



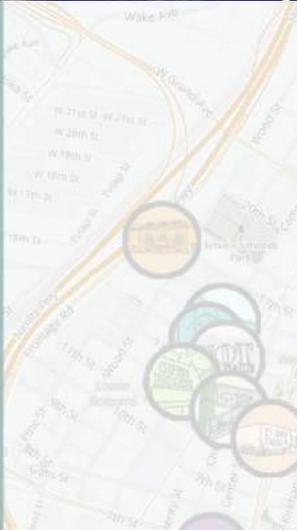
**NPR MORNING EDITION
LIVE AT YOUTH RADIO**

#LiveAtYR

West Side Stories

Gentrification in West Oakland

We tend to talk about gentrification as one story: newcomers displace long-time residents, erasing history and disrupting culture in the process. But living through dramatic neighborhood change always brings up many stories. Those stories--from West Oakland's people and places--are what this interactive is all about.



A Race Where Facts Actually Matter. PLAY NOW!

Mood Ring Mock Up



Mood Ring Prototype





**STEM Media That Matters:
Summative Evaluation of Youth
Radio's Innovation Lab**

Authors: Alex Gurn, Kristin Bass &
Julia Hazer, *Rockman et al*

Funding provided by the National
Science Foundation's Advancing
Informal STEM Learning (AISL) program

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Rockman et al, 2016

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This report represents three years of evaluation research by the team at Rockman et al, working in collaboration with Youth Radio, to reflect on the nature and impacts of data-rich journalism and transmedia production.

We would like to thank the National Science Foundation for its continued support of the research and development on this critical work. This project was made possible with funding from the Advancing Informal STEM Learning (AISL) program. As a result, Youth Radio's media products and Rockman et al's external evaluation are freely available to the public.

We are grateful to the many young people and STEM educators at Youth Radio who took time to pause from their media projects to reflect on the processes and products of this work.

We hope that this report helps inform public dialogue on the important role of youth media to advance policies and practices that nurture young people's capacities to systematically investigate their world, to examine issues impacting youth communities, and to develop creative responses to real-world problems.

Executive Summary

To explore the role and impact of Youth Radio's NEXT: The Innovation Lab, *Rockman et al*, an independent research and evaluation organization, conducted an external evaluation of the project. With funding from the National Science Foundation's Advancing Informal STEM Learning (AISL) program, the Innovation Lab sought to develop and research a scalable, evidence-informed theory of action to engage underrepresented youth in Science, Technology, Engineering, and Mathematics (STEM) learning through the collaborative creation and dissemination of original journalistic media, technology, and curriculum tools.

This report addresses key findings and questions that emerged from the evaluation and explores implications for informal STEM learning. The Innovation Lab established a mobile-first media lab to engage young people in storytelling that combines journalism, design, and code. This youth media work is grounded in three core strategies:

1. To engage youth in STEM media projects that respond to real-world, issues impacting diverse youth communities;
2. To enact "collegial pedagogy" that teams up STEM media professionals with youth to co-construct stories and technology for real audiences; and
3. To intentionally teach young people to produce media through a reiterative design-based approach that reflects science and engineering practices;

The study found ample evidence that Youth Radio's approach has resulted in the production of relevant, high-impact multi-modal media (e.g. interactive technology and data-rich journalism) for youth and adult audiences. Youth experienced enhanced learning about, interest in, and abilities to participate in STEM media production. Thus, youth participants became technology developers, as well as critical consumers. In addition, as a public media organization, Youth Radio engages youth and adult audiences to think deeply about social, political, and scientific issues from multiple youth perspectives.

This research illustrates how youth media making can encourage emerging and professional creatives to work together and negotiate roles through reiterative processes of ideation, research, and design of journalistic technology. The Innovation Lab suggests a set of media making strategies that cross cut science and engineering practices, which have the potential to promote dynamic learning for young people from groups historically marginalized from STEM fields and to challenge dominant narratives about youth.

Introduction: Youth Media in a Complex Digital World



Image: Youth Radio producers cover the 2016 presidential campaign

Young people growing up today in and out the United States must learn to navigate a digitally-mediated world of increasing complexity and contradiction. Over the past few decades, the rise of “fragmented globalized capitalism” has created, on the one hand, structured opportunities for those already in power to accumulate capital and on the other, structured exclusions for those on the outside (Katz, 2008). The disparities between the rich and poor in the U.S. have grown larger and faster than in any other advanced economy in the world (Stiglitz, 2012).

These disproportionate concentrations of wealth and privilege reflect historical patterns of marginalization and power that intersect with labels of race, ethnicity,

gender, class, sexual orientation, and language identity.

People’s access to the technological advances of globalization continually shapes one’s social and material practices. New technologies are altering the basic expectations and opportunities presented in the media landscape. At the same time, massive transnational migrations of populations have resulted in increasing amounts and degrees of linguistic and ethnic diversity in cities and towns across the U.S. In this way, most young people’s worlds can be seen as widening on a global level and expanding on the local level.

The ubiquity of digital technology and rapid expansion in the use of data across all sectors of the economy has reshaped the everyday realities around communication, education, work, and community life.

For access to this evolving multi-modal media scape, we the technology users regularly grant companies access to collect, mine, and ultimately commodify the varied and growing forms of data about our mobile online activities, gps-tracked movements, and consumption habits. To navigate these new spaces, young people must develop critical understanding of the social conditions

and tools afforded by data-structured environments.

Handheld mobile devices let young and old people access countless interactive apps to distract oneself, to learn, and perform a range of activities, from banking, shopping, and doing business to creating art, publishing, or engaging in citizen journalism. New technologies create opportunities for youth organizations to leverage digital tools for creative youth expression and social change.

Youth Radio confronts these multiple intersecting forces that render both obstacles and possibilities in designing. The rapid spread of technology has created openings for the public to access new tools of interactivity and creativity. As more technological tools become available and within reach of more people, our essential means of communication and identity-making are in flux (Cope & Kalantzis, 2009; Ito et al, 2010).

The presence of digital media and technology in young people's lives is often taken for granted. Social media, online gaming, online music and video sharing, and smart phones play central roles in shaping youth identities. Although digital media and technologies are widespread, young people do not have equal access to the devices or the social interactions and learning required to harness technology's possibilities. In other words, consuming media does not automatically lead to the ability to critically analyze or produce media for specific purposes. These are requisite skills for anyone aiming to participate

in the technological revolution, let alone pursue an education or career in Science, Technology, Engineering, and Mathematics (STEM).

While careers in STEM fields are projected to grow almost 20% between 2008 and 2018, youth of color are markedly underrepresented in these career pathways (Langdon, et al, 2011). Although there are plentiful STEM opportunities in the Bay Area and nationally, young people from poor and minority communities face significant structural barriers, as well as social-emotional factors that inhibit prospects (Margolis et al., 2008).

Recognizing the gravity of these demands, Youth Radio seeks to apprentice historically underrepresented youth into more full and equitable participation in civic and professional spheres. Youth Radio consciously works to develop young people's capacities as researchers, writers, and designers of data-rich investigative journalism and multi-media productions. Youth take on leading roles as creators of news media and technology, to critically analyze, respond to, and rethink their everyday worlds.

For over a decade, with the support of National Science Foundation (NSF) funding, Youth Radio has been working to develop and study its STEM-cognate initiatives, continually revising its programs in light of emerging technologies and reaching more broadly into the STEM education community. Previous grants built staff members' capacity for app development and STEM journalism,

and empowered a community of young people to create science stories with and about technology. Through its *NEXT: The Innovation Lab* grant, Youth Radio staff sought to expand its production model internally while developing and distributing its own online educational resources.

This report examines the processes, products, and implications of Youth Radio's informal STEM pedagogy, presenting research and theory on

youth media production that combines journalism, design, and coding. By considering the context of STEM teaching and learning at Youth Radio, and assessing the impact Youth Radio's STEM media on youth and adult audiences, we invite you the reader to ponder what it takes for media professionals to collaborate with young people on mobile-first storytelling, and what happens when they do.

Organization of the Report

The remainder of this report is broken into four parts. First, we provide an overview of Youth Radio's programming and this NSF-funded collaborative research project, *NEXT: The Innovation Lab*. This is followed by an overview of the evaluation study.

Next, we discuss of the evaluation findings, presented in three sections. The first two sections focus on inward-looking findings about Youth Radio's (a) implementation of STEM pedagogical practices and (b) impacts on youth knowledge, attitudes, and skills in related to STEM media production.

Subsequently, we present outward-looking findings that consider the potential impacts of the Innovation Lab's STEM media products on external audiences. The conclusion reflects on the implications of Youth Radio's work for advancing informal science with young people in diverse settings.

Youth Radio's Innovation Lab

The NEXT project supported research and development on collegial STEM pedagogy that combines journalism, storytelling, and multi-modal media production with young people.

Youth Radio Overview

Youth Radio (Oakland, CA) is a nonprofit community-based media organization where young people, 14 to 24 years of age, are invited to apply and engage in collaborative, hands-on, and mentored learning experiences as journalists and creators of media and technology. This professional learning community utilizes ethnographic and participatory approaches to design and research media making among youth producers and professional storytellers, artists, and educators of data-rich media.

At Youth Radio, young people volunteer to take courses, and after 6-months of unpaid professional development, can begin to engage in paid professional internships two to four times per week after school at the organization's downtown Oakland office.

Image: Interactive department featured on local news. Courtesy of Youth Radio.



Young people first go through an introductory media education course, organized around a weekly live show, in which they produce personal commentaries, news stories, public service announcements, discussion panels, photography, video, and social media campaigns. After this intro course, youth can select a 3-month specialized track, such as journalism, music production, and visual arts. Afterwards, youth can apply for paid internships on 3-month intervals in one of Youth Radio's departments to hone skills in a professional specialization, including but not limited to the Innovation Lab. On average, approximately 70 young people participate in Youth Radio internships each quarter. After each 3-month session, youth can apply to the same department or seek out another learning opportunity in a different department. When youth producers stay after turning 18, they are eligible to become project associates, a paid 6-month position that entails increased leadership and responsibility.

Through these mentored, work-based learning experiences, youth create news stories, digital interactives, and mobile apps that periodically get distributed by partnering media organizations, such as KQED, NPR, and Huffington Post.

The Innovation Lab

With a three-year grant award from the National Science Foundation's (NSF) Advancing Informal STEM Learning (AISL) program, Youth Radio launched its *Innovation Lab*. The project aimed to develop and research an evidence-informed theory of action to engage underrepresented youth in STEM learning through the creative production and dissemination of original media, technology, and curriculum tools. These media products aimed to inform real audiences through socially-conscious stories that affect and are affected by youth communities.

Rockman et al, an independent research and evaluation organization, conducted the external evaluation of NEXT to assess progress and offer recommendations towards the project's goals that included:

1. Developing mobile apps and other technology that collect, communicate, and invite users to engage with data in powerful ways (Interactive department);
2. Producing news stories that are rendered more dynamic, and impactful as a result of being integrated with apps and interactive media (Newsroom); and
3. Creating educator resources that individuals and institutions beyond Youth Radio can use to engage young people in innovative media production (Curriculum)

The NEXT project brought together Youth Radio's newsroom and app development programs to develop youth-driven stories, digital tools, and curricular resources that integrate multiple technologies and journalism. NEXT also became a pilot to explore scaling Youth Radio's programming to other youth-serving organizations through the creation of new media and educator resources.

In addition, NEXT was part of the first cohort of NSF AISL grantees to be asked to explicitly build research into the project. While the organization has engaged in participatory and ethnographic research for years, Youth Radio created a new level of inquiry by establishing a Researcher-in-Residence, through a partnership with Professor Cliff Lee of St. Mary's College of Education. Dr. Lee spends time weekly engaged in researching and teaching youth media.

In this project, Youth Radio explicitly built on knowledge and practices developed through its two previous NSF initiatives: *The Science and Technology Program* and *DO IT!* (Bass & Bandy, 2009; Hazer & Bass, 2014). These long-term efforts resulted in a) expanded opportunities for young reporters to produce investigative stories in partnership with university and media professionals, and b) established a space for mobile app development where young people could design and create technology. Prior evaluations have found ample evidence that program leaders approached the matter of informal science teaching through a lens of continuous

improvement and learning, building on and accumulating organizational and cultural resources.

By integrating STEM learning into its existing approach to journalistic media production, Youth Radio effectively made science and technology content more appealing, accessible, and personally-relevant to young people from historically marginalized groups. Youth producers learned STEM concepts and skills, such as coding and design, through app development. They experienced increased interest and confidence in

STEM. They developed a variety of soft skills, such as, how to communicate and collaborate with peers and professionals, project management, and critical thinking. One of the key enabling factors of success was intentionally “helping young people see that STEM was as much about process as it was about content – that science and technology were not just nouns, but verbs” (Hazer & Bass, 2014, p. 76). Over time, Youth Radio has developed foundational knowledge of hands-on, collaborative approaches to creative STEM learning.

Theory of Change

Through its NEXT project, Youth Radio sought to design, implement, and study a mobile-first media lab, which engaged youth from diverse backgrounds in storytelling that combined journalism, design, and code. The project was grounded in a theory of change that assumed IF Youth Radio:

1. engages young people in STEM media projects that respond to real-world, issues impacting diverse youth communities;
2. utilizes “collegial pedagogy” to team up STEM media professionals with youth in co-constructing stories and technology for real audiences; and
3. intentionally teaches young people to create media through a reiterative design-based approach that reflects science and engineering practices;

THEN, this would result in:

- a. production of relevant, high-impact multi-modal media (e.g. interactive technology and data-rich journalism) for youth and adult audiences;
- b. enhancement of youth learning about, interest in, and abilities to participate in STEM media production, thus becoming technology developers, not just users; and
- c. communication with and engagement of youth and adult audiences, including formal and informal educators, to think deeply about social, political, and scientific issues from multiple youth perspectives.

Evaluation Overview

In exploring multi-platform media production and STEM learning with young people at Youth Radio, this study drew on formative and summative evaluation, so as to offer practical feedback on program practices, understand what youth gained, and investigate the influence of youth-created, data-rich media on external audiences.



Source: Image courtesy of Youth Radio

In its ongoing evaluation research of informal science learning at Youth Radio, *Rockman et al* (Rockman) conducted the external evaluation of NEXT. This evaluation examined the effects of the program and its multi-media products on the skills, knowledge, and

attitudes that young adults need to produce and communicate STEM content through original media products, such as interactive websites, mobile apps, and journalistic stories. Rockman has served as Youth Radio's external evaluator and a "critical friend" on its research agenda for the past decade.

The main aims of Rockman's evaluation of the NEXT project were:

- ◆ to study the implementation and impact on STEM media production knowledge, skills and attitudes of a theory of change to engage underrepresented youth in STEM content through multi-media projects that combined digital app development and journalism, and
- ◆ to document progress and provide formative feedback towards the project's goals.

Evaluation activities included internal- and external-facing elements. First, Rockman explored informal science learning among youth collaborating with STEM professionals in the creation of community-relevant media. Later, Rockman turned its attention to explore the potential effects of the youth-created media on youth, educators, and other audiences outside of Youth Radio.

Key evaluation questions included:

1. What conditions need to be in place to successfully engage underrepresented young people in the creation of STEM-rich apps and digital media?
2. What skills, knowledge, and attitudes do young people acquire as a result of collaborating on the production of STEM-rich media projects?
3. What impact do the media projects have on external audiences, including formal and informal educators?

This report highlights key findings and new questions that emerged from the evaluation and explores implications for informal STEM learning.

Evaluation Methods

To address the evaluation questions above, we first sought to document how the NEXT initiative was being implemented and assess its impacts on young people's skills, knowledge and attitudes related to STEM. In subsequent years, we examined the impact of NEXT's media products on educators, youth, and adult users of the STEM-rich news stories, mobile apps, and curriculum resources.

The evaluation leveraged research instruments established in Youth Radio's past NSF grants. In order to minimize the burden on youth participants and staff, Rockman worked closely with the research and evaluation staff at Youth Radio to develop research protocols and constructs. The result is a co-construction of evaluation instruments, and sharing of raw data and interpretive frameworks. However, Rockman evaluators analyzed and reported on the data independent of the internal research team in order to provide alternate perspectives and ensure the trustworthiness and responsiveness of interpretations.

Data Collection

The evaluation employed multiple data collection methods to provide numerous viewpoints on the progress and outcomes of the project. For instance, findings from focus groups and extended interviews were combined with program observations and analyses of artifacts. These methods enabled evaluators to track

changes in participants' understanding of the processes involved in media creation, as well changes in knowledge and skills needed to design, develop, and launch a mobile app or data-rich story (e.g. pitch ideas; conduct market research; apply principles of design; use computational tools like App Inventor, HTML, CSS or JavaScript; incorporate feedback from users, peers, and professionals).



Source: Image courtesy of Youth Radio

Inward-facing evaluation activities included:

- *Youth Focus Groups & Interviews:* Each year, a portion of youth producers from YRI, Newsroom, and Curriculum Development groups participated in small group or one-on-one interviews to discuss what they were learning, doing and producing at Youth Radio, their thoughts on the programs and how they could be improved, and their attitudes toward and interest in science and technology.
- *Staff Interviews* – Youth Radio staff directly involved with youth

as part of NEXT program were interviewed about their experiences with and feedback about the program, as well as observed impacts that the program has had on students.

- *Observations:* Researchers observed classes, activities, and events that were part of the NEXT program to witness the process of skills development and product creation. Observation varied from passive to participant observation, depending on the nature of the activity.
- *Youth Surveys:* Youth completed regular surveys about their interest, knowledge, and attitudes toward science and technology, and skills they learned. The survey was integrated into internal formative assessment of youth development that informed ongoing program decisions.

Outward-facing evaluation activities included:

- *Audience Focus Groups:* Researchers conducted four focus group sessions (two youth groups and two adult groups) with the target audiences for the mobile apps, interactive websites, and multimedia news stories. Potential respondents completed a screening survey about their demographics, use of apps, and interest in and awareness of specific STEM content. Those selected used an app, read and listened to news stories, and provided feedback on the

products' content and appeal, as well as proximal changes in knowledge and interest in the subject matter.

