



EXTRAORDINARY EDUCATOR EXPERIENCES 2013



Center for STEM Learning
UNIVERSITY OF COLORADO BOULDER



SEND SOMEONE TO AFRICA AND THEY WILL BE INSPIRED.
SEND A TEACHER, AND THEY WILL INSPIRE OTHERS.



Professional Development like none other...

Similar professional development opportunities for teachers are widespread as summer programs through organizations nationwide. However, there is currently a lack of in-depth research investigating the actual benefits and interpretive nature of such programs as personal and professional science learning experiences for the individuals who participate in them.

This project not only provides life-changing opportunities for educators who could not otherwise participate in such a program, but also includes a research agenda that examines the educators engaged in these extraordinary professional development experiences in order to better understand their impact and value in terms of educator professional identity, improved classroom practice, and student outcomes.





Year 2: Highlights



This project is about inspiring teachers. It focuses on the professional development of science educators through extraordinary learning experiences. Such experiences are potentially life changing, involve opportunities to take risks, and purposefully integrate wonder, curiosity, and passion within STEM learning.

This annual report marks the conclusion of the second year of the three-year project funded by the Merck Company Foundation. For many years XSci has offered programs that take teachers on extraordinary science learning journeys. On these adventures, teachers gain direct, first person experiences of unique and often challenging envi-

ronments and multidisciplinary science within those settings.

Year 2 Highlights:

- XSci Michigan Partnership
- 2013 cohort expedition
- ELVIS - Research Model
- CESLN Growth
- Move to CSL at CU Boulder
- TED Talk - Experiential PD
- STEMx Dissemination
- Conference website and RFP
- Roots & Shoots participation



...“there is currently a lack of in-depth research investigating the actual benefits and interpretive nature of such programs”

XSci Background

XSci (The Experiential Science Education Research Collaborative) is a part of the new Center for STEM Learning at the University of Colorado Boulder.

The central focus of XSci’s work and the underlying theme for this project is science identity construction – or the degree to which science is integrated into one’s sense of self.

This work involves exploring the psychological and sociological processes by which people become inspired by science, engineering, technology, and mathematics (STEM) to the point of personal relevance, ownership.

Science identity construction incorporates the self into the learning equation as an essential element to meaning making and agency formation and is viewed as a critical precursor to science literacy.

Therefore science identity construction is potentially important to promote STEM career choice, and for our science teachers... to enrich their self-concepts and capacities as passion-

ate professionals able to ignite lifelong curiosity and inspiration within their students. This is the goal of XSci’s extraordinary experiences.

Importantly, this project considers the larger picture surrounding such extraordinary experiences, including:

- The complete design process; pre-journey, journey, and post-journey components;
- The formation of durable educator cohorts as collaborative communities of practice that extend into the future.

Although XSci has extensively researched various aspects of these efforts, an end-to-end examination of the process as a whole, including a pilot satellite program in another state (outside of Colorado), is the work of this project in order to expand the program and export the process to locations and practitioners nationally.

Project Overview

The purpose of this project is to explore the value of extraordinary STEM learning experiences for educators through the intersection of fields of study: Science Identity Construction through Experiential Learning and the Narrative Study of Lives.

For several years the University of Colorado has offered programs that take teachers on “science-learning-journeys” to Africa, Peru, Hawaii, the Galapagos Islands, and other destinations through its Experiential Science Education Research Collaborative.

On these adventures, educators gain direct, first person experiences involving multidisciplinary science. These experiences are made more powerful and memorable because they are set within unique and often challenging environments.

Indeed, such professional development opportunities for teachers are widespread as summer programs through a variety of organizations nationwide.

However, there is currently a lack of in-depth qualitative research investigating the actual benefits and interpretive nature of such science learning programs in terms of constructing science identities for educators and the consequent impacts on their students.

With this proposed project, we intend to examine the experiences of K-12 educators engaged in extraordinary professional development experiences in order to understand the personal processes that make them extraordinary and valuable to the participants and their work.

Specifically, this research will examine the in-

terpretation of these experiences in terms of science identity construction and the resulting changes in classroom practice and associated student perceptions and outcomes due to that interpretation.

As such, participants will include K-12 teachers and students of varying ethnic and social backgrounds. Research settings will be both in classrooms and in the field on science-learning-journeys.

We’ve selected a case study research approach under the conceptual framework of a phenomenology utilizing several data sources:

- Teacher-created video documentaries as personal narratives;
- Narrative journals,
- Educator and student interviews
- Participant observations.

Analysis is based on a conceptual model linking experience, narrative, and identity to agency, choice, and behavior.

We know little about the value of these kinds of professional development approaches as lived experiences, how they are interpreted and given meaning by educators, how such experiences are integrated into the identities and practice of those who choose to participate in them, and the resulting impact on students. This project seeks to inform the field about these issues.



Knowing this information would:

- (1) Promote the construction of better and more effective experientially based teacher professional development programs** by connecting theory with practice and informing designers of the psychological processes involved and how to connect them to student outcomes;
- (2) Contribute to the growing research into science identity through the formulation of a new model based on identity theory**, innovative

research methods, and the ultimate findings of the study, and;

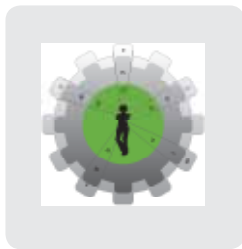
- (3) Empower educators themselves to become wiser consumers of experiential professional development** opportunities given limited resources (cost vs. potential benefit).

