woodward, UConn & CT State Historian. Includes info on virtual galleries and virtual field trips. Examples of

the former include the Smithsonian Museum of Natural History, the Roman Bath Museum, Bath, England, California State Railroad Museum, Australian History Museum. Examples of the latter include Colonial Williamsburg, The “Raid on Deerfield: The Many Stories of 1704” of the Memorial Hall Museum (MA) (includes resources pulled from The Library of Congress). “None of these programs can replace a visit to a museum, but they can provide a unique experience that teachers may not be able to otherwise recreate in their classrooms... they are easily adaptable to the objectives of the course curriculum.”

“A New, Additional Format for Changing Visitor Experiences, An open call to museum leaders.” Reprint from *Informal Learning Review* (2014), No. 125. John Jacobsen, Joseph Wisne, Shaun MacGillivray & Robert Mac West. Courtesy of White Oak Associates, Museum Consultants, Marblehead, MA, who presented at a meeting of NEAM. “A new format for changing visitor experiences is now possible given advances in museum research and practice, new audience expectations including participation, and matured digital technologies. A new business model may be necessary to sustain science centers and museums in a more restricted capital and operating economy. The new third format and its business model should combine the best of traveling exhibitions (TE) and giant screen (GS) films, and strive to achieve their original box-office impacts. But the innovation should bravely create a new and distinctly different kind of changing museum experience -- **a new presentation format combining immersion and interactivity into a new platform for STEM learning**, revenue generation, and museum vitality.” See site for their online library <http://www.whiteoakassoc.com>

“Bringing Life to Museum’s Collections.” Donald Osborne. *The New York Times*, Nov. 22, 2013. “Amid all the reports of a groundswell of disdain for car culture among young people, it may seem that the automobile is entering its twilight. But instead of being relegated to dark corners as curious relics, autos — surely one of the most life-changing inventions of the last 150 years — are being celebrated around the world. In recent years, **new museums** dedicated to the automobile have opened, others have spent millions on renovations that present vehicles in novel ways, and institutions once limited to displays of fine art have discovered the popular appeal of metal, glass, rubber and chrome... ‘Twenty years ago, when the museum opened, there was no such thing as an interactive display,’ said Terry Karges, executive director of the Petersen Automotive Museum. ‘With all of the quick, effective and entertaining methods for obtaining information today, museums have to change. They have to be a **showcase for information dissemination** and the creation of enthusiasm’.” <http://www.nytimes.com/2013/11/24/automobiles/bringing-life-to-museums-collections.html?pagewanted=all& r=0>

STEM/STEM Background & Ideas

STEM vs STEAM: Do the Arts Belong? Anne Jolly. Center for Teaching Quality.

She wrote Dr. Howard Gardner on how to include art in STEM. He responded: “I don’t have strong views about whether arts should become a part of STEM or be self-standing. What is important is that every human being deserves to learn about the arts and humanities, just as each person should be cognizant of the sciences.” <http://www.teachingquality.org/content/stem-vs-steam-do-arts-belong> Another piece on this from the UK: “As well as raising the profile of the arts in their own right, if STEM is to successfully turn into STEAM, we need to find ways to coherently link to the other four curriculum areas. Advances in technology have allowed projects like *Sonic Pi: Live and Coding* to target one or two of these areas and use them creatively. And as we can see from the way some teachers are bringing *Minecraft* into their lessons, it’s possible to link each STEAM subject to one project. It’ll be interesting to see how technology is integrated into the curriculum across all subjects and what kinds of opportunities this will create for collaboration.” <http://www.artsmark.org.uk/blog/using-technology-turn-stem-steam>

“Building STEAM: Blending the Arts With STEM Subjects: Goals are creativity and engagement.” Erik Robelen. *Education Week*, Dec 7, 2011. (Contact me for a copy)

Problem Based Learning for Sustainable Technology: Increasing the STEM Pipeline. 2009-2012. (Also projects in Advanced Manufacturing) Funded by Advanced Technology Education program of the NSF. New England Board of Higher Education Problem-Based Learning aligned to math and ELA Common Core State Standards for Speaking & Listening, STEM Literacy and Writing, the National Council of Teachers of Mathematics (NCTM) standards for grades 9-12, the National Science Education Standards (NSES) for grades 9-12, and the International Technology and Engineering Educators Association (ITEA) Standards for Technology Literacy for grades 9-12. Advisors included: Karen Wosczyzna-Birch, Executive Director, College of Technology, CT Community Colleges; **Jake Mendelsohn**, school program manager, Greater Hartford Academy of Math & Science, Hartford. <http://www.pblprojects.org/challenges-nebhe/#stempbl>