- *Educator & Student Surveys, Interviews, and Observations:* Educators who implemented the curriculum toolkits took surveys about their background and experience with app production and youth media education, their use of the curriculum, and any adaptations they made to the materials. Students completed surveys about their interest and knowledge in media production; what they learned; and their reactions to the curricular resources

Co-development of Instruments

Evaluators developed research instruments using a systematic, iterative process of construct identification, question creation, and instrument review (Wilson, 2005).

When possible, evaluators used items from published instruments and related resources, as well as measures created for prior Youth Radio evaluations. Staff reflections on evaluations from prior NSF grants suggested that standardized science attitude measures did not accurately represent the voices and understanding of the youth in their programs. Combined with growing concern that existing measures have inconsistent validity and reliability with ethnically and socioeconomically diverse populations (Weinburgh &

Steele, 2000), Youth Radio and Rockman researchers chose to focus evaluation reporting on qualitative data collected on program activities. All evaluation instruments followed similar construction and vetting processes. We drew on measures previously developed with the organization and worked closely with Youth Radio to develop alternate perspectives on items and constructs.



Source: Image courtesy of justgrimes via

Data Analysis

The purpose of our analysis was to create structure to make sense out of the multiple data. The study sought to understand STEM learning and youth media production through “an interpretive, naturalistic approach to the world...attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, 2000, p.3). We sought a holistic approach

towards data analysis that could respond to the complexity of the social contexts that influence Youth Radio’s work.

Rockman conducted analysis appropriate for the data collected in order to better understand and reflect on the social-educational patterns, and practices as an interested external observer and long-term critical friend. Qualitative analyses were performed using Grounded Theory (Strauss and Corbin, 1990) as a means of generating a theory that is reflective of the data. Evaluators simultaneously collected and analyzed all artifact data and qualitative survey data, created analytic codes and categories developed solely from the data, discovered basic social processes within the data, performed inductive constructions of any abstract categories, and integrated all categories into a theoretical framework. In addition, evaluators compared the data generated in the study to relevant science education frameworks, such as the engineering design and technology practices from the National Research Council (2012) and Next Generation Science Standards (2013), as well as to results of prior internal and external research on Youth Radio to position the current observations and analysis in a broader context.

Looking In: Implementation

*Collegial Pedagogy of
STEM Media Storytelling*

Program Implementation: Producing STEM Stories that Matter

"[The Innovation Lab] has a unique approach to journalism. It makes our stories much more relevant to users who are using technology. Reading is never going to go away but you can communicate a message much more effectively if someone is participating in the story." (Youth Producer)

The NEXT project launched The Innovation Lab at Youth Radio as a formal partnership with MIT (Massachusetts Institute of Technology) Media Lab's Center for Mobile Learning. The spirit of this collaborative research grew out of three core assumptions about youth and media:

-  Young people should be the creators of technology, in addition to conscious consumers and users of technology;
-  Young people should be active agents in generating theories and knowledge on youth communities, and not mere objects of inquiry for social science research; and
-  Young people should tell stories with social purpose across platforms.

According to Youth Radio Research Director Dr. Lissa Soep, NEXT created a viable means for the organization to design and research pedagogical approaches to engage culturally diverse young people in community-oriented, mobile-first storytelling that combines journalism, coding, and data.

In effect, Youth Radio's approach to youth media production disrupted long-held professional practices in public media that continue to privilege broadcast over digital or mobile platforms. Responding to the realities of readily-accessible innovations in technology and the salience of digital media in youth lives, this project looked to build the capacities of youth and adult collaborators to integrate these platforms to tell high impact stories from youth perspectives.

Ideally, says Dr. Soep, the Innovation Lab draws on "the best practices that we have for preparing young people in journalism and preparing young people to be creators of technology, in order to tell stories that matter." The focus on blending modes of media has allowed Youth Radio to approach pressing issues, such as gentrification, the juvenile justice system, and teen depression, through multiple pathways that leverage the communication potential contained within different platforms and tools.

These efforts were supported by the applied ethnographic research of Youth Radio's scholar-in-residence, a new position established through the NEXT project. In this role, Professor Cliff Lee, St. Mary's College of

California, navigated between a dual function as outside observer and participating STEM educator. Lissa Soep explained the unique aspects of this role. “He’s not just an objective observer. He is part of the story, participating in advancing the curriculum while studying it.” Youth Radio wanted someone who could code switch to play different professional roles. They sought an academic with expertise in teaching and learning alongside young people. In this multi-dimensional role, Dr. Lee must maintain a high level of independence and research rigor while, at the same time, having stake in the success of the work.

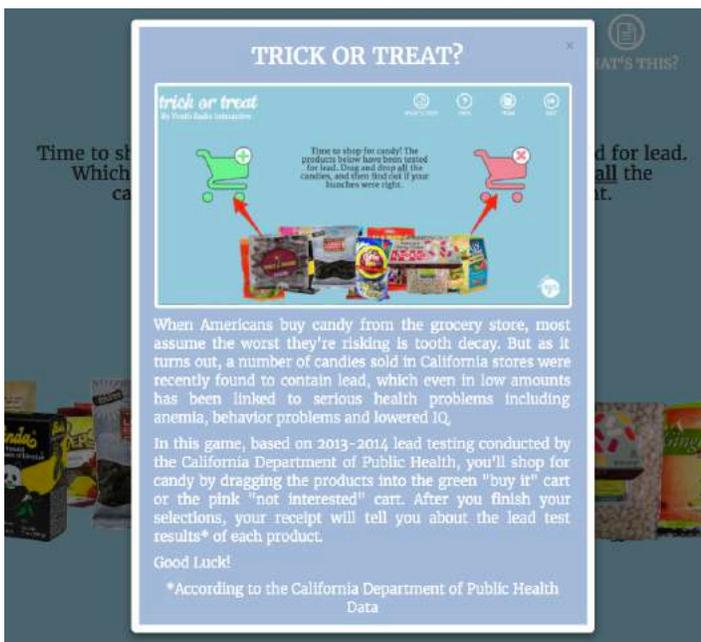
This shift in Youth Radio’s work has altered the workflow from its previous concentration on creating stories primarily for broadcast news media. As we will see below, investigative news stories have led to the development of interactive apps that can convey messages in different ways than possible through broadcast alone. Sometimes, a mobile app has sparked investigative journalism.

In this way, like other media organizations, Youth Radio has engaged in re-imagining what counts as journalism in the modern day so as to explore social issues using multiple modes of communication. Youth Radio aims to reach different and new audiences using a combination of traditional and emerging methods of storytelling.

At the same time, creating stories and technology across different platforms broadened what was necessary and what was possible in terms of teaching and learning with new and old forms of journalism and media. Educators at Youth Radio had to adopt and adapt new instructional practices. They were pushed to reconsider what it takes to produce stories and technology with youth. What pedagogical conditions are necessary to engage young people in dynamic learning through the creation of STEM-rich media? Before delving into informal STEM pedagogy, we describe some of the data-rich stories and technology products developed as part of the NEXT program. Then, we discuss the iterative development processes undertaken to create data-rich media.

What Counts as STEM Media?

Before examining the nature and impacts of Youth Radio’s youth media production, we outline a sample of news stories and mobile & web-based apps published by The Innovation Lab (see Figures 1-2). Some of these works directly investigate specific



Source: Screenshot of ‘Trick or Treat’ web interactive

STEM topics. For instance, two youth producers explained:

"I'm working on [a story] now about the roots of empathy, this program that brings babies into classrooms to teach kids empathy. So the science aspect of that story is a neurological perspective on how empathy gets triggered and created in the brain. So I talked to a neurologist."

"I'm working on a story about toxicity and lead in candy...about poisonous chemicals inside of candy...we have apps connected to [the story] and a lot of research from the CEH [Center for Environmental Health]."

For other products, youth utilize technology, integrate quantitative and qualitative data, and employ science and engineering practices to create more engaging media.

At Youth Radio, a STEM-rich project is foremost realized through the

incorporation of multiple forms of data, the integration of new technologies, and the application of social science research techniques to investigate and promote youth-driven inquiry, design-based thinking, and storytelling.

During year one, the Innovation Lab created 6 stand-alone mobile apps and began developing 3 apps based on investigative stories produced in the Newsroom. In year two, the youth team created 6 mobile apps and interactives, most of which drew on newsroom media stories. In year three, the Innovation Lab published 6 mobile apps and interactives, and prototyped four media products. All of these apps and interactives were inspired by or led to journalism in Youth Radio's Newsroom. In addition, the Newsroom produced STEM-rich news stories for local and national media outlets, such as NPR, KQED, Huffington, The Atlantic, and Medium.

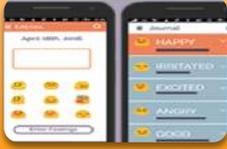
Left: NPR & Youth Radio tour Oakland during co-production of Morning Edition. Right: Screenshot of 'Oaktown' interactive that explores gentrification through place-based storytelling.



Figure 1: Sample of Innovation Lab's published mobile apps and interactives. Available at: <http://youthradio.org/yri/>



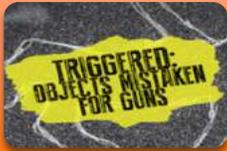
West Side Stories & Oaktown: Two interactive maps of gentrification in Oakland that include audio interviews with residents, documentary video, written posts, and artwork to examine the complex and contradictory impacts of rapid neighborhood change. The project was featured in The Atlantic, on public radio, and other outlets.



Mood Ring: A mobile app designed to help users track and reflect on how their emotions each day using emojis, to find resources, and to reach out for support from their peers. Development of the app and the problem of teen depression was featured on NPR's Morning Edition.



#5DollarChallenge: A web-based interactive that invites users to share meals they find in their neighborhood for \$5 or less. Data for the interactive were collected using Instagram and Twitter. The project was featured on NPR.org and local Bay Area public radio stations as part of a series on the future of fast food.



Triggered: A web interactive, linked to Youth Radio's coverage of youth relations with law enforcement, that explores data from 13 cases where someone was shot by a police officer who mistook an object that the person was carrying for a gun.



Double Charged: As part of multi-year investigation of the hidden costs of juvenile detention, this web interactive invites users to explore three scenarios in which families are charged a series of court-related fees for their child's alleged crimes.



Bucket Hustle – a mobile game, linked to coverage of the historic California drought, that quizzes players on knowledge of the drought through a series of questions they have to answer while racing to catch water droplets from the sky.



Know Your Props: A website that presents information on complex voter ballot initiatives in youth-friendly terms designed to assist first-time voters in making informed decisions.



Run for Prez: Mobile app, connected to 2016 presidential election, aimed at raising young people's interest in and understanding of politics. Players "race" against an opponent to the White House, answering questions about the presidential campaigns and the electoral process.

Figure 2: Sample of Innovation Lab's published news stories. Available at: <https://youthradio.org/category/journalism/>



Oaktown: Linked to *Oaktown* web interactive, in special co-production of NPR's Morning Edition, Youth Radio producers covered the local consequences of gentrification across the city in a tour of West Oakland with David Green and an interview with a public librarian and historian.



Smiling on the Outside: Teens Hide Depression: Developed in conjunction with the *Mood Ring* app, this story, which aired on NPR's Morning Edition, looks at the issue of teen depression, which led YRI to create *Mood Ring*.



2016 Presidential Campaign Coverage: Youth reporters provided on-the-ground analysis of the Democratic and Republican conventions and the presidential campaign. YRI released the related Run for Prez mobile app prior to the election.



Fast Food Scramble: Connected to the launch of *#5DollarChallenge*, Youth Radio teamed up with NPR to develop stories about the changing fast food industry and engaged audience members in sharing their own stories and data for map of people's food behaviors



Triggered: As part of multi-year investigation in youth-police relations, and linked to Triggered app, youth reporters developed written and audio pieces on the shootings of Michael Brown and Eric Garner, BlackLivesMatter movement, and opportunities for youth-community dialogue.



Unlocked: As part of a multi-year examination of the juvenile justice system, the newsroom developed four investigative stories on juvenile hall, incarceration alternatives, and probation reform that compliment the *Double Charged* interactive.



California Drought: Linked to the *Bucket Hustle* web interactive, youth producers developed multiple environmental stories about the consequences of California's historic drought.



A Teenager's View of Education Technology: EdTech holds promise in the classroom. However, youth perspectives on technology often go unheard. This article offers insights and "for those EdTech enthusiasts out there, the truth may hurt."

Collegial Pedagogy of STEM

We now consider the pedagogical conditions that Youth Radio educators have established and continue to negotiate within this small learning community. Our exploration begins with an understanding of the organization's evolving philosophy of "collegial pedagogy," a research-based theory of action about conducting socially- and politically-conscious storytelling with youth (Soep & Chavéz, 2005; 2010). This approach starts with the assumption that constructive teaching and learning "starts where the young people are" (Soep, & Chavéz, 2005, p. 410). In the words of one youth producer:

"Youth Radio meets us where we're at...it doesn't expect you to fit a certain mold when you walk through the door. It works with the skills that you have. It works with the interests that you have. And it pairs you with people who have been doing professional work for their careers. These are your mentors. It's ok to talk to them about your work and your life."

This collegiality calls for educators to continually build upon the resources that young people bring to the table. Drawing on diverse youth linguistic and cultural practices means doing social inquiry and making media that reflects the stories and voices of youth and their communities.

Whether developing a podcast commentary or designing a mobile

game, final published works are held to high professional standards. However, instructors do not expect that anyone enters the program, or begins an internship, with the full range of technical and soft skills needed to pull off producing polished media products that are ready for publication. Instead, there is an abiding belief that every learner possesses the creative and critical capacity to innovate. It is the job of Youth Radio educators to cultivate learning environments that front load youth voices, stories, and questions and that put young people in dialogue and participatory action with experienced professional media makers, journalists, and educators.

Enacting collegial pedagogy entails ongoing negotiation and sharing of ideas and responsibilities for designing stories and technology that promote diverse voices on social issues affecting youth communities. The young people understand that there is no single creative path one must follow to design purposeful media for real audiences (although there are specific iterative processes, described below). The learning journey starts with youth interests and existing knowledge, and builds new experiences from there.

Language and learning are intricately connected to our histories, life experiences, and sense of self. At the Innovation Lab, tapping into young people's "funds of knowledge" (Moll, Amanti, Neff, &

Gonzalez, 1992) is a key learning condition applied to develop their emerging professional skills and mindsets as data-informed storytellers and media producers. Throughout this report, we will see how Youth Radio's learning environment encourages multi-perspectival thinking and ongoing negotiation between culturally diverse youth and adult discourses.

Young people are invited to draw on their interests and questions, their social-cultural resources, and sense of self in the world, as the basis for designing media. In turn, this mentored, collaborative work sharpens young people's capabilities of getting to know the world through inquiry and interactive storytelling. In this way, youth empowerment comes not by relying solely on youth experiences, but by helping young people see themselves in the learning process and products and to wield tools that have the potential to transform their social and material contexts into pedagogical resources.

The Innovation Lab started with a commitment to produce youth-driven, data-rich journalism and media, which critically explores real world issues from multiple perspectives and draws creatively on multiple sources of data.

Source: Image courtesy of Youth Radio

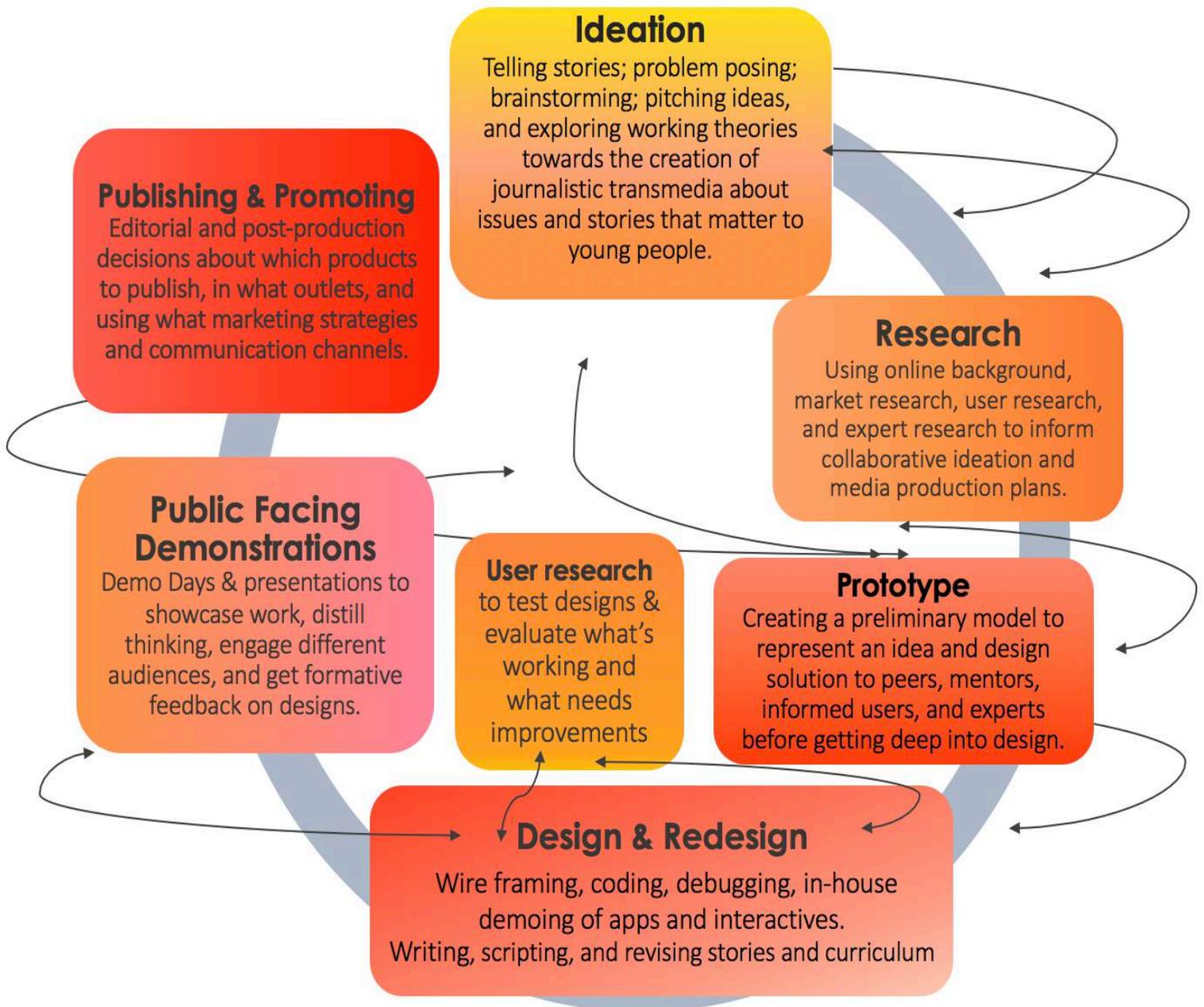


Media Production & STEM Practices

Innovation Lab interns learn to apply the core principles of Youth's Radio's social inquiry approach to tell stories, mix media, and create technology that are answerable to culturally and linguistically diverse youth communities in and beyond Oakland, CA. In producing media, young people collaborated with adult professionals and peers and engaged in iterative design processes that typically included ideation, research, design, and prototyping (Figure 4).