Advancing Science & STEM Learning, The Future Depends on it. Association of Science-Technology Centers (ASTC). “Science centers and **museums** are uniquely positioned to raise awareness, understanding, and interest levels in science and the other STEM disciplines. They know how to provide life-long learning and stimulation to learners of all ages. The fields of STEM come to life through informal learning outside of the classroom, creating a passion for curiosity and risk taking... skills that will be essential to face the challenges of a 21st century workforce. Science centers and **museums** specialize in cultivating critical thinking and analytical skills— two of the most important abilities that the STEM fields require. It is equally important to inspire, particularly at the elementary and middle school ages—a “make or break” time for kids to develop an interest in science. Most scientists first became interested in the field by the time they were 11 years old and many claim that informal science experiences at an early age helped them decide on their chosen career path.” (Also other related articles on their site such as “How Can **Museums** Help Teachers With the Next Generation Science Standards?” “**Museums**

are well suited to support teachers and schools as they address the demands of the NGSS.”) <http://www.astc.org>

The Condition of STEM 2014. ACT, a leader in measuring college and career readiness trends since 1959. Given the inconsistency of definitions across the country, defines STEM as four key areas: 1. Science 2. Computer Science & Math 3. Medical & Health 4. Engineering & Technology. Has a good list of STEM majors/occupations & a list of interest and achievement by state. Out of 294 occupations 93 are in STEM. Created a STEM score within the ACT Aspire reporting format and will make STEM scores an integral part of the ACT college readiness assessment reporting format in 2015. These steps will give educators and STEM leaders an early and ongoing view of the STEM pipeline within their states... While large numbers of students are interested in STEM, achievement levels remain far too low to foster success in most STEM fields. Overall, just 43% of 2014 graduates met the ACT College Readiness Benchmark in math, and only 37% met the Benchmark in science...**Upcoming projects at ACT include the development of ACT College and Career Readiness Benchmarks focused on the skills and knowledge students will need to be successful in STEM majors and occupations.** In addition, we continue to provide additional research and data on the importance of developing a more **holistic** view of college and career readiness. Our goal is to help educators, parents, and STEM councils and organizations broaden STEM opportunities for students at all levels. We must work together to get more students prepared to succeed in STEM careers. This is a critical step if the United States is to remain a world leader... The proposed federal STEM Teacher Pathways program seeks to produce 100,000 high-quality math and science teachers in the next decade. Out of the more than 1.8 million 2014 graduates tested, however, only 4,424 students expressed an interest in teaching math, while a meager 1,115 expressed an interest in teaching science. <http://www.act.org/stemcondition/14>
<http://www.act.org/newsroom/number-of-high-school-graduates-who-plan-to-teach-stem-low-unlikely-to-meet-expected-demand/?lang=english>

“STEM mastery: The ticket to reviving education.” *CtPost.com* Oct 19 2012. Dr. Steven Coan, CEO of Sea Research Foundation at Mystic Aquarium. “Education reform specialists should overhaul the restrictive chutes and ladders approach to science and math that begins in sixth or seventh grade, amend outmoded STEM teaching methods, and instead champion an interactive, real-world, **mentor-based** approach -- beginning in elementary school -- that models 21st century critical and creative thinking skills, energizes appreciation for STEM, and enriches students' knowledge about STEM careers. Innovative examples of this proven strategy abound. Blackstone Valley Regional High School in Massachusetts, for instance, which boasts a 93 percent graduation rate, reinvented itself in the past 10 years to help its students pursue rewarding STEM careers. In addition to plumbing, **automotive** and other traditional trades (which increasingly rely on technological advances), BVT offers rigorous training in emerging technologies, advanced STEM curriculum and even an engineering capstone class for seniors. Education reformers

would do well to study BVT's model of success and emphasize vocational education as a means to hands-on STEM mastery. In addition many organizations, science and natural history **museums**, zoos and aquariums nationwide offer first class STEM immersion programs which can be integrated into school curriculum.”

<http://www.ctpost.com/opinion/article/STEM-mastery-The-ticket-to-reviving-education-3965060.php>

“Awareness Grows of Importance of Learning Science Beyond School.” *Education Week*, April 6, 2011. “What’s often missing from the national dialogue on the issue is a concerted focus not simply on what happens in the classroom, but also on the opportunities to learn about science—and to inspire a passion for the subject— that come outside the school day and the formal curriculum. But many leaders in the field often referred to as ‘informal science education’ say that is beginning to change. There are signs that this sector is garnering wider attention and starting to be included in broader discussions on how to improve science learning among young people. One boost to the cause was the 2009 release of a major National Research Council report, *Learning Science in Informal Environments*. **‘What is often overlooked or underestimated is the potential for science learning in non-school settings, where people actually spend the majority of their time. Beyond the schoolhouse door,’ it said, ‘opportunities for science learning abound.’** The NRC report said one important feature of informal learning settings is the absence of tests, grades, and other familiar approaches used by schools to document the effect of education. ‘Assessments should not be limited to factual recall or other narrow cognitive measures of learning,’ it said, but instead ‘should address the range of intellectual, attitudinal, behavioral, social, and participatory capabilities that informal environments effectively promote.’ **The walls between formal and informal learning professional fields are only beginning to crumble. There is too little transfer of practice, learning, and community.** Martin Storksdieck, the director of the Board on Science Education at the National Academies, suggests that advocates still have a lot of work to do in convincing policymakers and the public that informal science learning merits increased investment.”

“Latest Wave of STEM Schools Taps New Talent. Erik Robelen. *Education Week*, Sept 14, 2011. “‘There is a large interest and achievement gap ... in STEM’,” said the President’s Council of Advisors on Science and Technology in a report last year that called for **1,000 new STEM focused schools over a decade. ‘The underrepresentation of minority groups and women in STEM denies science and engineering the rich diversity of perspectives and inspiration that drive those fields.’** Although there’s no official count of STEM schools, an SRI report identified 315 such public high schools as of the 2007-08 academic year. Ohio—with financial help from Battelle and the Seattle-based Bill & Melinda Gates Foundation—has supported the development of 10 STEM schools, part of the Ohio STEM Learning Network. ‘The idea was to create a STEM high school in each region [of Ohio],’ said Eric D. Fingerhut, a vice president at Battelle, a research and development organization based in Columbus, Ohio, that manages the network. ‘Each school

would serve a dual function: educating students in their own right, but then serving as a platform or hub that is generating the type of energy around improved STEM education that can spin out into the public schools ... and be a **catalyst** for innovation.’

“Get Ready for NextGen Science: New national standards promise to revolutionize the content area.” Ron Schachter, *District Administration Magazine*, June 2013.

“STEM Programs in K-12: Measuring Success.” *Bulletin of the CT Academy of Science and Engineering*, Vol 28,4/Winter 2013.

Mobility Makers. New York: Center for an Urban Future. Symonds, W. C., Schwartz, R. B., & Ferguson, R. (2011).

Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century. Cambridge, MA: Pathways to Prosperity Project, Harvard Graduate School of

The Jobs of Today: The STEM economy is much bigger than many imagine and the barriers to entry are also lower than most think.

<http://www.theatlantic.com/sponsored/chevron-stem-education/the-jobs-of-today/196>

Next Generation Connecticut – UConn. Gov. Dannel P. Malloy’s initiative to greatly expand educational opportunities, research, and innovation in the science, technology, engineering, and math (STEM) disciplines at UConn over the next decade. The shared goal of this initiative is to leverage the strength and resources of this University to build Connecticut’s future workforce, create jobs, and invigorate the State’s economy. The cornerstone of this effort is a major increase in the University’s enrollment, the expansion of our faculty, and the development of new and existing facilities to accommodate enhanced STEM research and teaching. It will also support the academic missions and the expansion of critical programs at UConn's Hartford and Stamford campuses. <http://nextgenct.uconn.edu>