While the particular media products and the nature of the creative processes differ slightly across departments, the design process follows a similar pattern regardless of the product. When production teams engage in this design process, there is rarely if ever a linear progression of steps. These are not understood as a rigid or linear process, but as core practices and guidelines for envisioning and producing data-rich journalistic media. The stages regularly intersect and overlap and may in fact proceed in different order than the figure below implies. The particular workflow must be developed to suit the design context and needs of each group.

Figure 3: Youth Radio's Iterative Cycle of Media Production



For instance, after conducting market research, a team may need to return to ideation because their envisioned app already exists. Likewise, an interview with a content expert may reveal a problematic app function or something missing, sending a team back to the drawing board. The media production teams continually learn to engage and apply systematic processes that relate to the scientific and engineering practices reflected in the Next Generation Science Standards (NGSS). These STEM practices represent strategies to engage in scientific inquiry. They encompass the essential means through which scientists and engineers investigate and make sense of the social and material world. Figure 5 below depicts overlap between NGSS' STEM practices and Youth Radio's stages in the media design cycle.

In the following section, we illustrate Youth Radio's media design cycle with young people's retrospective comments on each stage of the production process. In addition, we highlight pedagogical moves made by the instructors and young people during the ideation and research phases of a mobile app. We define pedagogical moves to be verbal and nonverbal actions used to promote or shape the learning activity or interaction. Examples of pedagogical moves include an educator's use of open or closed questions, overt instruction or lecturing, think alouds, and modeling behaviors. We aim to explore the ways that Youth Radio educators support young people in carrying out STEM inquiry by drawing linkages between youth life experiences and STEM practices in the context of media making.

Figure 4: NGSS Scientific & Engineering Practices in Action

<i>NGSS STEM Practices</i>	<i>Youth Radio's Media Design Cycle</i>
Asking questions and defining problems	Ideation; Research; Design
Planning and carrying out investigations	Research
Developing and using models	Prototype
Analyzing and interpreting data	Research; Design
Using mathematics and computational thinking	Research; Design
Constructing explanations and designing solutions	Ideation; Research; Design
Engaging in argument from evidence	Research; Design
Obtaining, evaluating, and communicating information	Ideation; Research; Design; Demos; Publishing



Interactive



Source: YRI workspace wall. Image courtesy of Youth Radio

Developing Mobile Apps and Web Interactives

Prior to involvement with Youth Radio Interactive (YRI), most youth interns in the first two years of the Innovation Lab had no experience developing mobile- or web-based apps. By year three, more young people came in with some prior coding and design experience and youth repeating internships. This meant that YRI interns had prior experience and thus could build on knowledge gained in previous sessions and continue work on long-term media projects.

During meetings three times a week, YRI interns learned about the conceptual and technological elements of app creation. One intern summed up the process of developing apps below, touching on the elements of idea generation, design, and coding:

The first thing...you have to come up with an idea, a concept, and a purpose for your app. Then you begin to theorize...You can start drawing the interface and...coming up with a very basic idea of how your app is going to function and some standard information and replacing it with functions...But before you code...depending on who you're working with, if you work with anyone at all, you will coincide with them and what they think. Then you deliberate based on what your drawings are and your ideas. Then once you come to a consensus you can code."

Young people generated ideas for their apps as a team or received suggestions from members of the Newsroom. Regardless of the source of their ideas, the interns identified a problem or issue they wanted to address and a clear purpose for the product. They paid attention to align the app's message and target audience, drawing on market research on existing apps, user research on a prototype, and design trends. The interns used coding languages and tools to build the apps, including App Inventor, HTML, CSS, JavaScript, SQL, Python, Sublime Text 2, and Photoshop.



Ideation: STEM Pedagogy in Action

In this teaching spotlight, we examine the instructional context of app ideation at an early stage in the process. Using transcripts of interactions between youth and adult staff in YRI, we aim to highlight pedagogical moves that supported youth to ask questions and define problems during the development of *Moving Out*, a mobile app designed to help young people understand and plan for the process and costs associated with getting one's own apartment. We enter in the midst of a brainstorming discussion to identify questions and issues that the young people can explore and address through an app.

Instructor 1: How can I live on my own, move out? Do I get a dorm room or get an apartment? Right? So what's another question? What do you want to know about?

Youth 1: How to take care of a house, pay bills, what are the...

Instructor 2: Do you mean how to pay bills?

Youth 1: Like mortgage and all of that.

Youth 2: I think he means like how to find a home.

Youth 3: Ya'll thinking about that already?

Youth 1: How to budget.

Youth 2: Okay, say you get the apartment, how do you manage all your money?

Youth 1: All the process.

Instructor 2: Oh, like how do you even get a place?

Youth 2: Me and my friend was looking for an apartment to rent together and they told us that we need to be making at least three times the rent...What the hell?

Instructor 2: Yes, that's pretty typical what they said. If you are trying to get a \$1000/month place your income should be at least three thousand.

Youth 3: Damn! A year?

Instructor 2: No, a month... They want to make sure that you're going to be able to afford to pay for this apartment. If you only make \$2000 or \$1500 a month and you're trying to rent this, they're like, "How are you going to live?"

Youth 2: But you also need your lights on. You also need your cell phone.

Instructor 2: So this goes back to adulthood. Right?

Youth 1: That's exactly what I'm talking about. Where is that?

Youth 2: I want to hear more stories about how people survive. How do you get to that level?

In this excerpt, we see how young people's questions and life experiences form the basis of instructional exchanges. Youth Radio instructors help to tease out meanings, offer their own interpretations, and provide structure to transform youth cultural practices into researchable issues that can be addressed through a novel app. Adults investigate alongside youth. They do not predetermine a project's focus, nor do they expect youth to generate a meaningful app idea without support. The initial ideation process may take a week or more to etch out the core problem or issue. However, in later stages, the team will continue to hone this central purpose, for instance, as they develop deeper understanding of the parameters of the problem and its impact on other youth (content and user research), as well what digital tools currently exist to address the problem with specific audiences (market research).

Ideation

App ideas came from a variety of sources to fulfill a variety of purposes. For the mobile apps and interactives associated with the Newsroom's stories, the youth were assigned projects based on the stories on which the Newsroom was working. The intern, below, describes this inter-departmental ideation for two apps: *Fines and Fees* (now called *Double Charged*), which examines the financial costs and debt incurred to youth and families in the juvenile justice system, and *Toxic Candy Guessing Game* (now called *Trick or Treat*), which looks at the presence of lead in candy. Both of these web interactives grew out of long-term investigative reporting at Youth Radio.

"We were given the ideas based on the stories that the journalism department had already done. That's where we got [Double Charged] idea from and that's where we got the Toxic Candy app from. So it was assigned."

However, for other products, such as the Youth Radio app, which allows users to configure and personalize how they interact with Youth Radio's media products, the YRI team generated the idea on their own and chose to work on it. The app was a personal response to a larger community need.

Research

Once the young people had the basic app idea in hand, they conducted various forms of research

to inform its design and development. One intern explained the difference between market and user research:

Market research is when you... research different projects that are similar to the idea that you came up with...Market research is looking at all the projects that [have] to do with those same types of characteristics and kind of rating your own opinion and getting ideas [for your own app]...User research is kind of like you're doing research based on some of the views or basically research on the user flows like the steps that users go through when they're using an app...the user experience.

In conducting market research, one youth detailed how the team gathered screenshots of existing apps to review and draw ideas for the apps they were creating.

We've done really long PowerPoints with...screenshots of different apps...We took screenshots and things how they like the interface, what style and colors they used and what the whole user experience was like.

Although the incorporation of research in media production is not new at Youth Radio, in recent years they have employed a more systematic focus on market research and the use of exiting and novel data to inform designs.



Research: STEM Pedagogy in Action

In this teaching spotlight, we take a closer look at the use of content research to inform the initial conception of the *Moving Out* app. This interaction picks up immediately following the brainstorming session described in the *Ideation* spotlight (See insert above).

Instructor 1: You've got a lot of amazing questions...I want you to continue to ask questions... Usually at this point I, we do user research. We go ask people. But I thought we'd take what [Researcher in Residence] suggested that we take one step back and do content research. So with a team...you're going to pick one of these questions...and do some research and find the answers or projects that are affecting the answers...Because how are you going to build an app if you don't even know what the content would be? Great apps look good, work well, and have something valuable inside of them, content, that's actually going to help. Because there's no point in having an app that looks really pretty that doesn't give you anything or do anything for you outside of maybe a game...
[Youth teams get a laptop and spend 20 minutes searching for information online]

Instructor 2: What did ya'll learn?

Youth 1: Some of the things we found, other costs [such as] moving fees, storage rentals, security deposit, application fees, parking fees...renter's insurance....

Youth 2: I read another site. I didn't write it down. I didn't go to another page and type but I was just reading it and...they say heat, water, electricity, air conditioning...

Instructor 2: And every place is different. Some will cover water. Some will cover heat.

Youth 2: Depends on where you're moving. If you got to pay for parking. Some people have garages. Credit reports. Sometimes they charge application fees...deposit...

[Back and forth discussion on varying amounts required for security deposit, as well as basic explanation of a security deposit, after one youth asks for a definition.]

Instructor 1: So based on this, just your initial ideas...what type of app or interactive do you think young people might need for their first apartment? For an 18 year old...or even for a 20-something year old in their first apartment.

Youth 2: A stable job.

Instructor 2: But what kind of app would you create to teach them?

Youth 1: Maybe something that has information on it...I feel like it could be an app that shows this stuff, something more simple...

Instructor 2: Almost like a check list?

Youth 1: Yes. Maybe like a check list.

Instructor 1: Maybe, have you asked about these things.

Youth 1: Something simple.

In this excerpt, the instructor transitions the team from posing questions on an issue they care about to conducting preliminary background research on their questions. The aim of this research—to begin cultivating “content that will actually help”—underscores a driving objective of YRI to develop technology that serves a clear social purpose. Seeing the various costs entailed in getting an apartment, the youth have clearer understanding of the problem and consider building an app that offers a checklist of things to consider. After multiple additional rounds of research, including market research on specific apps, the production team concluded that comparable apps were not suitable for youth because they cost money to use, required users to create accounts, presented information that was too complex for first-time apartment hunters, and did not inform users of the definitions of different terms.



Pitching: STEM Pedagogy in Action

In this spotlight, we take a look at the first time the Moving Out team formerly pitched the idea in-house for their app to help youth navigate the process of getting an apartment. Each team had 30 minutes to plan a 10-minute pitch, as practice for Demo Day, a public event that includes STEM professionals from the community. YRI instructors explained:

“Imagine you got funders and they want to see what ya’ll been working on. You want to try to sell them on things that are going well, what else you’ve still got to add... Say what are you making and why. Demo the app. What you have so far and how it works...What are your next steps? Then we’ll give you feedback...Be ready to present at 4:35. You guys should be working together. Figure out what you want to say. Who’s going to say what...”

Each team grabs a laptop and gets to work. In 30 minutes, they regroup to present.

Youth 1: We’re gonna demo our new video game called Moving Out... We’re building it to help young people apartment hunt and understand all the cost of moving out for the first time. If you don’t know certain cost and fees...it will help you understand more than what people actually show you or tell you... [Showing screen] So this is the first thing the user sees. Now I was thinking about a screen that says, Show Us the Knowledge... There’s going to be a question up here. And a picture related to the question... They pick the answer. If they pick the wrong one it’s going to be red. Then, what is the answer and why... We’re going to have a budget calculator...that’s going to rate your budget”

After each pitch, the young people share some self-analysis on their delivery and content and areas to improve the presentation, both individually and for the team overall. Then, the other youth producers provide feedback, followed by the instructors. The group addresses feedback on the apps’ content in a separate discussion, which requires reminding.

Instructor 1: ...I’d like you to tell us the rationale for the app...because people who are in the audience they don’t want to know just how to do it but they want to know what’s your thinking behind it... In the same way when [youth] jumped into the describing what it’s actually doing I wanted, as an outside person, they want to know why did you guys start with a quiz. Right? So just explain that part of it... You could start with something really engaging and then at the end kind of come full circle... And whatever is your key phrase or idea...say it multiple times so they don’t forget. This is what our app’s about. This is why it’s important. You’re kind of telling a story. Right?

Instructor 2: [Youth 1], you’ve done [pitching] before several times... I could tell you were doing it off the top of your head. Because you repeated yourself. And the second time you explained what the app did you did an excellent job. You started with what is the problem and then you gave the answer to the problem...

[Youth 2], I thought you did a good job of explaining all the pieces of the app...It is important to remember where’s your part stop and where does your part begin. That’s remarkably difficult... When you prepare, come up with your transitions...so that person knows, “When I hear this, I know it’s my turn.” Or if you’re like, “Now, [name] will explain this.” That’s going to help transition... Eye contact...As the first time doing just the easy pitch you guys got to work on your eye contact and not be staring at the phone.

Giving and receiving critique is a key part of coaching at YRI. In this exchange, they practice honing youth presentation skills before Demo Day. Instructors focus only on a few issues within the young people’s control. The presence of an external audience creates an authentic learning challenge and the feedback explicitly references possible audience interpretation.

Another youth producer describes how doing market research expanded the group's understanding about the social problem that their app, *Safe Space*, would address.

"We started with a challenge to identify a problem and then develop an app that could help solve the problem. We needed to tackle one problem but came upon two problems. Our first one, we noticed a lot of violence and discrimination against people in the LGBTQ community and that there is not a lot of information in the mainstream media about the laws that protect people in this community. Then through our market research, we looked into apps and websites that are available. We found a number of apps that can help people to stay safe. But most of the current apps are geared to women in particular and are focused on social networking."

The *Safe Space* team then conducted user research through youth surveys, learning that many LGBT youth experience discrimination but lack knowledge or tools to take steps to defend their rights. "Our takeaway was that there was a need to create an app that encourages people to take action to protect themselves and others in a

hostile situation," explained one youth producer.

The young people also noted that they used market research to find and repurpose snippets of code from the Internet for elements of their apps, such as a slider or fonts.

"We had a slider which we used... We got [the code for] it from the Internet and then we incorporated that into our design."

*"As a media organization, we have to verify all facts before we release an app. There a high standard we need to meet."
-Youth Radio instructor*

"I actually had to find the fonts which is sort of tedious because you have to through pages of fonts."

The youth teams also conduct interviews of content area experts to gain unique insight in a particular field. For instance, when developing *Mood Ring*, a mobile app that tracks users' emotions with emojis and

encourages them to reach out when they need help, the design team reached out to experienced mental health professionals to better understand the issue of depression and get feedback on the app idea.

During one interview, the team shared a plan to incorporate a feature into the app that would automatically generate a text message to someone on the user's friend list after a designated number of days s/he reported feeling sad or depressed. Although such a feature was logical and well-intentioned, the team's

research revealed that the app could in fact violate a person's privacy of protected health information. Without control over when and how a user communicates their personal data, the app would have unintentionally infringed on the user's privacy rights.

Background content research is a key stage when collaboration occurs between YRI and the Newsroom. In particular, newsroom interns assist fact checking information contained in the mobile apps and websites. As one instructor explained, "As a media organization, we have to verify all facts before we release an app. There is a high standard we need to meet." In contrast to many app developers, Youth Radio follows journalistic standards related to the trustworthiness of the claims and assertions in all media they produce. Since the Newsroom specializes in this type of research, YRI consults with them to help develop or substantiate the content.

Design

When designing their apps, the youth producers created wire frames or mockups of how the app would look and function, using programs such as Photoshop. Design included the look and feel, such as selecting appropriate colors for the app and determining user flow.

"The very first step was organizing what it would look like and what it would do and how it would function...doing a mockup. So we spent time on Photoshop thinking

about what it would look like, the background, the color of the text, the color of the background, what kind of colors would complement each other and the app...and the content."

"For the [Double Charged app]...I picked out the colors. I found a good color scheme... Then we came up with the format. The only information we were given is what's the story about, here are some simple structure stuff they want to implement. How it's going to flow and everything else was pretty much derived strictly from us."

The youth applied various design principles when planning their apps. They focused on their target audience and making their apps logical, easy-to-use, current, and with appealing fonts.

"I definitely think about the market and think about the attitude of the app, first of all what the story is about... Other things I incorporated...I consider a lot of simplicity...You want the right way to use apps or the easiest, most logical way to use it. So it is designed around the user."

"[For] the [app] design, we kind of base it off of what's popular and what's going on right now with designs in apps. For example, we used the update on the iOS 7. Now it's no longer all 3D looking and it's just flat, completely. So we used that as well in our app design. So

we had these shopping carts where you put the candies in the app and those shopping carts started off looking all 3D-ish... But then we got rid of that and made it just complete flat colors so as to match what's going on right now in design."

"A good font is easier on the eyes and more appealing...you have to find fonts that go well with each other...I consider the overall vibe of the app and it goes with the text. We wanted to limit ourselves...Basically from there it was a matter of what fonts go together, what looked natural, like made sense visually."

Coding

Coding is a key feature of YRI's media development. The team used various tools and languages when coding their apps. When writing code, first-time YRI interns often used an app development program created by MIT called *App Inventor* or a sophisticated text editor for coding called *Sublime Text 2*.

"When we started writing code, we started writing out just a regular text editor. It got really screwed, and your code would get all jingle jangled...Then we started using Sublime Text and it's color coded, it's marked up, it tells you by color what are the functions, what are your elements, what are the properties...It's designed for a code not just free range blank canvas. So it's extremely convenient."