“Girls Learn About Manufacturing” about Dream It. Do It, of the CT Center for Advanced Technology (CCAT). Karen Jarmon, *Hartford Courant*, June 8, 2014. (Cites CT Lt Gov Nancy Wyman, Manufacturing Institute President Jennifer McNelly, Commissioner of Dept of Economic and Community Development Catherine Smith, and CT Commissioner of Labor Sharon Palmer. Cites SME Education Foundation www.facebook.com/smefg *The Detroit News*: Matt Kovac, dean of Butler County Community College’s Natural Science and Technology department, said the school’s emphasis on hands-on learning and making things fills a void in millennials’ experience. Previous generations had plenty of opportunities to learn how to fix or make things, whether it was through Lincoln Log kits or **fixing a car** from their father or neighbor. Millennials “don’t have the built-in familiarity with fixing things, making things,” he said. <http://www.detroitnews.com/story/business/personal->

finance/2015/01/12/manufacturers-woo-millennials-new-training-tactic/21615651

How Cross-Sector Collaborations are Advancing STEM Learning (STEM Learning Ecosystems Working Paper). Kathleen Traphagen & Sskia Traill. Feb 2014. Noyce Foundation. “Outside the school walls, STEM learning is everywhere. More than 90 million people visit science **museums** and centers every year to experience hands-on STEM learning. Portable digital devices have catalyzed thousands of creative opportunities for learning to happen anytime, anywhere, in ways that are both individualized and instantly connected to a worldwide community. Bolstered by the National Research Council’s Surrounded by Science report and Center for Advancement of Informal Science Education (CAISE) research as well as other studies pointing to the value of intentionally connecting learning environments, many cross-sector efforts have emerged... Initiatives look for mutually beneficial activities, such as using resources more effectively — be they school classrooms, **museum** exhibits, parks and recreation centers, volunteer scientists, computer labs, curricula, or science kits. Or coalitions may work to leverage a new funding source through partnership, or collaboratively identify and fill gaps in the system. This emerging field of interconnected STEM learning needs to better share promising approaches, pilot new ideas, understand what lessons can be gleaned from efforts that did not work, and research the results of similar efforts in different fields.”
http://www.noycefdn.org/documents/STEM_ECOSYSTEMS_REPORT_EXECSUM_14_0128.pdf

“A New Era in STEM Education.” STEM Education Coalition. James Brown, Executive Director. Washington, D.C. 2014. Has 600 members. “One new issue we’ve spent some time trying to understand is the emerging reality that **nearly half of new jobs in the STEM workforce don’t require a traditional four-year college degree**, and so are served by community colleges, trade schools and a variety of other educational pathways. These are jobs like **auto mechanics**, craftspeople in advanced manufacturing, cybersecurity specialist, and other forms of modern technicians. Another new area is around informal STEM education and the myriad of learning opportunities available to students outside of the regular school day, whether on campus, through local **museums** and science centres, or elsewhere in communities across the country. Integrating these emerging career pathways and learning opportunities into a better STEM pipeline is quite a challenge... In July, the House passed a bill called the STEM Education Act that would establish a comprehensive definition of the STEM subjects for the purposes of federal grants that would be adapted to the needs of each state based on its workforce needs. In addition, the Coalition worked with the Office of Senator Jeanne Shaheen (state of New Hampshire) and the Afterschool Alliance to develop the Supporting Afterschool STEM Act, to promote greater research into the best practices in **informal STEM education** and better collaboration between US Federal Science Agencies like the National Science Foundation and NASA on informal STEM programmes... the Coalition also worked closely with Congressman Joe Garcia (District of Florida) to

introduce the Innovative STEM Networks Act, a bill that provides competitive grant opportunities to states that form network-based **partnerships** between schools, universities and community group to promote the STEM subjects.”

<http://www.stemedcoalition.org>

Career Academies: Long-Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood. James Kemple. MDRC June 2008.

“Established more than 30 years ago, Career Academies have become a widely used high school reform initiative that aims to keep students engaged in school and prepare them for successful transitions to post- secondary education and employment. Typically serving between 150 and 200 students from grades 9 or 10 through grade 12, Career Academies are organized as small learning communities, combine academic and technical curricula around a career theme, and establish partnerships with local employers to provide work-based learning opportunities. There are estimated to be more than 2,500 Career Academies operating around the country. Since 1993, MDRC has been conducting a uniquely rigorous evaluation of the Career Academy approach that uses a random assignment research design in a diverse group of nine high schools across the United States. Located in medium- and large-sized school districts, the schools confront many of the educational **challenges found in low-income urban settings.** The participating Career Academies were able to implement and sustain the core features of the approach, and they served a cross-section of the student populations in their host schools. This report describes how Career Academies influenced students’ labor market prospects and postsecondary educational attainment in the eight years following their expected graduation. The results are based on the experiences of more than 1,400 young people, approximately 85 percent of whom are Hispanic or African-American.” <http://www.mdrc.org/publication/career-academies-long-term-impacts-work-education-and-transitions-adulthood>

CT STEM-Related Educational Asset Directory 2007. (Grants info) CONNvene.