The interns worked with *App Inventor* primarily as they first started out in YRI. One youth producer, during his second internship in YRI, compared *App Inventor* a floatation device for a child learning to swim, providing helpful supports while developing the conceptual understanding and technical skills to code.

While the tool's graphical interface allowed youth to build apps with limited knowledge of programming languages, they had mixed views of its usability and long-term value. The youth producers critically assessed the tools functions and limitations:

"App Inventor, I feel like it's got a lot of flaws because they're still designing it. But the reason I think it's cool and I stick with it is for its purpose and that's to get this technology and coding into more normal people's hands and give the power to everyone. That's kind of what I'm interested in. Personally, it's motivating because I want to see everyone using this technology for more useful reasons. So that's why I like App Inventor."

"I understand the purpose of App Inventor and I think it's important for us to add to it and everything. I think it's cool that we use it...But at the same time I think it's like honestly more beneficial for us to actually spend time learning programming languages because if you ever want to pursue a job or a career in computer science no one is ever going to ask you to do it in

App Inventor. That's just the truth of the matter."

Over time, many YRI participants learned to code in a number of languages including HTML, CSS, JavaScript, and Python. The youth found that encountering problems was a typical part of the development process.

"When you're writing code, you will come into problems, you will have problems. I don't care how good you are at making code you will have problems. It's going to break, and it's probably for the simplest little comma in the wrong place."

One example of a development problem that the youth encountered and remedied had to do with positioning icons:

"I remember the [Trick or Treat] app, we had an issue with positioning some of the icons at first on CSS...we were using...Boot Strap, something that [our supervisor] taught us. So we were learning how to use Boot Strap to position the icons correctly and it took a while but we got used to it...We were able to fix it."

Prototyping

At any given point, the apps may be at different stages of development. Earlier in the development process, youth teams test or demo their apps with other members of YRI or the Newsroom and with STEM professionals at MIT, The Innovation Lab's formal partner

"With the Youth Radio app, we tested it with the Newsroom and with MIT...we just talked through it with them".

During development, the YRI members collaborated and gathered feedback both internally and externally to Youth Radio. Internally, they worked with Youth Radio staff, other members of YRI, and the Newsroom.

"[In YRI,] we would share as a group like, okay, does this look good, does this look good?"

"[We] partnered very closely with the journalism department. The idea behind that is they create the story, and we, as [YRI], our job is to make it an interactive extension of that story to create a better experience for the viewer and now user."

Some YRI interns noted that the Newsroom tended to drive their collaborations, in that the Newsroom developed the stories for the apps and sometimes directly informed the app designs. At times, this process led to challenging scenarios and required returning to the design stage:

"For the Youth Radio app...we had to change the entire design because of what [the Newsroom] preferred... I had already had the original design working...[I had to] basically just delete a whole page of work and start over."



Journalism

Developing STEM Stories

Youth participants in the Newsroom frequently worked stories that dealt with STEM topics. This represented a continuation of previous NSF-funded efforts that established a Science News Desk in the Newsroom. Some examples of STEM story topics included the roots of empathy, addiction, toxins in candy, Internet censorship, and social impacts of California's drought.

Not all newsroom stories expressly address STEM topics, but most pieces draw on qualitative and quantitative data and integrate multi-modal communication (e.g. text, image, audio). By the third year of the NEXT grant, Youth Radio explicitly implemented data-informed practices across its journalism efforts. All youth reporters are now expected to incorporate at least one piece of vetted statistical evidence in a story. This has helped the youth producers to develop more overt understanding of how to use different forms of data to enhance storytelling in journalism.

As the Newsroom members mainly worked on pieces of reporting, interns

followed a somewhat different process for producing stories than YRI. This included: 1) idea generation, 2) research, and 3) writing, scripting, and revising. This iterative process was achieved through ongoing communication and collaboration.

Ideation

In terms of how the young people generated the ideas for their STEM stories, some came up with story topics on their own, while others had help from Youth Radio staff who recommended a topic that was personally relevant to them.

"[For my Toxic Candy story], one of my [supervisors]...said that they were finding out about toxicity and lead...she said that she wanted me to work on this story since she knows that I occasionally bring in big things of gummy worms...I was personally interested...[but] it wasn't something I discovered on my own."

"For the Internet censorship [story]...it was a group brainstorm."

Regardless of the content or idea origin, Newsroom interns found it important to write about something in which they were interested, but also surprise and inform their audience.

"Try thinking about something that you're interested in...if you're not interested in it, this is not going to be a piece that you're going to want to follow through on...Thinking of things that you're personally interested in is always best...no

matter what you're reporting on but definitely reporting on science and tech."

"A huge part of it is being interested in what you're talking about and maybe looking for the shocking aspect in it... You think about what you like a lot, you look for something that people wouldn't know and hopefully you can find some science to back that up."

Research

The Newsroom reporters used various types of research and data collection for their stories, including background research for interviews, fact-checking, and searching for statistics or research results online.

"A lot of the research sometimes comes from fact checking."

"[For a story about how people use privacy settings on their social media pages,] I went and looked at what was the numbers of all the people that get stalked on the Internet and things like that."

When producing their STEM stories, the youth also gathered interview data from investigators or scientists.

"I've talked to a number of professors and scientists... For example] I wanted to look at lack of sleep in teenagers. So I spoke to the director of a sleep lab at Brown in Rhode Island."

The youth noted the importance of finding the right expert(s) to interview.

This meant getting someone who could offer relevant information about the particular topic in a clear and engaging manner for the target audience.

"You have to find a good expert. You have reach out to them and make sure that you have time... Sometimes that expert doesn't totally work out. So if that doesn't fit in your script... There is no surprising aspect or there isn't something that fits totally right, then you might have to reach out to somebody else."

Design: Scripting / Writing/ Editing

The youth understood that writing required flexibility and an open mind. The process was not linear but rather demanded multiple cycles of writing and revision. On a global level, reporters often needed to allow a story to go in a direction other than originally anticipated.

"First [when beginning to develop a STEM story], I would try to think from all points of view and not just try to pick a side first. Especially with science stuff it's many different ways that people say things and many ways that people think. So I think that the first process would be just seeing how many ways I could come at [the topic]...not choosing a side, not going in saying this is what I'm going to do."

"With my recent empathy story...[initially] we wanted to talk about what was going on like

developmentally but...we weren't focusing enough on what's going on inside the brain which ended up being what was more surprising. It was more interesting."

When writing STEM stories, young producers said it was imperative to use research and data to support their assertions and claims.

"I find it important to add data and research mostly to back up what I'm saying"

"I state whatever the data or the facts are...I usually explain what it is first and then...such and such says ... But it's not really a certain way that I include it... I just need it to back me up if there's any question about the story."

Furthermore, interns learned that research did not stop when they began drafting their pieces. In fact, they often needed to gather more information after reviewing interviews.

"I think a lot of the research comes when you're trying to interpret what the expert says and you're scripting...So in your scripting you definitely have to make sure you're getting everything right. I have to do follow-ups with experts."

As they went through all of the gathered data, youth sometimes struggled to pull out the most relevant aspects. They thought deeply about how to present complex or dry data in ways that were clear,

comprehensible, and interesting to their target audience.

"When I emailed and contacted [the expert] initially, she sent me a lot of her research to read, which was definitely heavy and dense research. A lot of that...research also you have to do when you're trying to find what's the most interesting. I'm thinking of her interview specifically where I got so much information. A lot of it was hard to listen to, pretty scientific. I had to do some research on the parts that I thought that I could take the most interesting aspects of."

"Having to consistently decipher things that [experts] say... Like this person was talking to me about toxicity in lead... They're talking about there is 0.00004 amount of lead and I'm like that sounds boring to me and I already want to sleep. How am I going to make all of this information, which is very interesting, how am I going to make it palatable for just the person who is listening in their car?"

"When you put your script together you want to make sure that even though sometimes science...or technology can be hard to understand...it's best to make your story sound like conversation and in a way that you want to listen to it. It's a long process."

Given the challenges that they encountered, youth reporters offered some advice they would give to the experts being interviewed.

Recommendations included breaking down complex ideas or terms, talking with enthusiasm, providing examples, and being understanding of youth reporters.

“I would like for you to talk to me like an adult, yes, that’s true. But I would also like for you to remind yourself that I have to talk to an audience... You know not everybody understands these big words that you’re using or all the terms that you’re using... You say a big word or term that somebody wouldn’t understand and I prompt you to explain what you mean.”

“I’m supposed to make you feel comfortable because I’m the one interviewing you but still try to be there with me. I need you to know that I’m nervous along right with you so I need you to...[be] more understanding that I’m still a child.”

Collaboration

The Newsroom interns collaborated with staff and peers when brainstorming and creating STEM stories. In year one, the young people noted a disconnect between the Newsroom and YRI when it came to working on news stories that had a related app. Interns from these different departments did not tend to continue working together after the initial idea was generated. Staff and interns envisioned more ongoing cross department work, though it took considerable time to begin altering existing patterns. By year three, cross-departmental

collaboration increased. A Newsroom intern in year one said,

“I had never worked with the App Lab as far as us getting together and actually being like, we’re doing a story. But we do the brainstorms every now and then, which are useful... But as far as I am aware none of us are really involved with the apps... maybe in the next few [Youth Radio] sessions they’ll be able to actually get together and work.”

Cross-departmental collaborations most often occurred during the ideation and research phases, as teams brainstormed and tested ideas to get additional perspectives. YRI interns in year 3 explained that YRI often consulted with Newsroom interns to help conduct fact checking. “I guess the part we collaborate with the Newsroom a lot is with fact checking. They’ve got lots of experience with that so they’ll work with us.”

In addition, because of ongoing time constraints posed by producing high impact media during after-school hours, Youth Radio staff often did the time-consuming work of planning and managing collaborations across departments. “I know that (instructor) has a lot of those discussions with people working in other departments,” said one intern. “She’s here a lot more, like when we’re at school, so she can spend the time and get things set up before we get here... Time is always pretty tight.”

Summary

Youth Radio's Innovation Lab follows an approach to collaborative construction of youth-led media products. This approach relies as much as possible on teaching and learning that is situated in and builds upon the interests, curiosities, and life experiences of young people. Overt instruction by STEM educators and professionals aims to explicitly elevate young people's awareness of reiterative design processes and how to apply these practices in the context of producing interactive apps and news stories

Youth Radio's collegial pedagogy places youth interests, assets, and developmental needs in dialogue with educators' knowledge of the subject matter and professional practices. Enacting a collegial pedagogy does not mean all voices always have equal weight, but that youth and adults are expected to actively negotiate what, how, and why the team operates.

Youth Radio's work emphasizes the benefits of constructing conditions where young people experience STEM learning as something they do, not as something done to them.

Youth producers reflect on their own knowledge and perspectives to identify and conceptualize a social issue or problem to address. They frame the questions that get asked. They collect the data and conduct analyses that inform the design of media products that respond purposefully to an identified problem for particular target audience(s).

Throughout the process, youth teams are mentored closely by expert media makers. The Innovation Lab presents STEM professionals and youth with design challenges to tell stories that resonate in youth communities. This learning environment is constructed through an emphasis on collaborative ideation to frame and respond to youth community issues in process-oriented, youth-led inquiry. The final products comprise questions, research, insight, and feedback from both youth and adult producers.

This section examined the learning conditions at Youth Radio that engage young people's identities or sense of themselves and broaden their repertoires of storytelling and media making. In the next section, we look at learning, applied skills, and attitudes that youth develop in producing transmedia that matters

Looking In: Youth Impacts

Impacts of Learning to
Produce Journalistic
Media

Creating Data-Rich Transmedia: Learning Outcomes

“Very few people have this opportunity, especially so early in life, to be able to have this venue, before you even go off to higher education... I'm never going to be this person ever again. So, I think it's important to communicate who I am now and the experience that I've had, for me to be able to look back on it in the future, and also for other people to be able to look at that and compare me with themselves.” (Youth Producer)

Young people working in The Innovation Lab created new technology products and stories through an iterative and collaborative process. This included idea generation, primary and secondary research, and product design and development. Through this work, youth participants are developing key capabilities, which entail a range of skills and knowledge, such as:

-  How to investigate and tell stories about the social world using data
-  How to design and code interactive media and technology
-  How to think and work like a scientist
-  How to collaborate with youth and adults to produce media and technology

As a result of this work, young people have become more interested in STEM practices, including engaging in novel empirical research, app development, and data journalism. Additionally, many of the youth became more interested in science and technology and more likely to see STEM applications as personally

relevant to their everyday lives and future career pathways. Through their internships, youth understand they are engaging in the work of data scientists. Some interns also perceive themselves as emerging data scientists and data journalists.

Learning to Use Data to Tell Stories that Matter

Through the production of mobile apps, web interactives, news stories, and curriculum resources, young people have had opportunities to critically analyze, conceive, and devise media that integrates multiple forms of data. During year 2 of the NEXT project, Youth Radio deepened its explicit focus on data-rich practices through the development of a research plan, which became a successful NSF proposal to the Innovative Technology Experiences for Students and Teachers (ITEST) program (ITEST Award #1513282). This two-year project, *From Data to Awesome* (D2A), began in the third and final year of NEXT. D2A aims to test the efficacy of a collaborative

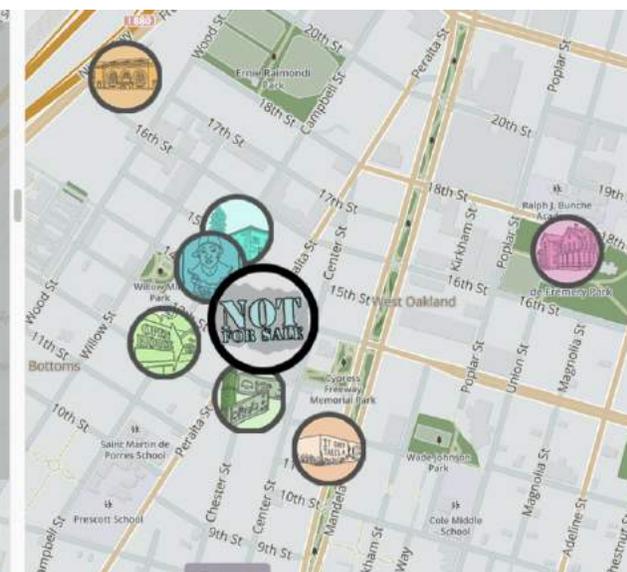
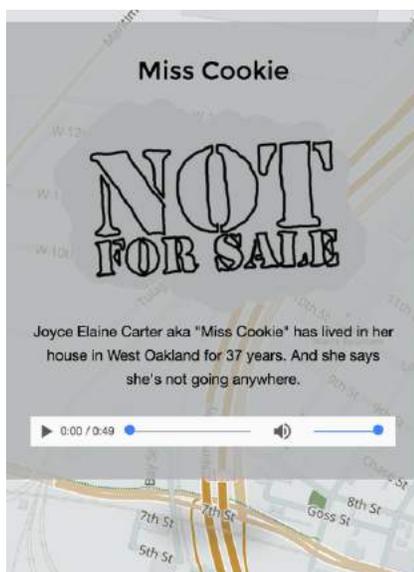
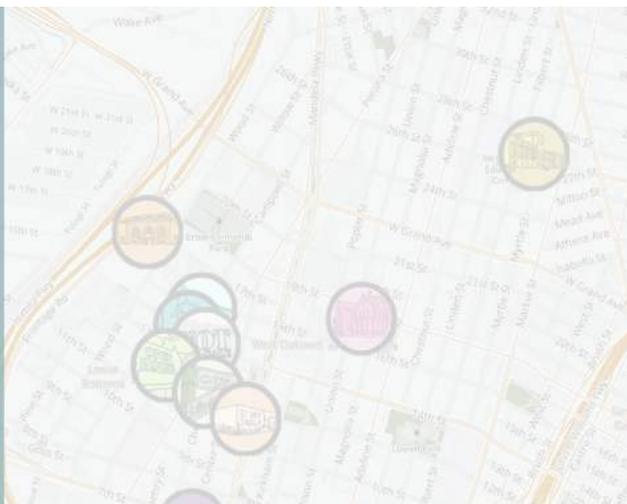
strategy to motivate and prepare underrepresented youth to discover, utilize, and share data science skills as they produce interactive media for local communities and national audiences.

Both projects are mutually reinforcing. AISL-funds for the NEXT project helped Youth Radio consolidate its thinking and build a grounded theory of action about the nature of STEM and data science in orchestrating high-impact youth journalism. In turn, the first year of the D2A project advanced the organization's policies and practices on creative data uses. As a result, young people working in the

Innovation Lab, and increasingly across all departments at Youth Radio, have gained a stronger understanding of the possibilities and processes of data-driven storytelling.

YRI interns regularly collected and processed data in the course of their media production in order to conceptualize, research, and tell engaging stories that impact youth communities.

For instance, in producing *West Side Stories* (formerly called *Westification*), a project that explored the issue of gentrification, members of the YRI team conducted initial library research on the neighborhood's history and developed protocols to



Source: Screenshots of 'West Side Stories' web interactive courtesy of Youth Radio

interview recent and long-time residents about their experiences. Youth used the images, audio clips, and video they gathered to create an interactive map of historical landmarks and people in the neighborhood over time. The team conducted library research on the history of West Oakland and spoke to recent and long-time residents to document the neighborhood's changes.

The interactive meant to serve as a welcoming online space and a low-stakes curated environment that could help dispel stereotypes and might interrupt dominant narratives about gentrification. One intern noted how people usually think of gentrification as "white, rich" people moving into a neighborhood, but this is not always the case – "it sometimes means a person of color just recently moved there." The YRI team designed the website to give users information about West Oakland, so they could decide for themselves about what gentrification is and what effects it has on the community.

Their goal, was to help users draw their own conclusions about the nature of the changes occurring in the neighborhood:

"At the end of the day, we want them to have this information, good or bad. We want them to interpret it their own way, and then be able to make a conscious decision like is this really gentrifying? Is this something that is just happening?"