Beyond High School: Efforts to Improve Postsecondary Transitions Through Linked Learning. Alliance for Excellent Education. ALL4ED.ORG

Connecticut STEM Careers Partnership. U.S. Dept of Labor Employment and Training Administration STEM Opportunities in the Workforce System Initiative Grant Proposal – Phase II. Connecticut Workforce Development Council July 24, 2008. Duns 170205335 (Diane Goldsmith was one of the key support personnel.) **(Need to investigate what happened with this extensive proposal for the State of CT.)** <http://www.ewib.org/Portals/0/docs/CT%20STEM%20Career%20Partnership%20Grant.pdf>

NCREST STEM Early College Expansion Project (SECEP). The National Center for Restructuring Education, Schools and Teaching (NCREST), a research center at Teachers College, Columbia University, leads the STEM Early College Expansion Partnership (SECEP). “Our goal is to engage students in early college experiences as

well as to improve STEM education in participating districts in Michigan and Connecticut. Over five years, SECEP strives to improve both college readiness and STEM education for 22,000 high-need middle and high school students, decreasing drop-out rates and boosting college enrollment. SECEP also will **improve underrepresented populations' access to STEM careers** by increasing the number of students enrolling in dual credit STEM courses and pursuing postsecondary credentials. This will be accomplished through targeted professional development, coaching, and ongoing support.”

http://www.tc.columbia.edu/ncrest/projects_cp_STEM.html

S.T.E.M Initiatives Research Brief (Exemplary Initiatives). The Principal's Partnership. Union Pacific Foundation. “Programs should develop partnerships among a broad range of education stakeholders, including schools, businesses, higher ed, government, community, in order to provide authentic mentoring and internships.” http://www.uprr.com/newsinfo/releases/community/2011/0303_foundation-national.shtml

A Talent-Based Strategy to Keep Connecticut Competitive in the 21st Century: Growing, Using and Enriching Connecticut's Talent Pipeline. Connecticut Office for Workforce Competitiveness, Feb 2007, © Battelle Memorial Institute. For STEM see p11, including reference to CONNvene process. Advocates a STEM-focused “**Virtual Learning Center**” to include access to all STEM curriculum & a “statewide network of after-school and out-of-school programs with a concerted focus on encouraging interest and participation by families and youth in STEM activities. Encourages “the expansion of engineering programs such as **Project Lead the Way** and CPEP.” <http://www.hartfordinfo.org/issues/wsd/EconomicDevelopment/2007KeepingCTCompetitive.pdf>

STEM in New Haven. Powerpoint citing CONNvene 2006 & youths leaving the state. Dr. Reginald Mayo, Superintendent of Schools; Ken Matthews, Matt Supervisor; Richard Therrien, NHPS Science Supervisor. Asserts that the four disciplines are interdependent, and “by endeavoring to blend these four STEM education seeks to create 21st century learning opportunities and skill development for **all** students. Some 75% of jobs in the future will be in STEM, not just STEM careers, it is STEM in every job.” http://www.powershow.com/view1/f6416-ZDc1Z/SCIENCE_at_New_Haven_powerpoint_ppt_presentation

A Bridge for All: Higher Education Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics. BEST (Building Engineering & Science Talent). Identifies “‘what’s working’ across the country to **develop the technical talent of under-represented groups** in pre-K through 12, higher education, and the workplace. No comprehensive assessment on this scale had ever been attempted. Three blue ribbon panels published their reports in 2004.” Includes eight Design Principles to Expand Higher Education Capacity, one of which is “enriched research experience with beyond-the-classroom hands-on opportunities and summer internships that connect to the world of work.... Notes

that community colleges play an increasingly critical role... Even the most successful college and university-based programs have made scarcely a dent in the production of a well-educated, well-prepared and diverse scientific and technical workforce. The reason is that doing so is one of America's most complex public issues, and as such transcends sectoral boundaries. Change on the scale required will never be achieved one department or one campus at a time. Neither can institutions of higher education get the job done on their own. Extending effective policies and practices across America requires a national **strategy that begins in the nation's communities**. <http://www.bestworkforce.org/index.htm>