The YRI team wanted the interactive to dig below the surface of gentrification, so as to demonstrate not only what the phenomenon consists of, but also how the neighborhood and its people are impacted by it. This driving purpose necessitated collecting and communicating a host of local voices and stories about change and displacement. As one youth explained, they wanted to use the interactive map of people and places to illustrate the diverse social and economic consequences of these changes on Oakland residents:

"We kind of already made the assumption that people know what gentrification is. I think it would be really important to ... Not just explain ... what it is, but kind of show what it means for the city. There are more ways than just mom and pop's being shut down and there are more ways to look at what's happening. A lot of stuff has to do with the police activity and stuff like that. So maybe we should be cautious of seeing that the person who's coming to look at this website actually knows. We should offer as much information about what it is and how it affects the community as much as possible."

This youth producer's comments reflect an interest in advancing public understanding and dialogue about gentrification. She is conscious of a need to develop a product that is responsive to multiple audiences with varying knowledge and assumptions about this complex issue. Indeed,

learning to tell data-rich stories calls for young people to think carefully about how to frame and communicate data to meet particular purpose(s) and audience(s).

By participating in the production of interactive media, Youth Radio interns learn to consider the dynamic relationships that can transpire between a text and its intended audience. They engage in real world projects that require them to think like producers, that is, to reflect on how to create products for desired effects with target audiences and how audiences may use, interpret, and respond to the media.

Newsroom interns also learned to incorporate data extensively in their stories. They recognized the importance of finding experts who could provide compelling sources of information, and double-checking the accuracy of the experts' comments.

"A lot of the research sometimes comes from fact checking. Once you talk to whoever your expert is then you need to go back and check on that a lot of the times."

"[There's] also the trial and error factor when you're picking an expert. Sometimes they work really well and sometimes they say things really well, but often when you're an expert and you're talking about something that you know a lot about over the phone I feel like they default into [a] voice which is like, yes, let me talk to you about this expert thing. You're like I could really use some good tape... It can

be hard to push people who are experts to talk like they're interested in anything."

Sometimes reporters consulted experts directly, other times they reviewed published research. For a story on lead toxicity in candy, for instance, a young author consulted information from the Center for Environmental Health to illustrate the availability of potentially hazardous sweets. Using data from existing research lends credibility to the story and allows this author to accurately scope the problem.

"I find it important to add data and research mostly to back up what I'm saying. Sometimes you can use it so that you don't have to say an answer to a question. That's typically when I like to use it the most....[For the Toxic Candy story], people are assuming that this is all sort of outlying corner markets [and not candy at mainstream stores]...It is in actuality a large, widespread problem. Being able to use research or audio from experts who just point blank says that without me actually having to state that as a sort of personal opinion is a lot more useful to me."

In this way, NEXT gave young people hands-on experiences to develop understanding and know-how to use data to investigate issues that are relevant to their lives and their communities. Some youth participants explained:

First, I research trends among young people, which can be represented by data. Then, I find ways to communicate important information about those trends in my writing. This involves evaluating the quality of my sources and refining my arguments based on the quality of the data.

I gather information on the issues that young people face in order to produce news pieces that accurately discuss and analyze those problems, where they come from, and what youth can do/are doing to face them.

I looked at statistics of displacement and development in communities for my project on gentrification. I used this data to support my claims and make those claims in the first place.

Youth Radio participants are coming to see themselves as producers, not only consumers, of data. They are sharpening their perceptions of the role that data can play in communicating with different audiences and making convincing arguments.

Learning to Design & Code Media

By taking part in the Innovation Lab and creating STEM-rich apps and stories, the young people learned about the media development process and gained programming, design, and research skills. Youth

interns learned the guiding principles and methods to construct digital media and mobile apps that address specific issues and problems they have identified as important.

In the first two years of the grant, most youth interns had no experience with app development prior to their involvement with YRI. Thus, the majority of what they learned about the process and strategies of creating technology resulted from the program. As the youth developed apps from start to finish, they learned coding languages such as HTML, CSS, JavaScript, SQL, and PHP. They also learned that encountering problems or glitches when coding is a typical part of the development process.

“I had no idea about anything that was involved with [app development] prior [to joining YRI]. So I’m completely new. It seems very real, very realistic, very possible. I know how to do it and more or less I know the process to go through a project and work with a team.”

“What I’m using, which I’ve never done before [YRI] is HTML, CSS...that was a big surprise because I didn’t expect to be doing that as much. But that’s what I’m doing a lot...I think it’s very unique, but it’s difficult...It takes time. It takes a lot of practice...It is learning a whole new language.”

The young people were surprised by how much they enjoyed and were

interested in design and coding. Some described this attitude shift.

“Coding is dope. Coding is tedious, and irritating but it's still dope...I was surprised about how excited I was about coming [to YRI] because I'm like an artist musician type dude.”

“What I really enjoyed most was the coding. I started working with html and CSS and PhP. When you see the results of coding and what you've done, it's really exciting.”

“I like being able to build things with code. If I'm really into it, I like the fact that I'll stay up until 3 a.m. and work on something.”

“When you finally get something in writing code, it's that eureka moment. Like, one step in writing code is debugging. You never know how long it's going to take. You might think, I'm so close. Just give me 5 more minutes and I'll have this. And there you are, 3 hours later and you still think I'm just 5 minutes away. When you finally get it, it feels like you've been digging forever and found gold.”

The young people also changed how they see and use technology, gaining a better understanding of and appreciation for its development and how it works.

“At first you don't really understand [coding]. It's like, what is all this. You feel like you're going to fail. And you do. But then when you

get it right, it's amazing. It's so exciting to understand how it works and how to do it...Now I look at technology and web sites completely differently.”

Another student became more critical of the types of apps she used in her personal life, while another realized the level of work that went into creating the websites he used.

“For me since I started coding I've realized that every simple thing we see on a Web page is actually not that simple. It takes a lot of effort to do really simple stuff. So when I see something really amazing I have much more appreciation.”

“I'll never look at a Web page ever the same ever again. If you're a music buff and you're listening to a song and oh yeah that trumpet sounds really cool. Now I'm looking at a Website, and I'm like how did they make that tool box float? It's like special. It's satisfying. It's cool.”

“I actually stopped downloading a lot of apps, since I joined the App Lab...just thinking about the relevancy in my life with the apps...I stopped downloading games...I just kind of grew out of the whole phase because I've been through the process of building an app, and I kind of...[have] a different perspective on things.”

The young people appreciated that they could apply what they had learned from the Innovation Lab to their personal lives. They felt the

experience opened opportunities to pursue app development in the future if they chose to do so.

"I saw how useful [app development] is and how I can apply it. [I could] even use it as job related if I got interested in it enough... We live in a digital world. There's a high demand for websites, high demand for a lot of graphic material ... If there's any demand for something and you have this skill and it's presenting opportunities... If I wanted to pursue doing [app development in college]... If I wanted to start in computer science, or I wanted to learn to code I have a leg up on freshmen starting in."

"I learned that I can use these tools for my own personal projects outside of the building or outside of school. I can even use it for school projects too."

Lastly, engaging with tech professionals helped give the young people's internships real-life relevance. Talking to staff at companies such as Google, Mozilla and Ask.com, the youth realized that they shared common work processes.

We learned how people at Ask, real programming companies, how they also do their own thing, which was pretty similar to ours.

[A man from Google came to Youth Radio and] basically went through his process of designing apps with

us at Google. He went through it step by step through a nice PowerPoint... It was a cool experience just learning how to design things from a person's perspective who worked at Google.

So it's a good tool for networking with other people. We've actually had opportunities to network with other people from different organizations who do the same thing. So that's been a cool experience too... we had the opportunity to go to Mozilla in San Francisco.

Interning in the Innovation Lab effectively opens doors for youth participants to explore interests in new media production that deepens their understanding of technology in practice, building their design and coding skills and creating opportunities to interact directly with STEM professionals.

Learning to Think Like a Scientist

While gaining greater awareness of professional trajectories in science and technology, Innovation Lab interns received induction into STEM practices, to think critically and create media with multi-modal data. As a result, many youth participants see themselves on a transformation from consumers or users of media and technology to producers and developers. As mentioned above, the emphasis on data practices was bolstered by the D2A project, which

began in the final year of NEXT. Working on STEM-rich media, youth interns deepened their understanding of the breadth of scientific research applications.

"As aspiring developers, we do a lot of research. It would be easy to not think of it as a science. But with all of the market research and user research we do, we are gathering data and figuring out how we can use it to find problems and then solve those problems."

In addition to designing and executing data-rich media projects in the Innovation Lab, youth learned specific science content in developing stories that focused on science and tech subjects. Through the research and data collection for their STEM stories, the youth became more interested in science and were more prone to see its connections and relevance to their daily lives.

"I think the best part about this internship is the way that we're able to use these resources to help us discover things that apply to us about ourselves... My first big feature story was... something that I like to do. I like to shop a lot... It's a science story because [interviewee] was a psychologist and she definitely taught me things that I didn't know before, like how do I identify an addiction and what that looks like. So I learned a lot from her and the neurologist that I also spoke to. I learned about brain connections and how at my age of

adolescence we no longer have the ability to form such strong connections because it's too expensive to the brain. That definitely made me think about people my age and how we react and act in certain situations."

"I think one of the most interesting things about working with tech and science journalism is the fact that even though you're the reporter and your job is to spread information to an audience, most of the sort of stuff that you are working on... is stuff that you yourself discover, which makes for an interesting story. Your job can change rapidly... Your story can change depending on how or what sort of questions you go."

The young people felt it was extremely important to bring youth voices to science and technology stories. By working on media that investigates or applies STEM practices, youth participants experienced STEM in ways that contrasted what they learned in school, at a time when they were still open and developing. The Newsroom's *Science Desk*, which explores STEM-specific content, was particularly powerful in reshaping youth perspectives on science.

"I think it's just so kids like me can see that science is not all boring. I think that's why it would be important for [the Science Desk] to be [at Youth Radio]. There are many other reasons, yes, science is important; science is life and all of

this. But I think that without the science desk I would still have that mind frame that science is just boring and it's just strictly this, strictly that. They don't show this part of science in schools. They don't show you how a story idea is a part of science and stuff like that."

"As young people, none of us are specialized...we have ideas about what we like to write about and what we're interested in but we don't totally know exactly what that is. The science desk at Youth Radio has exposed us to the idea that science is not all chemistry and physics or whatever we do in school but it's kind of whatever applies to most of what we're interested in...I think there's a super beneficial part to having a science desk at Youth Radio and I hope it stays for a long time."

One young person who initially did not feel interested in science said that her experiences at Youth Radio made her more aware of how science relates to her everyday life as well as more open to and engaged with science stories.

"Well, like my second session we met with [a scientist who came to Youth Radio]...it was interesting...he brought us...a Q-tip and...toothpaste... It was like, when you see this, what do you think? So when you see toothpaste you're like yes I brush my teeth... Then he was like yes but think more science-y...he broke it down like you can look at the ingredients in it,

the colors. So it's more of like you can take a boring object and just blow it up and find something interesting about it. I think that's what really interested me on the life science part. I'm not really into science like that but after hearing how stories go from being this little and then this science part of it just makes it so big. I think that's what really kind of, I'm not going to say it opened my eyes all the way to science but I'll more listen to it and be involved in a science story now."

Furthermore, other youth felt that society did not typically value youth voices but that Youth Radio afforded young people opportunities to dive deep into topics and questions about which they were curious.

"I think people in general don't really listen to young people about most things...With the Science Desk it's really interesting because I can bring up I'm really interested in the Oculus, the new technology that allows you to view video games from a virtual reality perspective. That seems cool to me where as normally I would be like that seems cool, yes...and now I'm going to go sleep. Now [with the Science Desk at Youth Radio,] it's like well do you want to do research on the Oculus or do you want to find out about that? Do you want to go to an event where the Oculus is going to be? Do you want to try that out? Because there's a science tech desk here, things that I am interested in can be explored and I know that I have the opportunity to

explore them...It just helps you learn to be curious, which I think that a lot of people my age have lost."

In short, NEXT provided young people hands-on experiences to investigate science and technology concepts and develop STEM-rich media that offer new or different perspectives on youth in society. The iterative process of producing socially-responsive media transpired in team-based learning, which leads us to the next theme.

Learning How to Collaborate on Complex Projects

The Innovation Lab sought to combine data-informed journalism with youth-designed interactive technologies to generate new models of storytelling. A central mechanism for realizing this vision is collaborative practice that puts teams of youth in close working relationships with one another and experienced media professionals. NEXT extended Youth Radio's long-standing collegial pedagogy, adapting it to the context of multi-modal journalism.

The YRI and Newsroom departments operated in different ways to produce their respective (but complementary) media. In the Newsroom, reporters primarily worked closely with an adult producer, who would suggest topics for stories and provide other support

during the production process. In contrast, YRI interns typically worked more closely with their peers to construct apps and interactives, with project responsibilities distributed based on individuals' skills and interests. As one youth explained:

"[For the Gentrification interactive] [youth intern 1] drew up the places, [youth intern 2] was working on the audio, and I had to basically get the content for said projects...So the mural, the schools that he drew up, I had to get the content to him, and write a description."

Perhaps as a result of this collaboration, the YRI department had a more convivial atmosphere than some other Youth Radio departments. One young person who had recently worked in the Newsroom observed:

"[YRI] is a lot more social, and it allows more room for light-hearted social interactions as well. That's not to say it's not as professional as the Newsroom, but it is definitely more relaxed and that is really nice, in comparison to working in the Newsroom, to come to like a social-ish situation. In the Newsroom, it was very one on one. You dealt with your own projects and you kind of worked with your supervisors on improving your own skills and getting more ideas, but in [YRI], our ideas are a lot more collaborative and thereby more innovative."

A longtime member of YRI corroborated this account, claiming

that the collaborative process was consistent with the practices of the larger tech workforce.

“Yeah, the workplace culture for [YRI] I think is probably the best in [Youth Radio]...because we are separated...enough to where it’s easier to focus but we collaborate with each other. We operate, like I said, like a tech startup which is good experience to have.”

The YRI and Newsroom teams also had opportunities to work across departments, particularly as they brainstormed project ideas at the beginning of the internship. Young people described how they generated apps and stories from these sessions. One Newsroom intern specified:

“For the Internet censorship [story]...it was a group brainstorm. It was the Innovation Lab, so we had [the YRI group, too]...they felt that I should do a story because I have an app on my phone that I use to get around the school Internet.”

In other cases, YRI interns constructed interactive media inspired by Newsroom stories. Several YRI members mentioned this as one of the group’s responsibilities (in addition to creating other apps and interactives):

“We work directly with journalists in the Newsroom to make their stories interactive, make them fun, make them visualized. We do not necessarily just code but we just

deal with like the process of creating and...making something glow, making something pop.”

“[We] partnered very closely with the [Newsroom] department. The idea behind that is they create the [STEM] story, and we, as [YRI], our job is to make it an interactive extension of that story to create a better experience for the viewer and now user.”

Members of the two departments met initially to exchange ideas and information about the interactive apps. Often, though not always, the Newsroom assumed majority responsibility for the content, while a YRI team took lead on designing and producing the media materials.

Youth Radio staff confirmed that they intended for the YRI and Newsroom departments to work mostly independently on projects around a larger theme. Their vision for collaboration was not for news reporters to learn how to create interactive software or vice versa, but rather for members of each team to apply their respective skill sets to communicate STEM ideas in creative and compelling ways. The end result is a portfolio of work capable of reaching a variety of mass-market and professional audiences.

Summary

Youth Radio’s collegial pedagogy shapes the manner in which young people and media professionals create STEM media and the types of

learning that transpires. Youth Radio staff and youth producers actively negotiate and collaboratively construct both the learning processes and media products. The Innovation Lab's approach to media production combines:

- Teaching and learning that is situated in and builds on the interests, curiosities, and life experiences of young people, and
- Overt instruction by STEM educators to explicitly raise young people awareness of reiterative design processes and to apply these practices in the context of creating interactive media

Youth Radio's pedagogy places young people's interests, assets, and developmental needs in dialogue with STEM artists' and educators' knowledge of the subject matter and professional practices. Enacting collegial pedagogy does not mean all voices always have equal weight, but that these voices are expected to actively negotiate what, how, and why the team operates.

The youth are cognizant of the unique opportunities they have to learn STEM media practices from professionals in diverse fields. In this way, youth participants widely interpret Youth Radio as a space that nurtures their talents and teaches them skills to effect change in society. They have opportunities to work with powerful digital media equipment, to network with and learn from professionals in the field, and to create with purpose and produce

meaningful work. Cumulatively, this results in high-quality, multi-media products that showcase the young people's capacities as creative and critical media producers. The ability to create and publish the apps and multi-media stories and to share their productions with peers and wider audiences, heightens the young people's sense of purpose and audience that is driving their work.

As a result of their work in The Innovation Lab, youth producers gained a deeper understanding of the breadth of scientific research and its applications, as well as the process for developing STEM-rich media. In addition to learning STEM content, many youth became more interested in science and were more likely to see connections between STEM and their everyday lives.

Youth interns perceived multiple benefits from having opportunities to examine their personal viewpoints in relation to science and technology issues. By participating on media projects that creatively drew on multiple forms of data, and sometimes directly explored STEM topics, young people experienced changes in their perspectives on STEM. In particular, NEXT helped youth recognize that science was not just an abstract school subject, but was intricately connected to the world around them. Along the way, the young people gained knowledge and skills that have helped develop repertoires of practice as users, critical consumers, designers, and developers of media and technology.

Looking Out: Audience Impact

User Feedback on Data-
Rich Media

Engaging Educators and Youth: Process & Impact of Sharing STEM Media

"[The Youth Radio toolkit] built on itself very organically. From the icebreaker [to]...actually getting in and using the materials, it was very elegantly done." –High school teacher

"It was great. I enjoyed the lesson...[Youth Radio's] activity was interactive, relevant to my life, and interesting" –High school student

"[Youth Radio] is a youth empowerment and advocacy project that has taken the old tools of oral history gathering, built a trusting community, refined a training model, and is now harnessing and unleashing the multi-platform, multi-media possibilities of the digital universe." –Adult audience member



Source: Video screenshot courtesy of Youth Radio

For almost a quarter century, Youth Radio has worked to develop the skills and mindsets of young people in and around Oakland, CA, to analyze the world and produce media that responds creatively to issues and problems affecting culturally, socially, and economically diverse youth communities.

The NEXT initiative drew on the organization's institutional knowledge and understanding about how to lead mentored, collaborative youth media production in critical

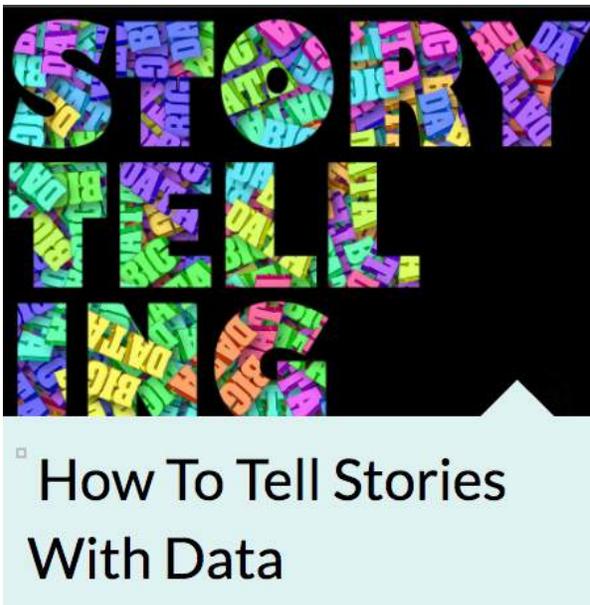
communities of practice. Through this work, the team has sought to rethink and broaden the ways that youth and adults can tell stories and respond to problems that matter to young people.

This small, determined network of socially-principled media producers, journalists, and educators continually strives to hone young people's capacities to engage readers, listeners, and viewers in ways that raise consciousness, spark dialogue, and advance knowledge.

As a public media company, Youth Radio produces and freely disseminates its media products for an expanding audience. NEXT effectively supported Youth Radio's efforts to research and conceptualize the process and practice of communicating, engaging, and influencing external audiences.

Past evaluations by Rockman et al have focused wholly on the internal processes, media products, and learning outcomes at Youth Radio, such as considering the informal STEM teaching opportunities and challenges afforded by the learning context.

This current project expanded the scope of the evaluation to also include outward-facing questions of implementation and impact. In particular, we sought to explore: how do adults and young people understand and use Youth Radio's curricular products? How do educators interpret and implement this media? What if any additional resources or supports do educators need to successfully implement them? What impact do YRI's media projects have on external audiences? By examining audience interests in and perceptions of Youth Radio's STEM products, we aimed to enhance the responsiveness of



Source: Screenshot courtesy of Youth Radio

youth-led media for educational purposes.

Below, we first present findings regarding the curriculum toolkits' purpose and dissemination efforts. Next, we explore evidence about the impact of the toolkits on the educators and students using them. Finally, we examine findings from four audience focus groups regarding adults' and youths' ideas and experiences using Youth Radio's stories and interactive apps.

Crafting Educational Resources

In collaboration with Youth Radio staff, young people have worked to create multimedia toolkits designed to enable educational organizations to incorporate elements of the Youth Radio's media analysis and production into their own teaching and learning settings. Professional staff and youth producers described the overall purpose of this work as an effort to:

- document and share the expertise of Youth Radio with others;
- help young people's voices and stories to be heard;
- meet the demands of informal and formal educators for storytelling resources; and
- partner with outside groups and individuals in order to get feedback on and refine resources.

As with its other published media, the Innovation Lab follows a reiterative production cycle in

creating educator resources, described in detail above. In general, the Curriculum Department follows two methods for developing educator toolkits.

One design method consists of a collaborative production process between a young person with expertise in the subject area and a staff person. Another method entails documenting Youth Radio's approach to teaching a particular concept and seeking youth feedback on the lesson. Both methods required high levels of collaboration among the youth and staff, described by youth producers as a mutual relationship of contributing knowledge and ideas.

As opposed to an individual classroom teacher creating his or her own lessons, a strength of Youth Radio's toolkits is that they incorporate the expertise of youth and adult media professionals, thus offering a mixture of perspectives not typically represented in school curriculum. The youth producers described the importance of bringing a youth voice to the curriculum development work. One intern explained:

When I started the process of [creating the lesson plan], I thought about me and what I would want to hear and what I would want to listen to.

Providing youth perspectives throughout the curriculum design process helps to ensure that the lessons will be engaging, clear,

appropriate, and relatable to young people. When creating the toolkits, the youth producers drew upon their personal interests and recent experiences learning this material at Youth Radio.

Similarly, professional staff brought their past diverse educational experiences to bear on the materials they produced.

When I was an individual teacher starting out, I was writing all of my own lesson plans. It was always through my frame of learning, my frame of expertise...[But, in creating the Youth Radio curriculum] it's not one person writing a curriculum...it's a team approach...that allows us to bring out an expertise that you wouldn't normally have access to [with] one type of curriculum...[For example] we have [another staff person] who is [focused on app development] and we have [another staff person] who is an amazing educator looking at a different level of things. One of our producers is also writing toolkits, and we have [another staff person] who is a coder coming in and weighing in.

The educator toolkits integrate the program's news stories, interactive sites, and mobile apps to communicate and teach content knowledge and methods that youth and adult producers have generated over the years. Thus, the curriculum provides a documentation of and a view into Youth Radio's collective knowledge.

Figure 5: Sample of Youth Radio's published curriculum toolkits. Available at: <https://youthradio.org/for-teachers/>



Fact-Checking for New Journalists: This toolkit gives an overview of fact checking strategies and case studies based on Youth Radio's news stories, and a group activity to apply learning.



The Art Of The Interview: This toolkit covers the basics of interviewing, techniques to apply in different types of interviews, and how to critique an interview. Includes a tip sheet when interviewing experts.



The Fundamentals of Field Recording: Using text, video, infographic, and a lesson plan developed with high school students, this toolkit overviews the key strategies of recording audio stories in the field.



Telling Stories with Data: Using case studies from Youth Radio's portfolio, this lesson walks through ways youth and adults can collaborate to integrate data into storytelling about the social world.



Controlling Your Online Presence: This toolkit explores the question, What is Your Digital Footprint? The lesson introduces young people to issues related to privacy and professionalism online.



Sound Science: This toolkit provides four project-based learning ideas for STEM educators to incorporate recorded audio and music in the classroom.



The Art of the Infographic (Part 1 & 2): This two-part lesson covers how to make infographics that suit one's available data and purpose. It breaks down the process of visualizing data into multiple steps and uses Youth Radio infographics as case examples.



Mobile Design (Part 1 & 2): These lessons outline strategies on how to develop ideas and pitch plans for a mobile app.



How to Make a Podcast: Launched jointly on KQED Teach, an online learning platform for educators, this toolkit helps teachers learn how to make high-quality podcasts with students.



How to Plan a Dynamic Database: This toolkit introduces the key concepts involved in setting up a relational database, such as, how to organize, split up, store, and query data.

There are numerous advantages of having an organization with a proven track record of high-impact media production develop its own curriculum.

It gives that legitimacy for teachers when they hear about [Youth Radio's] curriculum they're like, oh, it's actually proven in a professional setting. That adds a lot of value and the brand to it that strengthens what we do.

Given the amount of high-quality curriculum materials available online, Youth Radio designers sought to envision toolkits that creatively built upon existing resources without duplicating others' efforts. One staff member explained:

I feel very conscious of...how to create something that adds to the education resources on a particular topic. You look at Transom, Radio Rookies, even this American Life has resources online...People have really great resources...So as someone who writes curriculum, I struggle with and I try to do my best to think of a way that makes it better...I don't think we should be doing this just for the sake of doing it. I think that we should be creating curriculum that we really offer something fresh and we offer something that really makes people think about youth storytelling or really thinks about deeper engagement and the narratives that we want to tell. That's hard. We do a lot of linking to other resources and I think that's really great, but sometimes I worry, okay, people are

asking me for our field recording unit, for example. I can write one, and we teach it [at Youth Radio], and we have a way of doing it, but what if I've already seen one that I think does it better. Why don't I just refer them to that?

Youth Radio has addressed this challenge by focusing on showcasing what is unique about the organization's approach to youth media production. In essence, they have aimed to "pull back the curtain" and illuminate their process for creating transmedia products through a youth-centered approach. A Youth Radio educator commented:

Here's this polished product which a lot of, if you look at curriculum online, it's listen to this finished broadcast and then we'll talk about it...You rarely hear how that's made, and you don't see the rough draft...One thing that [Youth Radio is doing] and I'd like to keep on going this direction is pulling back the curtain...There's also the youth centeredness. I can only think of a couple of outlets that have youth voices. If you're...marketing to an audience of high school age and college age people, it's really powerful to hear someone your age talking about stuff that hopefully matters to you.

By pulling back the curtain on Youth Radio's approach, the organization hopes to provide access for educators to experiment with youth-driven media in their own teaching contexts.



How To Get Started With Fact-Checking

Source: Screenshot courtesy of Youth Radio

The curriculum toolkits are intended for use by formal and informal educators. Both Youth Radio staff and high school educators who implemented the toolkits agreed that the curriculum was appropriate in a variety of subject areas for high school students, as well as likely middle school students. For using the curriculum with even younger students, adaptations and increased support would be needed. A high school teacher commented:

I think it worked really nicely for all of my high school students...and I think that it could be useful in lots of subjects...I'm wondering if it could go younger. I don't know about middle school students but I think they're already kind of asking the questions anyway. So it seemed to be a really good fit for them to have a structure that they could put that into. Maybe a younger grade level might need more supervision with it but it's not impossible.

There is no one formula to appropriately adapt curriculum to meet individual students' needs. Each young person and each classroom are unique and thus instructional adaptations are specific to the teacher's particular context. Youth Radio looked to design its curriculum materials to allow for tinkering.

Disseminating Educational Resources

Teach Youth Radio

Dissemination efforts for the toolkits have included a variety of strategies and outlets. In year two of the NEXT project, Youth Radio launched Teach Youth Radio (TYR), a web portal designed for educators seeking curriculum resources that tie in to news and interactives (<https://youthradio.org/for-teachers/>). This online portal established a "one-stop-shop" where the curriculum and other teaching tools were easily accessible online. Youth Radio could thus centrally organize and share materials with educators working in classrooms, after-school programs, museums, and other informal settings. Prior to its launch, the curriculum resources were "kind of all over the place on the Youth Radio website," one staff member noted. Along with the site, they created a TYR mailing list and newsletter to provide updates on newly published toolkits and upcoming workshops.

The toolkits have been published on PBS Learning Media, a national network of over one million PreK-12 educators, which provides free access to digital content and professional learning opportunities (See www.pbslearningmedia.org).

Online Teacher Professional Development

In year 3 of the NEXT project, TYR developed a curriculum about podcasting for KQED Teach, an online professional learning network, launched in 2016, to engage educators in learning to develop their own digital media literacy and media making skills (See <https://teach.kqed.org/course/podcasting-with-youth-radio>).

TYR's course, *Podcasting with Youth Radio*, offers teachers 5 modules with 26 hands-on lessons to apply the skills and resources needed to produce podcasts themselves and bring podcasting into the classroom. For instance, the course addresses how to create a brief pitch for a

podcast, techniques for interviewing different types of people, how to find and record great sound, how to edit raw audio into a coherent story, as well as techniques for finding one's radio voice.



Source: screenshot courtesy of Youth Radio

KQED's Do Now

Youth Radio also utilized its public media partners to do outreach and interact more directly with students.

On a regular basis, Youth Radio produced Twitter-based lessons as part of KQED's Do Now, a weekly social media initiative designed for students to respond to social issues

(<https://youthradio.org/outlets/kqed-do-now/>). Each *Do Now* created by Youth Radio features a youth-produced story, additional resources, and a discussion prompt to generate student and teacher dialogue about the issue. Responses are posted to Twitter and culled through specific hashtags. For instance, the *Do Now* shown above included a story that examined the struggles of homeless youth in San Francisco, classroom activities to dig deeper and discuss, and the prompt: *Given the rising cost of housing throughout the country, what protections should young people receive to protect them from homelessness?* (#DoNowHomeless).

According to web analytics, approximately 18,000 young people engaged visibly in Youth Radio's *Do Now* lessons in 2015. Some of KQED's most popular *Do Now*'s ever were produced by Youth Radio.



In addition to social media, the toolkits were promoted and shared at scholarly and practitioner-oriented conferences, workshops, and media-making boot camps in the Bay Area and nationally (e.g., American Educational Research Association meeting; Digital Media and Learning conference; Third Coast International Audio Conference; California Council of Teacher Education Conference; and workshops with school district practitioners and community-based organizations).

Practitioner-oriented presentations and workshops have generated a good deal of buzz and word of mouth promotion, according to staff. “We’re getting such positive responses from educators. It’s gaining traction,” said Youth Radio researcher-in-residence Cliff Lee. At the same time, Lee explained, the amount of time and energy required to coordinate, plan, and implement face-to-face workshops poses an organizational challenge. The participants who attend these events get a personalized introduction and understanding of Youth Radio’s approach and what the toolkits have to offer. However, it takes a large amount of resources to provide such an in-depth view. As a result, Youth Radio leaders are reflecting on ways to effectively and efficiently share their educational tools with outside audiences. “There’s always a trade-off. It’s deep or nuanced when you try to work on a larger scale. How do you maintain the depth and reach a wider audience?” pondered Lee.

For this reason, KQED’s Do Now and other outreach campaigns that utilize existing networks represent a particularly valuable strategy to directly engage educators in ways that require less effort to reach a large audience. Youth Radio’s Lissa Soep and Cliff Lee maintain that their most effective dissemination strategies of educator resources have relied on external partnerships. Similar to Youth Radio’s news pieces, which have long benefited from exposure on NPR, coverage by traditional media organizations and educator-focused networks has allowed Youth Radio to reach a wider audience. Youth Radio has leveraged inter-organizational partnerships to communicate within existing networks of educators, rather than depending exclusively on its own outreach.

Two drawbacks, however, to primarily using networks developed by partnering organizations are a) limited direct access to individual educators in those networks and b) no direct access to manage and track online metrics related to usage. As a result, “we don’t really have a reliable way to say how many students and teachers are using these products,” said Soep. For these reasons, the organization has looked to differentiate its marketing efforts to focus on both utilizing partners’ existing networks and building Youth Radio’s own channels for direct communication with formal and informal educators.

Teacher & Student Feedback

As part of the curriculum design cycle, Youth Radio invited classroom teachers from their professional network to test out TYR lessons. Feedback from educators who used the toolkits with their students informed curriculum revisions and future development. Rockman visited a high school English teacher and a high school ESL teacher to observe and discuss how they implemented the lessons. Students were also surveyed about their perceptions and reactions to the lesson. Two additional educators who implemented TYR lessons were interviewed about their perceptions and uses of the resources. Sixty-five educators who downloaded one or more toolkits from the TYR website were also surveyed about their opinions. Below, we share educator

feedback about the toolkits, which they perceived as interactive, accessible, flexible, and engaging materials that emphasize youth voice in the classroom. We then discuss educator recommendations.



Source: Screenshot courtesy of Youth Radio

Interactive, Accessible, and Authentic Materials

The educators described the toolkits as accessible and clear. Lesson

objectives are made explicit and learning activities build progressively on these intended goals. Teachers also felt that the toolkit adequately prepared them to teach the lesson.

"I would say that [the toolkits] were kind of like a starter kit to get kids interested in radio and how to use the tools and then how to jump right in... I think that the way in which the kits are set up and...how to use them...made it really unintimidating...[The toolkit] built on itself very organically."

Teachers said the toolkits were interactive and flexible. All TYR lessons are designed to include active discussion and practical application to explore media and technology concepts and practices.

Educators who participated in TYR's podcasting curriculum on KQED Teach were also impressed with the balance of technical information with engaging activities. One teacher said, "it was really active...there were nice chunks of information that were broken up with hands-on activities."

Teachers observed high levels of student engagement during toolkit activities, especially because the students could apply what they were learning in an experiential manner. In particular, educators appreciated that complex theoretical concepts were presented alongside contextualization and hands-on practice.

"[The toolkit] was really hands on, and it really encouraged the

[students] to just get in there and start messing around with technology...It was very clear. They were like, here is a snippet of information and now here's the practical application. Once you're set with that piece of the practical application let's go back to the theoretical information...It was a... back and forth of theory and then application almost immediately.

[The toolkits] also kept the [students] very engaged...It was really powerful hearing their voice on tape...they loved learning to record. It was...something that they would like to do in an ongoing way."

An ESL teacher we surveyed described the value of TYR resources that provided ample "room for improvising" on the part of students and teachers. In particular, the incorporation of Youth Radio's media products and activities for students to produce their own media made TYR "a source of authentic materials, which, unlike textbooks, provide students of ESL/EFL with an opportunity to hear natural language in context."

Other educators appreciated the valued added of their students engaging with high-quality youth-produced media and creating finished products themselves.

While most respondents highlighted the accessibility and engaging nature of the toolkits for their students, some teachers emphasized that the materials helped them to increase their own confidence and ability to

incorporate digital media practices in the classroom.

One high school educator we interviewed, who described himself as interested but not experienced in integrating media into instruction, said, "I'm interested because my students are tuned in to technology. If I want to tap their interests, I have to use technology." When he started planning a unit on oral history that entailed students interviewing people in their family or community, a colleague suggested looking at Youth Radio's website. He explained:

"I used the lesson on doing interviews...and I got ideas about storytelling...It made me realize I can do this, that I don't have to be an expert... A lot of [my students] are pretty savvy with technology, and so they teach me things too... [Youth Radio's] materials helped me feel comfortable with doing a project that was kind of new for me."

Overall, students who participated in lessons based on the toolkits offered positive remarks about the interactive discussions generated and in-depth analysis of media and technology issues, which may not typically find their way into classroom learning.

For instance, students said:

"Social media isn't brought up when learning and even then, this lesson was a lot more hands-on."

"We usually don't talk about this stuff in any of our classes."

"We usually don't examine ourselves in this particular way, but we do a lot of self-examination."

"In school we have discussions about these topics but we don't get an inside look or perspective."

Emphasis on Youth Voice

The educators confirmed that Youth Radio had met its intention of creating innovative materials that incorporated and emphasized the importance of youth voice.

"It was really exciting to find an entire organization [Youth Radio] and an entire series of educational tools that was already built around telling kids that their voices mattered and that they have perspectives that were useful. So I felt really well supported in the radio module and because of the toolkits I didn't have to reinvent the wheel."