The Talent Imperative: Meeting America's challenge in science and engineering, ASAP. BEST (Building Engineering & Science Talent). 2004

The 4th USA Science & Engineering Festival, Walter E. Washington Convention Center, Washington D.C. Hosted by Lockheed Martin. The largest and only NATIONAL science festival, features nationwide contests and school programs, including our popular 'Nifty Fifty' science speaker program and X-STEM Symposium. The Festival will culminate in a Grand Finale Expo on April 16-17, **2016**. More than 350K+ attendees will celebrate science at the Expo, and engage in activities with some of the biggest names in STEM, hear stories of inspiration and courage, and rock out to science during our incredible stage show performances. <http://www.usasciencefestival.org>

A Program Director's Guide to Evaluating STEM Education Programs: Lessons Learned fro Local, State, and National Initiatives. April 2013. Draws on The National Science Foundation's Innovative Technology Experiences for Teachers and Students (ITEST) Learning Resource Center at EDC; The Massachusetts Department of Higher Education's Pipeline Fund @Scale Program Initiative; The University of Massachusetts Donahue Institute. May be downloaded at the STEM Learning and Research Center. ITEST supports the research and development of innovative models for engaging K-12 students in **authentic experiences** that build their capacity to participate in the STEM and information and communications technology (ICT) workforce of the future. <http://stelar.edc.org/publications/program-directors-guide-evaluating-stem-education-programs-lessons-learned-local-state>

Curriculum (Some of the above also relevant)

Pathways in Technology Early College High School. Began in Brooklyn in 2011 and now spreading to nearly 40 schools around the nation and could grow to an estimated 100 schools by 2016. By 2018 there will be 14 million new tech jobs for those with associate's degrees. Available via request to IBM is the STEM Pathways Playbook by IBM used to create P-TECH schools. (So far just one in CT, but a few more planned.) <http://www-03.ibm.com/press/us/en/photo/45396.wss>
IBM <http://citizenibm.com/2012/10/p-tech-where-we-are-now.html>

Press Kit <http://www-03.ibm.com/press/us/en/presskit/42300.wss>
NY <http://www.ptechnyc.org/ptech>
Time <http://content.time.com/time/magazine/article/0,9171,2165479-5,00.html>
Norwalk <http://portal.norwalkps.org/schools/nhs/neca/default.aspx>
<http://www.ptech.org> Called in CT the CT-ECO schools.
Aspen Institute: <http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-americas-future/models-success/ibm>
Ready for Jobs That Haven't Been Invented Yet (Citizen IBM)
http://citizenibm.com/2014/08/fetherstonhaugh_leslianne.html#more-7566
Gov Dannel Malloy praises P-TECH
<http://www.governor.ct.gov/malloy/cwp/view.asp?A=11&Q=539440>

College Access Challenge Grant A federally funded formula grant that is designed to foster partnerships among federal, state and local government entities and philanthropic organizations to significantly increase the number of underrepresented students who enter and remain in postsecondary education. The U.S. Department of Education provides CACG grants to states to meet the needs of underrepresented students and families, with priority to those living at or below poverty, as authorized under Section 781 of the Higher Education Act of 1965, as amended; 20 USC 1141. The Connecticut Board of Regents for Higher Education manages the state's CACG program. <http://www.ct.edu/initiatives/grant>

Connecticut Center for Advanced Technology, Inc. CCAT has developed comprehensive minds-on, standards-aligned, STEM-themed curriculum packages that for implementation in both classrooms and out-of-school-time enrichment programs. They are offered with accompanying educator training and optional supply kits. CCAT can also work with schools and districts to develop new curriculum or assist in curriculum revision efforts, especially re-alignment with Common Core Standards and NGSS. <http://www.ccat.us/eduworkforce/curriculum>

College Ready Learning Technologies. Bill & Melinda Gates Foundation. 2012. The College Ready Team at the Foundation invests in learning technologies with the core aim of accelerating student learning. This first group of early investments represents a sampling from three portfolios. The College Ready Work (CRW) & Next Generation Models (NGM) Portfolios focus on multi-year projects designed to innovate in the areas of digital courseware; games for learning; embedded assessments; and social networking environments. The Next Generation Learning Challenges (NGLC) Portfolio is a larger short-term cohort of investments also designed to support and innovate within the fields of modular courseware, games for learning, and embedded assessments. Our goal in all the projects has been to fund highly engaging digital tools that support students in mastering rich and rigorous learning tasks anytime, anywhere. This collection of investments includes technologies that support students in math, science, literacy and social studies. All investments asked grantees to carefully align their offerings to the cognitive demands of the Common Core State Standards. <http://www.gatesfoundation.org>

Project Lead the Way. The nation's leading science, technology, engineering and math (STEM) solution in over 6,500 schools across the U.S. University of New Haven is one of the designated coordinators. "The U.S. Department of Commerce estimates that jobs in science, technology, engineering, and math (STEM) will grow 17 percent by 2018—nearly double the growth for non-STEM fields. By 2018, the U.S. will have more than 1.2 million unfilled STEM jobs because there will not be enough qualified workers to fill them. STEM is where jobs are today and where the job growth will be in the future." <https://www.pltw.org>

Ford Next Generation Learning. <https://fordngl.com> "CTE Is Hot Topic for Senate Auto Caucus" *July 25, 2014* Brendan Desetti "In a briefing on the workforce needs of the automotive industry, CTE programs and the Perkins Act took center stage as critical to ensuring a healthy, skilled workforce for the **auto industry and advanced manufacturing**. Hosted by the Senate Auto Caucus and its co-chairs, Sens. Rob Portman (R-OH) and Sander Levin (D-MI), the briefing featured a panel of auto industry experts from Ford, Toyota, Volkswagen, Honda and the United Auto Workers. Dispelling the misconception of good STEM jobs being only those at the engineer or doctorate level, the industry panelists utilized this forum to emphasize that the **skills gap for STEM jobs is largest at the technician level**. With technician-level STEM careers offering family-sustaining wages, federal policy should be designed to reduce the stigma on these education and career paths." <https://fordngl.com/stem-is-cte>

SAE International. <http://www.sae.org> "A World in Motion" and F1 in Schools." SAE Foundation <http://foundation.sae.org/about> : "One of the most pressing issues facing industry today is the decline of students enrolling in science and technology programs. This decline and its impact threaten the ability to meet future workforce demands with repercussions to be felt for generations to come. SAE is actively addressing this issue with programs that bring math and science to life and sow the seeds of endless possibilities for today's students. From the acclaimed **A World In Motion®** and **F1 in Schools™** programs for students in grades K-12, to the challenging, highly-competitive **SAE Collegiate Design Series™**, along with **scholarships** and **awards**, the SAE Foundation helps to inspire the next generation of innovators."

"IB Offering Certificate For Careers: Initiative Geared Toward Diverse Student Population" Erik Robelen. *Education Week*, Vol. 31, No. 35, June 13, 2012. "The International Baccalaureate organization, best known in the United States for its prestigious two-year diploma program for juniors and seniors, will enter new terrain this fall as it formally rolls out an initiative centered on a variety of career pathways that includes engineering, culinary arts, and **automotive technology**. The move comes as the IB presence in U.S. public schools rapidly grows and as the organization has made a concerted push to expand access to a more diverse student population. Billed as blending academic and practical skills, the IB Career-related

Certificate has been piloted at eight U.S. schools...”

<http://www.edweek.org/ew/articles/2012/06/13/35ib.h31.html?tkn=UTXF1Tolk8BV3q%2BNnT%2FaR3MYcbsf0YqjTbEx&cmp=ENL-EU-NEWS1>

Summary Brief: International Baccalaureate Standards Development and Alignment Project. Conley, D., Ward, T. (PhDs) Educational Policy Improvement Center, Eugene, Oregon. © 2009 Educational Policy Improvement Center, Eugene, Oregon. “Each of the 50 states has established educational standards that drive the curriculum and assessments in the state. These state-level standards are frequently compared to one another and to standards developed by national U.S. standards-setting groups, such as the American Diploma Project (ADP), Standards for Success, ACT, and the College Board. State education departments increasingly expect all educational programs offered within a state to demonstrate alignment with the state’s academic content standards. Postsecondary institutions, which are offering college-level credit for courses taken in high school or are giving students preference for admission based on programs such as IB, increasingly seek confirmation that the IB Diploma Programme is in fact well aligned with college readiness standards.... The results of this study clearly confirm the strong relationship between the IB Diploma Programme and standards for college readiness and success. The IB standards demonstrate a very high degree of alignment with the KSUS standards in all subject areas. In addition, many of the individual IB standards are at a level more advanced than entry-level college courses. Furthermore, the IB standards address key cognitive strategies that are critical to success in entry-level college courses. These key cognitive skill areas are rarely addressed in state content standards but are identified almost universally by college instructors as being central to success in entry-level college courses. In short, students who participate successfully in IB should be well prepared to succeed in entry-level college general education courses and in some cases to have already learned material covered in such courses.”