For example, one educator appreciated the balanced viewpoints and youth perspectives of the Controlling Your Online Presence toolkit, which presented both the positive and negative side of controlling online presence. The toolkit provided a framework to help students think about the complex ramifications of online activity.

Educator Recommendations

Potential challenges of implementing the toolkits included a lack of media

and technology resources, school restrictions, and limited instructor knowledge and experience. For example, one educator wanted longer-term access to professional recording equipment in order to carry out the 'Fundamentals of Field Recording' toolkit. Other teachers expressed interest in the 'Controlling Your Online Presence' toolkit but commented that most social networking websites are actively blocked on their school's internet server.

For instructors with limited experience integrating digital media or those less familiar with specific content, such as digital storytelling, there was interest in attending an in-depth workshop where Youth Radio could guide instructors through using and teaching the toolkit lessons.

Other educator suggestions included adding time estimates to the toolkits, developing lesson "hacks" to enable educators to more easily adapt the lessons for various audiences (e.g., younger students), and creating other or more comprehensive toolkits. One teacher commented:

"It would be great to build a longer and more comprehensive curriculum based on the toolkits because I think a lot of thought has gone into them and it shows."

Youth Radio's podcasting course on KQED Teach represented this type of extended curriculum, developed for teachers to deepen their own understanding and abilities to

produce media and engage young people in it.

Toolkit Impacts

As a result of working on the curriculum toolkit development, Youth Radio interns gained knowledge and experience in how to design and structure lesson plans. Youth participants expanded their



Source: Screenshot courtesy of Youth Radio

teaching practices, and shifted from being consumers of adults' lessons to producers of their own instructional materials. The youth producers recognized the importance of curriculum development, as others began to use and give feedback on the toolkits. Youth Radio interns said:

"I definitely gained another perspective of teaching... There's just so many different sections of how to teach... which completely blew my mind."

"You have to have the order of this lesson plan. You can't just say...oh, let me tell you this real quick. It's like you have to have a set structure."

"It's incredibly important [for youth to be involved in lesson development... The perspective is different. The experience is different. The mutual understanding of your age is different... Kids sit in class all day learning from people who are older than them...but when

someone who is teaching you... is the same age... You can relate a thousand times easier."

As the youth producers widened their curriculum expertise, they fine-tuned their ability to design and package toolkits that would engage teachers and youth to learn and apply the analytical and media making concepts and skills practiced at Youth Radio.

Providing educators with curriculum developed collaboratively by youth and professional media producers offers multiple benefits for teachers and students. Specifically, educators identified three types of impact – student learning, enhanced confidence, and new perspectives.

Learning to Make Media

Engaging in the interactive, hands-on lessons in media production, students learned a variety of skills, such as how to interview, how to operate microphone equipment, and how to create an infographic. Educators explained:

"I think [my students enjoyed the toolkits because of] the equipment and the way in which the information was presented and the fact that they felt like they had gained a new skill by the end of it... They came away with tangible skills because they were actually taken through something that they hadn't known to do... that they learned to do it by the end."

“Our students had to collect interviews on their own, from both their peers and adult experts, after our session discussing ‘The Art of the Interview’. Going over the different types of interviews spurred them...develop strategies for their interviews, which they actively reflected on with us afterwards.”

“The DIY infographic toolkit does a good job explaining how to take data and tell a story visually, how to make your data visually appealing... I think my students learned how to think about the reader and how to visualize the data they collected to have an impact on the reader.”

The toolkits engaged young people’s interests and led them to learn about and practice new media skills.

Increased Confidence to Investigate and Tell Stories

By implementing the toolkits, both educators and students gained confidence in using digital media and technology. One educator with no prior experience teaching digital storytelling described how the toolkits helped increase confidence to experiment with media and journalism in the classroom. This educator also reported that the the students “were more confident and effective as reporters thanks to the skills we used from this toolkit.”

A high school ESL teacher said:

“I think [my students] definitely felt more confident... I had a lot of shy girls in my class...A lot of [my students] are immigrants, all English language learners...So I think [the toolkits] promoting curiosity as an expressible thing like if something sounds interesting, follow up on it and ask questions...Go be curious about things... I think they were feeling like they were able to use technology to tell a story and to kind of capture information and then turn it into something tangible... That was a definite shift that I saw...If you want to know something it’s okay to ask and supporting that curiosity, I think, is something that [the students] carry into the other classes.”

Through the toolkits, students have opportunities to get a taste of Youth Radio’s work and develop the background skills and confidence to pursue questions and construct stories that matter to them.

New Perspectives

The toolkits supplied both educator and student users with alternate perspectives on pressing social issues, an observation that reflects Youth Radio’s longstanding purpose to provide youth-driven journalism that counters the dominant narratives in major media outlets. For example, one educator described how the Controlling Your Online Presence toolkit provided her with a youth perspective, and her students with a big picture view to critically reflect on their online presence.

It felt like [the toolkit]...gave me an alternative perspective...a more kid friendly perspective. [For my students] the whole benefit of the curriculum is the ability to kind of step into that landscape view and be critical of the larger picture...

"I think for [my students] it was a bit eye opening. They're so focused in on that individual tweet ...that they don't take a step back and look at the sort of landscape...the map of what they're doing online."

The majority of students in this classroom also believed they deepened their understanding of social media and how to manage their 'digital footprint,' as a result of participating in Youth Radio's lesson. One high school student said he discovered "that my social life online is not as private as I previously thought it was." Other students said they learned:

"To be aware of what you put on the internet,"

"the way that youth use media is different based on our different experiences," and

"how easy it is for information to be seen by anyone by simply searching up a name."

This and other toolkits offer a conceptual framework for students to consider the various dimensions of their online presence and the consequences of media and technology use in complex ways.

Summary

As part of the NEXT project, Youth Radio expanded its efforts to document its pedagogical practices and to share knowledge about informal STEM teaching and learning through the development and marketing of educator resources. The primary product of this work are curriculum toolkits designed for both formal and informal educational setting across multiple disciplines. Teach Youth Radio became the organization's official education site to showcase student-centered curriculum tools. Youth producers, in collaboration with teaching staff, developed these DIY media toolkits to enable educators nationally and internationally to incorporate elements of the Innovation Lab's work into their own teaching.

Findings suggest that educators find the curriculum resources to be interactive and engaging, in part because they reflect and emphasize youth voices and facilitate dialogue among students and teachers on issues that young people care about. Educators want instructional resources that they can easily adapt to their own teaching context to help youth develop media literacy. Teachers reported that their students gained understanding and confidence and picked up new skills related to the analysis and use of media and technology.



Source: Image courtesy of Flickr via CC licensing.

Audience Impressions of STEM Media

In the final year of the NEXT grant, Rockman evaluators conducted audience focus groups with youth and adults in order to:

- Understand the intuitive ways that people use and interpret Youth Radio's interactive apps and stories the first time they are encountering the media,
- Gauge potential audience members' level of interest and likelihood of future use, and

- Gather feedback and recommendations to inform future Youth Radio products.

Rockman recruited participants who were interested in journalism and digital media that address issues facing the environment and local communities. Two focus groups included young people, aged 15-24. Two focus groups included adults, one of which comprised educators.

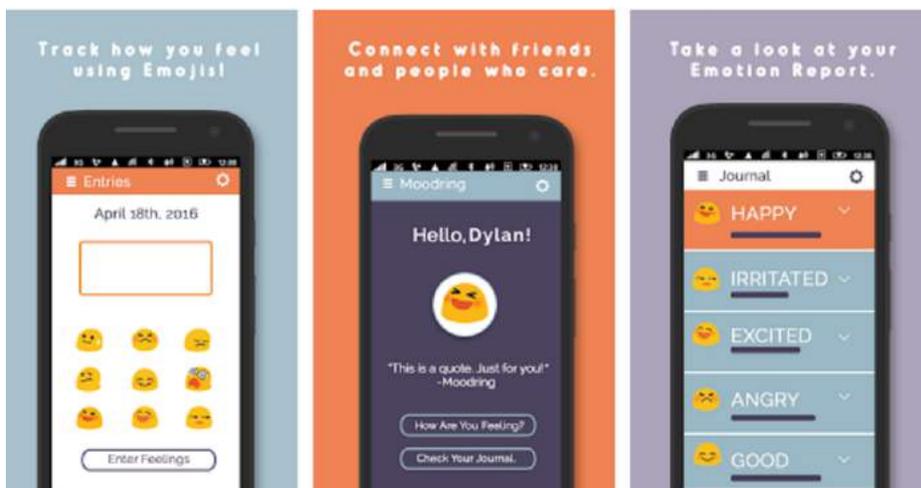
Prior to each focus group, participants were presented 2 mobile apps or interactive websites and 2-3 related stories. Participants were provided a brief questionnaire to ensure they reviewed the products and to help organize thoughts prior to discussion. Participants reviewed the following media:

Mobile Apps and Websites (Available at: <https://youthradio.org/yri/>)

- 'West Side Stories' (interactive website) about gentrification in Oakland
- 'Trick or Treat' (interactive website) about lead toxicity found in candy
- 'Bucket Hustle' (mobile app) about the drought in California
- 'Mood Ring' (mobile app) to help users track their emotions, and encourage them to connect with people they trust when feeling down.

Stories

- 'When Depression Hits, Teens Find Help,' NPR segment about teen depression and the Mood Ring app



Source: Screenshots of Mood Ring mobile app courtesy of Youth Radio

- 'How We're Making "Mood Ring,"' article about the making of Mood Ring mobile app
- 'Teens Say California Drought Makes Tap Water Taste Funky,' news story about California's historic drought.
- 'Oaktown Tour,' radio segment on NPR's Morning Edition about gentrification in Oakland, related to Oaktown interactive website
- "Double Jointed: The Science Behind Turf Dancing," documentary short exploring social and scientific aspects of urban contortion

General Impressions

Many of the adult participants were familiar with Youth Radio in a general sense, having heard a news story on NPR. Only a small number of youth participants had any prior knowledge or impression of Youth Radio. No participant had previously used or encountered the youth media reviewed in the focus groups.

Overall, focus group participants characterized Youth Radio as an engaging platform for young people to share their perspectives on critical issues facing their communities and the environment through interesting and informative multimedia tools.

A youth participant said, "Youth Radio's media products were well presented and showed the different perspectives of the community, engaging with different or similar issues." Other teenagers we spoke to believed Youth Radio wields "tools

for youth to speak out" to provide "input about what they see in their communities."

Respondents understood Youth Radio as a vehicle for young people to express themselves and investigate issues that matter to them. One adult participant described Youth Radio as

"a youth empowerment and advocacy project that has taken the old tools of oral history gathering, built a trusting community, refined a training model, and is now harnessing and unleashing the multi-platform, multi-media possibilities of the digital universe."

All participants thought the final products represented high-quality and creative media that captured "stories relevant to the life of teens." Many respondents expressed feeling inspired by seeing "expert, polished pieces that you can't easily differentiate from media by adult professionals" (adult).

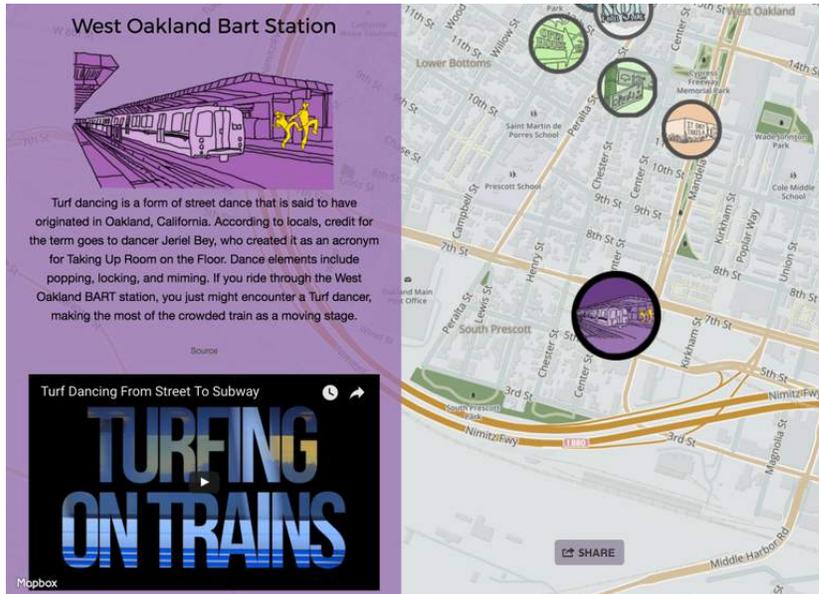
In addition to professional-level quality, participants found the products easy to use with accessible content, as well as visually and audibly appealing. Participants said:

"Youth Radio's media products are incredibly interactive and easy to navigate. The production quality is high and the content is very easy to understand and digest." (Adult)

"The accessible, stylish, thoughtful media addresses ongoing

dilemmas, points of hope, and a diversity of experience.” (Adult)

“There are great dynamics...everything transitioned very smoothly”



Source: Screenshot courtesy of Youth Radio

Sharpened Youth Voices

While respondents believed Youth Radio’s products reflected comparable quality to other independent media outlets, they also identified “an authentic youth voice” in the news stories and apps. The products capture youth perspectives in “real life situations” and convey these perspectives in ways that are different than adult-produced media. One adult participant explained, “Because it is the youth who come up with the content topics, the stories are uniquely authentic, fascinating and real.”

Another maintained, “It’s clear that the kind of topics that are chosen

are coming from [young people’s] lived experience, and so that can resonate with many young people everywhere.” (adult)

In response to Double Jointed, a documentary about the science behind turf dancing, one participant remarked:

“[The video] had what seemed like a much more youth-driven narrative, the way that the story was told. It wasn’t like the curious, quirky NPR reporter coming to talk to the young people dancing on the BART. It was a young person talking to another young person.”

Putting youth in the driver seat of media production shapes the nature of the questions that get asked and the stories that get told. Audience members had a clear sense that the young people created the products about issues and problems taking place in California that were important to them. At the same time, many participants inferred that the media were developed in partnership with media professionals. In particular, educators we talked to expressed interest in better understanding how the youth and adult producers collaborate, wanting to know about the processes of enacting collaborative pedagogy.

Behind the Scenes of Learning and Teaching

Focus group participants wanted to look “behind the scenes” of Youth Radio’s productions. Only one

participant said that she was only interested in the media product itself, not the youth author or production process. Educators were especially interested in additional content that highlighted and explored the teaching approach, the learning processes and outcomes, and the young people themselves. They expressed a desire to “see and hear” how things function through the media production cycle. Others were interested in stories or information that showcase the youth producers themselves. For instance, educators said:

“Can Youth Radio share more with outsiders...about the youth, about the learning process, the difficulties and struggles of creating their products?”

“I’d like to get more context about how youth came up with the idea, what the purpose is...information on behind the scenes...I wanted to hear the youth tell their own experience. Like, ‘This is what part I played in making the app, and this is what I learned from the experience.’”

“You could put the youth up on a higher pedestal for the audience. Show us the youth designers. Who they are. What are their stories?”

Audience members wanted to get a chance to peer in to what makes Youth Radio and its youth producers special. Participants understandably want to know more about the people and process that lies behind the published products. Given the high

production value of the investigative stories and interactive technology, audience members want opportunities to examine the creative process of youth media and get to know the youth designers.

However, youth and adult leaders at Youth Radio have historically exercised caution when showcasing the youth producers. As a journalistic organization, they tend to focus on crafting and disseminating high-quality, informative products that examine aspects of young people’s social and physical environments, rather than focus on the young producers themselves. As journalists, they are trained to focus reporting on the story and avoid becoming part of the stories they are reporting.

At the same time, in today’s digital age, media content is often broadly shared on social media and thus open to multiple forms of audience engagement. Media organizations must acknowledge and deal with the reality that the media production phase no longer ends at the point of delivery. User generated comments and the sharing of media have become regular components of the “digital afterlife” of media, which has tremendous consequences on youth media making.

As a result, Youth Radio staff and students devote considerable time throughout production to think about what will happen after a story or mobile app reaches an audience. How will the story be interpreted? What potential positive and negative responses may occur? At what point

and how should an author become involved in the comment stream of a piece that an unintended direction online? In other words, youth producers “who undertake this kind of meticulous production work are constantly envisioning not simply what a story will look or sound or read like, but what it will do” (Soep, 2012, p.100).

The interactive nature of digital media creates unique opportunities and challenges to engage audiences, tell stories, and investigate issues in new ways. Thus, while exercising intentional caution with respect to draw attention to the authors and designers themselves, Youth Radio has sought ways to harness the power of audience engagement.

The Power of Interactive Media

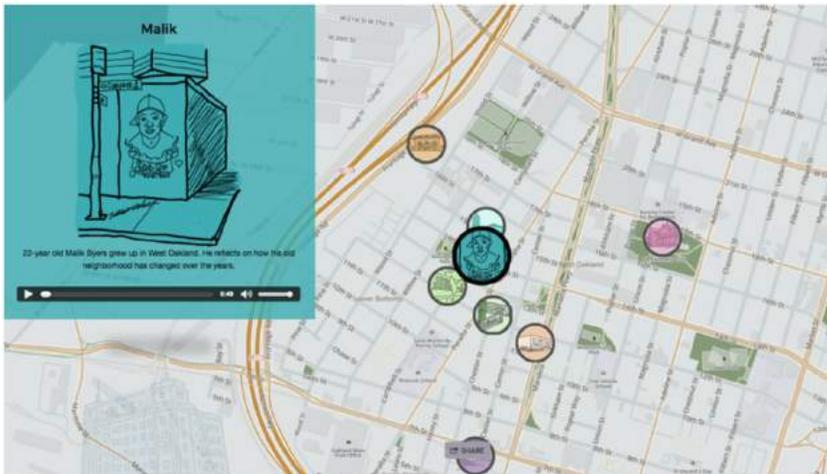
Journalists no longer merely report stories to consuming audiences. Increasingly, journalists are asked to engage audience members at various stages in the media production arc. A recent Reuters survey of news editors and executives found that more than half of respondents (54%) believed that

increasing audience engagement online was a top priority of their newsrooms (Newman, 2016).

By utilizing multimodal platforms to investigate issues and tell stories, Youth Radio has experimented with the affordances of digital media. This has allowed for a transition from mainly one-way flow of communication and passive audience relationship to one that is multi-directional and interactive. Focus group participants understood the diverse range of Youth Radio’s media that draws on visual, audio, and interactive storytelling.