<http://www.ibo.org/contentassets/d74675437b4f4ab38312702599a432f1/epicsummmarybrief.pdf>

Out-of-School STEM Learning: A National Summit. Board on Science Education (BOSE) at the National Research Council of the National Academies. Videos.

http://sites.nationalacademies.org/DBASSE/BOSE/DBASSE_088709

Kemp Auto Museum. Roll up your sleeves and dive in to an actual classic automobile. First, Grades 9-12 students will enjoy a docent-led tour that will cover the social and technological history of the automobile. Students will hear about the evolution of the auto in the US and Germany. Next, they’ll listen to our audio tour which will describe the collection in detail using story telling and interviews. Finally, students will take part in a hands-on technical session in our restorations shop that will give them a look under the hood of some of the most unique and advanced automobiles in the world. <http://kempautomuseum.org/school-programs.aspx>

The Old Motor. Comprehensive online vintage automobile magazine that is updated daily. Featured are well over eleven thousand classic car, antique car and old car photos and videos along with information about them. In addition, a quick look at our categories menu will show you other sections that cover antique motorcycles, antique trucks, steam cars, old gasoline stations, old repair garage and old dealership photos and more. <http://theoldmotor.com>

How to Start a STEM Club. Compass Learning (includes Renzulli Learning Systems, created by Joe Renzulli & Sally Reis, well known gifted ed specialists from CT). <http://navigator.compasslearning.com/learning/how-to-start-a-stem-club>

University of New Haven. Prof Maria-Isabel Carnasciali, Ph.D. has expressed interest in helping the NEAM, with the donated Delta Thor chassis as a learning tool in particular. <http://www.newhaven.edu/Faculty-Staff-Profiles/Maria-Isabel-Carnasciali>

Education Development Center. EDC designs, implements, and evaluates programs to improve education, health, and economic opportunity worldwide. Collaborating with both public and private partners, we strive for a world where all people are empowered to live healthy, productive lives. EDC is committed to education that builds knowledge and skill, makes possible a deeper understanding of the world, and engages learners as active, problem-solving participants. While the issues we address are diverse, all that we do is united by our conviction that learning is the liberating force in human development. EDC currently employs 1,350 staff in the United States and around the world, including teachers, health and social science professionals, mathematicians, professional development experts, scientists, researchers, and management and technology specialists. http://www.edc.org/newsroom/articles/leading_conversation_stem

American Association for the Advancement of Science. <http://www.aaas.org/enhancing-education>

U.S. Dept of Education Investing in Education Fund. http://www2.ed.gov/programs/innovation/index.html?utm_source=rss&utm_medium=rss&utm_campaign=the-u-s-department-of-education-announced-the-start-of-the-134-million-2014-investing-in-innovation-i3-grant-competition

Next Generation Science Standards. <http://www.nextgenscience.org>

Common Core. <http://www.corestandards.org>

	Education 1.0	Education 2.0	Education 3.0
Meaning is...	Dictated	Socially constructed	Socially constructed and contextually reinvented
Technology is...	Confiscated at the classroom door (digital refugees)	Cautiously adopted (digital immigrants)	Everywhere (ambient, digital universe)
Teaching is done ...	Teacher to student	Teacher to student and student to student (progressivism)	Teacher to student, student to student, student to teacher, people-technology-people (co-constructivism)
Schools are located...	In a building (brick)	In a building or online (brick and click)	Everywhere (thoroughly infused into society: cafes, bowling alleys, bars, workplaces, etc.)
Parents view schools as...	Daycare	Daycare	A place for them to learn, too
Teachers are...	Licensed professionals	Licensed professionals	Everybody, everywhere
Hardware and software in schools...	Are purchased at great cost and ignored	Are open source and available at lower cost	Are available at low cost and are used <i>purposively</i>
Industry views graduates as...	Assembly line workers	As ill-prepared assembly line workers in a knowledge economy	As co-workers or entrepreneurs