In general, youth and adult participants preferred those media products that position the audience as active users who have opportunities to shape how they explore the issue or story. In particular, the web-based interactive West Side Stories captured the attention and imagination of focus groups members (See <http://youthradio.github.io/>). The interactive map of gentrification in the neighborhood of West Oakland explores the phenomenon from multiple perspectives by weaving images, video, artwork, and stories. As one educator explained:

“I found the interactive map of Oakland to be absolutely captivating and a phenomenal compilation of different sources... The map relates to all of our lives I think, given how widespread an issue gentrification is. I often seek out multiple stories and perspectives on issues I'm learning



Source: Screenshot courtesy of Youth Radio

about, so the map was helpful in providing those pieces.”

The intuitive, user-friendly design of the site made it easy to navigate and encouraged participants to linger. “I just found the platform...the aesthetics...so inviting...I just wanted to keep going,” added another respondent.

At the same time, the issue of gentrification strongly resonated with users’ own life experiences. Participants learned new perspectives on gentrification and also felt like they gained an understanding of its impact on Oakland residents. Participants drew connections to neighborhood changes they are witnessing in their own cities. For instance, young people from Buffalo, NY saw clear parallels between social patterns in Oakland and their own city.

“I saw a lot of similarities between the stories from the west side in Oakland and the west side in Buffalo... I vibed with the website...We live it.”

“The story of gentrification on the west side of Oakland is a similar narrative to the one on the west side of Buffalo. I have experienced it on both sides, moving in and moving out.”

“I really enjoyed reading [West Side Stories] and hearing people's stories of gentrification, because I've dealt with the same issues... I live in Buffalo, NY and as of late more people from the suburbs

have been moving to the city and driving black people out of their neighborhoods...Although I'm really happy that there's more neat stuff to enjoy in the city, I don't want to have to look back one day and say, This used to be my home and now I don't recognize it.”

The inclusion of multiple perspectives allowed users to see that gentrification has diverse, and at times contradictory, consequences. When a neighborhood undergoes redevelopment, new businesses and services may emerge. Beautification projects take place. However, at the same time, many poor and working class residents become displaced when they can no longer afford the rising cost of living. Historic sites may be demolished to make space for new builds. And the shared history and cultural traditions of the place can be lost in the process. As the Bay Area and the city of Oakland have prospered overall amidst expanding economic opportunities, particularly in the tech industry, West Oakland has undergone rapid transformations that Youth Radio puts on display.

The interactivity of the site encouraged people to peruse the stories and think deeply about a topic that has wide-ranging impacts. The integration of multiple forms of media allowed users to deepen their own understanding of the human costs of gentrification. “[West Side Stories] gave personalities and identities to the people who are

being displaced,” offered one teenager.

In some cases, young people gained new language to explain their lived experiences:

“Some of us might not have had the language about gentrification, but we’ve lived the experience. We understand it.”

“[West Side Stories] gave a name to what I’ve seen happening in my own neighborhood... It raised my awareness.”

In addition, some participants felt inspired by the interactive to dig deeper into their personal family history, explore the topic of gentrification, or discover more about local history.

“[West Side Stories] warmed my heart...It made me want to talk to my grandmother...I want to ask my grandmother questions about her life. I want to know more about gentrification.” (Youth)

“I really loved West Side Stories. As a newcomer to Oakland it encouraged me to take more time to learn about the history of the place and seek out elders and culture bearers to learn from.” (Adult)

By interacting with people’s stories and the map, users were able to reflect on a critical issue that permeates our culture. Moreover, participants appreciated that Youth Radio approached this controversial subject through a welcoming tone.

They recognized that the organization may have a strong social justice and equity-focused agenda regarding gentrification. However, the site frames the phenomenon in a way that does not attempt to impose conclusions or a singular narrative. An educator said:

“West Side Stories...I just found the platform so inviting...It dealt with some really heavy issues in a way that was not heavy-handed...It felt open ended, it felt even like a little bit guided by the user's interests...It seemed like they highlighted some progressive social policies and work being done in the neighborhood too.”

While using the interactive and reflecting on the phenomenon, some participants came to understand how they are connected to it. “I realized that I’m actually a part of gentrification,” one youth explained.

By approaching the issue in an engaging way, participants felt welcome to co-construct their own interpretations about gentrification. They did not feel as though they were being lectured or criticized, but rather, encouraged to think about the various ways that gentrification affects and is affected by people from differing backgrounds living in one place.

In producing the interactive map of gentrification, the design team thought long and hard about how to create a product that could effectively reach multiple audiences and not turn off particular groups.

One youth producer said, “When we started the interactive, we did not want to target anyone or make them feel guilty.” She added, “We were intentionally creating the interactive for open interpretation.” The production team wanted to help users to reexamine their own experiences and assumptions about gentrification in a safe space. By hearing different people’s stories and observations about gentrification, the team hoped to provide an interactive tool for users to gain consciousness of the complex nature and impacts of gentrification.

As with other areas of its reporting, Youth Radio effectively disrupted dominant narratives about a social phenomenon by exploring multiple dimensions through young people’s perspectives. The interactive, coupled with related news reporting, provides accessible data and compelling stories that show gentrification cannot simply be reduced to either urban development or cultural displacement. The mapping project thus offers a tool to contextualize and counter the prevailing narrative of gentrification as a single story of urban change spurred by wealthy newcomers supplanting longstanding residents.

Summary

The Innovation Lab produces interdisciplinary media that incorporates multiple forms of data and addresses a range of STEM topics. Following a reiterative design

cycle, youth collaborate on media that explore important questions on issues, such as, the effects of long-term drought, climate change, toxins in food, teen depression, and urban change.

The young people producing the media learned new content and practices to develop interactive technology for real audiences. This diverse body of work has impacted public audiences by raising awareness about social and scientific issues that affect young people’s lives. Using interactive media, audience members were engaged as technology users, not only listeners and readers. They were invited to co-construct their own meanings and encouraged to reconsider issues in light of different viewpoints.

Audience feedback indicates that users deeply value Youth Radio as a source for professional quality products that are easy to use and convey often untold youth perspectives in ways that are different than mainstream adult-produced media.

Focus group participants, particularly educators, wanted more insight into “behind the scenes” at Youth Radio. They desire content that illuminates the teaching and mentoring approach, the challenges of producing media, and the young people themselves. They want to gain a more in-depth understanding of the rationale and processes for collaborative youth media production so as to learn from or emulate Youth Radio’s pedagogy.

Conclusion

The ways that people read, write and communicate have changed. The media we have available have transformed. Young people are not only accessing and using these new media. Increasingly, youth are producing and publishing multi-modal texts that others are reading online. They are designing and developing new media tools and virtual environments that are redefining how stories are told. Informal STEM learning encompasses critical sets of knowledge and practices necessary to meet the needs of our rapidly changing and increasingly technological world.

Today's workforce needs to be prepared to collaboratively address complex problems and design creative solutions for the challenges of tomorrow. A majority of today's school-age youth will likely work in careers and use technology that require basic understanding and know-how in STEM. Currently, more than 70% of all jobs in the US are STEM-related (Langdon et al, 2011). Education policymakers, leaders, and teachers recognize the need to nurture all young people to be scientifically literate, regardless of home language, socio-economic background, gender, and ethnicity.

However, there is growing concern that there are insufficient numbers of qualified workers to fill STEM-related jobs. A recent survey of corporate leaders found that more than half of

current career opportunities require at least basic STEM literacy, and more than one-third require advanced STEM knowledge and skills, particularly related to computer science and informational technology (Business Roundtable, 2014). Moreover, women and youth from non-white, lower socioeconomic, and non-English-dominant backgrounds are disproportionately underrepresented in the STEM pipeline (NSF, 2013).

Despite broad awareness of the importance of STEM learning, youth in California and across the country frequently lack high-quality opportunities to engage in STEM-related thinking and practices. Pedagogical conditions necessary to support the development of science literacy are often not in place in schools. For example, a large-scale survey of elementary science education practices in California found that "only about 10% of the students in the state experience science instruction that regularly engages them in the practices of science" (Dorph et al, 2011).

During early adolescence, young people's interest and motivation to learn science tends to decline (NRC, 2011). Out-of-school programs like Youth Radio can play a crucial role in broadening youth interest and participation by providing hands-on, inquiry-driven learning that builds young people's STEM knowledge and skills. As communities across the country transition to the Next Generation Science Standards (NGSS), local school systems can

look to collaborate with out-of-school programs to provide multiple and different types of learning experiences that apprentice young people into STEM practices.

The Innovation Lab extended Youth Radio's longstanding collegial pedagogy in the construction of data-rich media across multiple communication platforms. Informal STEM learning at Youth Radio draws on both youth-centered and standards-based approaches. Proponents of youth-centered approaches argue for the need to nurture conditions where each learner feels his or her voice is valued. In this way, instructional practices recognize and value the knowledge and assets that each young person brings to the learning. Proponents of standards-based approaches maintain that young people must be inducted into a canon of core knowledge and skills and held to high learning standards. Instructional content is chosen because it aligns with predetermined principles, not because it builds on student interests.

Invoking Freire (1970), many educators refer to traditional teaching approaches as a banking system where students passively memorize and regurgitate information provided by the teacher. As Shor (1993) argued, "students are not empty vessels to be filled with facts, or sponges to be saturated with official information, or vacant bank accounts to be filled with deposits from the required syllabus"

(p.26). Instructional practices that center on rote memorization in a narrow range of skills risk leaving youth incapable of navigating the rapidly changing terrain in an information age.

However, Youth Radio demonstrates that a youth-centered approach need not sacrifice high professional standards, and vice versa. Young people and adults can both be placed at the center of the curriculum.

Youth Radio educators actively disrupt dominant ways of thinking about poor youth and communities of color. The deficit model that prevails in education institutions leads some educators to underappreciate and devalue the background knowledge and life experiences that poor and minority youth bring with them. Indeed, the cultural and linguistic assets of historically underrepresented students are often construed as problems to be corrected rather than building blocks and learning resources. As Gee (2000) writes:

"We rarely build on their experiences and on their very real distinctive lifeworld knowledge. In fact, they are often asked, in the process of being exposed to specialist domains, to deny the value of their lifeworlds and their communities" (p. 66).

Youth Radio staff and youth producers turn this dominant discourse on its head by collaboratively negotiating both the processes and products of informal STEM learning. This approach

intentionally situates media production in the context of young people's interests, observations, and life experiences. At the same time, STEM professionals and educators engage in overt instruction to explicitly elevate young people's awareness of reiterative design processes and to apply these practices in the creation of interactive data-rich media.

The Innovation Lab provides opportunities for youth to create data-rich media that combines journalism and technology production by exploring issues and stories that impact youth communities. To enable this multi-modal media production, Youth Radio applied its collegial pedagogy to new media making. Youth drive the dialogue. Youth identify the problems they investigate. Youth devise the questions that get asked. Youth define and collect the data. Youth design and create media that they publish for real audiences.

Given the growing expectations and demands of school and work spheres, educators must craft inclusive learning spaces for youth who are historically marginalized from STEM education. Youth Radio reflects the transformative potential of a critically conscious pedagogy that exercises political clarity and advances high expectations for all young people. In the words of John Dewey (1922):

"What will happen if teachers become sufficiently courageous and emancipated to insist that education means the creation of a

discriminating mind, a mind that prefers not to dupe itself or to be the dupe of others? Clearly they will have to cultivate the habit of suspended judgment, of skepticism, of desire for evidence, of appeal to observation rather than sentiment, discussion rather than bias, inquiry rather than conventional idealizations. When this happens, schools will be dangerous outposts of a humane civilization" (p. 141).

Youth Radio represents one such "dangerous outpost of a humane civilization," standing at the forefront of broadening who has the capacity to shape local and national dialogue on pressing social, political, and scientific issues affecting young people. As such, Youth Radio is working to advance equity and social justice by broadening youth civic participation through data-rich journalistic media production.

This goal is achieved by constructing an atmosphere for learning that respects and recognizes diverse social and cultural backgrounds and perspectives. Within this environment, care is taken to develop relationships that honor youth voices and stories, while critically analyzing and stretching young people's ability to deconstruct and act upon the world around them.

Drawing on collaborative youth-adult relationships, STEM gets interwoven into this informal setting by connecting STEM content and practices to young people's lived experiences. Armed with genuine

interest in and understanding of the youth producers' lives, Youth Radio educators draw creative linkages between professional and youth discourses. As the youth develop their capacities as producers of technology and journalism that examine the social world, they learn to research and develop solutions to real-world problems.

Youth Radio leverages young people's interests, sociocultural resources, and funds of knowledge to collaboratively create journalistic STEM media that inform and are informed by diverse youth communities. This collaborative approach to design thinking fosters dynamic learning environments where youth from diverse backgrounds engage firsthand in STEM learning.

Communicating ideas across media platforms and using varying degrees of audience participation and interaction is hard intellectual work. It requires conceptual understanding of the topic or idea, solid command of multi-modal communication strategies, authorial voice, and technical skills to translate ideas into code. We tend to fixate on the teaching of coding as a key mechanism to national economic growth and securing technology-related jobs for Americans. While important, coding represents a tool that can be equally applied for social good, profit-making, or corrupt purposes.

Youth Radio's approach to transmedia production views coding

“as a place to begin, not an end in itself” (Soep & Lee, 2016). This work compels STEM educators to ask, and prepare their students to ask, “What is the purpose, value and impact of the thing I'm making? Is my product, and my process, part of a solution or part of a problem?” (ibid).

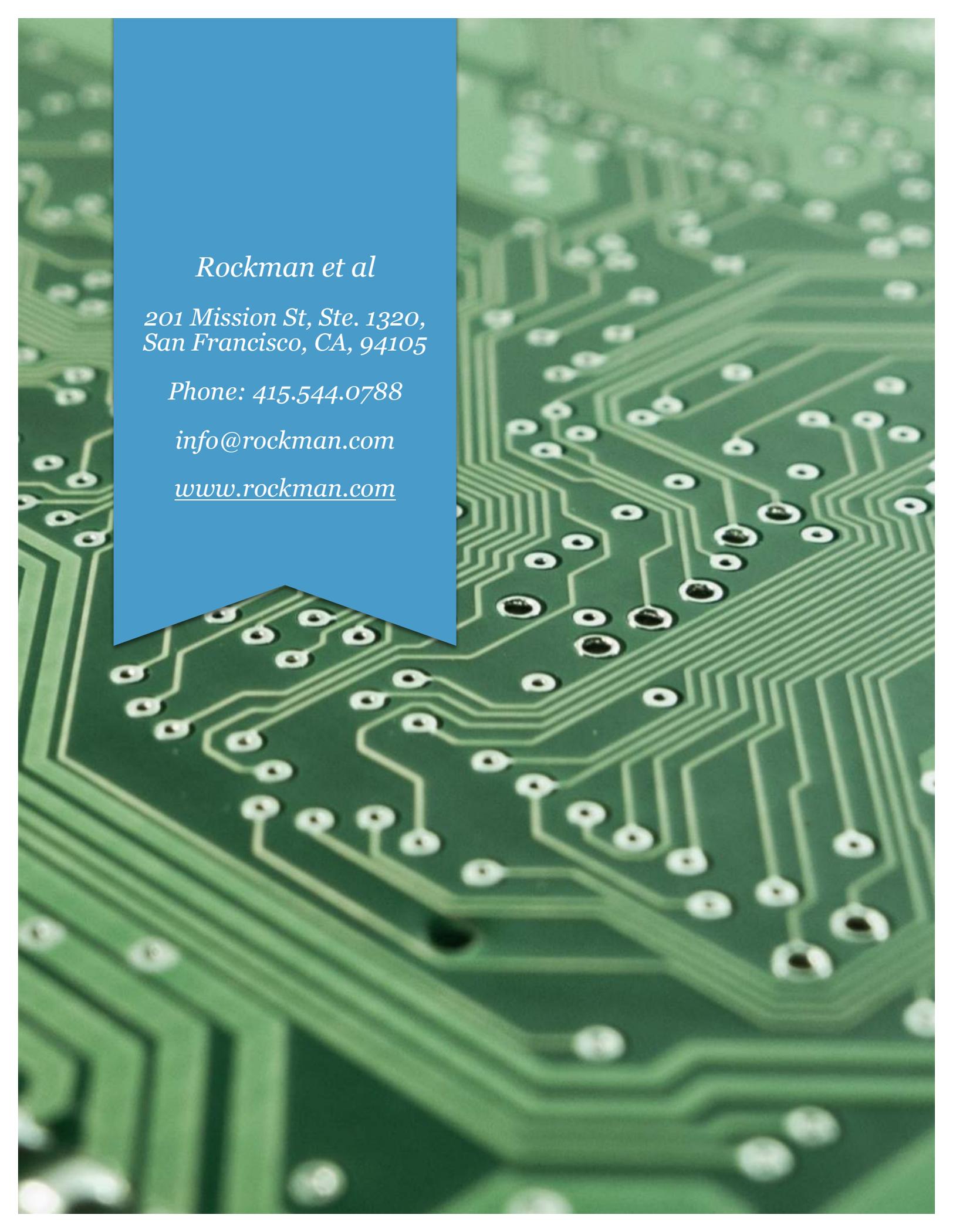
Youth Radio's commitment to enact a collegial pedagogy pushes staff and young people to continually consider the underlying purposes of co-constructing media that combines journalism, design, code. Youth Radio producers have opportunities to experience STEM as a process that reflects their lives and to learn ways to take action through media and technology innovation.

Youth Radio produces media that is answerable to real audiences and seeks to cultivate opportunities for open and thoughtful dialogue across social and political viewpoints. As digital technologies emerge, the organization has sought to engage audiences using print, radio, and interactive media. The Innovation Lab established a space to experiment with mixing media and tools for storytelling. Although it is easy to become engrossed in the technology, the technology in and of itself will not necessarily lead to productive learning outcomes for youth or audience participants. Thus, the quality and integrity of the story remains the most essential element in developing Youth Radio's STEM-powered media and in shaping its impact on the world.

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The background of the entire image is a close-up, slightly blurred photograph of a green printed circuit board (PCB). The board features a complex network of white conductive traces and numerous circular solder pads. A solid blue banner is positioned on the left side, partially overlapping the PCB. The text is centered within this banner.

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