Research products communicating the findings of the study as papers, reports, presentations, and online components as the project deliverables will include:

- Detailed case studies of each case;
- A cross-case analysis
- An invariant structure description of the “essence of the experiences”
- A final synthesis and interpretation of findings including a refined conceptual model for the construction of science identity.

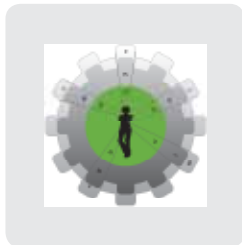
ORIGINAL YEAR 1 & 2 GOALS

To examine the design and the actual experiences of two educator cohorts (one in Colorado, one in Michigan) engaged in extraordinary science professional development activities in order to understand the impacts on participants' science identities and the resulting impacts on classroom practice and student outcomes.



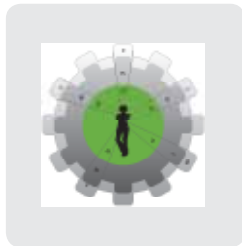
Objective 1

Conduct & research an Africa science learning journey with the Colorado cohort (summer 2012).



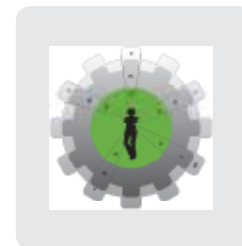
Objective 2

Conduct & research an Africa science learning journey with the Michigan cohort (summer 2013).



Objective 3

Articulate, execute, & evaluate the design process and the strategy for program export to a satellite location (Michigan).

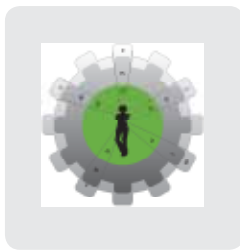


Objective 4

Create the infrastructure for in-person and online collaborative tools to support XSci cohorts into the future.

YEAR 1 & 2 UPDATE

Goal: To examine the design and the actual experiences of two educator cohorts (one in Colorado, one in Michigan) engaged in extraordinary science professional development activities in order to understand the impacts on participants' science identities and the resulting impacts on classroom practice and student outcomes.



Objective 1 Progress

Conduct & research an Africa science learning journey with the Colorado cohort (summer 2012).

Objective 1 Progress:

Research activities continue to examine the ongoing impacts of the Africa experience on Colorado educators involved in the 2012 Africa STEM Learning Journey. In 2013, this has included:

- Multiple post-trip educator interviews, including additional interviews with case study focus educators
- Post-trip educator surveys
- Multiple classroom research visits to observe teacher practice and student interactions

Notable outcomes to date include:

- One participant applying and accepted as a Fulbright Scholar to teach as a U.S. representative in

Japan, attributing his application to his XSci Africa experiences

- One participant being featured in documentarian and Academy Award Winner Davis Guggenheim's latest film about teachers (premiering on CBS in September 2013)
- Significant and continued interactions between the 2012 Colorado educator cohort and the 2013 Michigan educator cohort
- Educator creation/ participation in fundraising for African orphanages and schools

AFRICA

2013



Teacher Special Edition

Daughters.

How to pay it forward
and inspire your girls.

Climbing Mt. Kilimanjaro

Mike's amazing story of climbing Kilimanjaro
with 14 brave teachers from Michigan.

Guitar Hero.

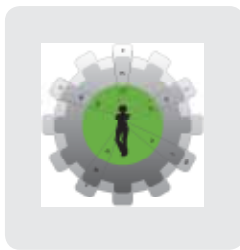
Bringing joy to an orphanage.

The Rooftops of Africa - One Man's Journey

An incredible journey combining music, triumph, friendship and courage.

YEAR 1 & 2 UPDATE

Goal: To examine the design and the actual experiences of two educator cohorts (one in Colorado, one in Michigan) engaged in extraordinary science professional development activities in order to understand the impacts on participants' science identities and the resulting impacts on classroom practice and student outcomes.



Objective 2 Progress

Conduct & research an Africa science learning journey with the Michigan cohort (summer 2013).

Objective 2 Progress:

The 2013 XSci Africa cohort successfully completed their pre-journey and in-journey deliverables.

They are currently working on their educator-created personal documentary videos in preparation for the upcoming film festival in November in Michigan.

Work on this objective has included:

- Establishment of the legal agreement between XSci and Michigan Technology Institute to facilitate the transfer of funds to support their work and scholarships to Michigan teachers
- Establishing a leadership infrastructure with the new XSci team at Michigan Tech and the Michigan STEM Network (a member of the STEMx national network, as is Colorado)

- Adoption and modification of the XSci program design for Michigan
- Educator applicant recruiting
- Participant selection through a needs-based review process (as per mandate to select educators who could not otherwise go without scholarship support). This includes underserved teachers and teachers of underserved populations (rural, urban, minority) and teachers with limited access to STEM professional development.
- Pre-Journey participant physical training
- Pre-Journey course content study (volcanology, biology, cultural anthropology, altitude physiology)
- Pre-Journey video creation workshop

- The Journey: Climbing Mount Kilimanjaro, teaching in African schools and AIDS orphanages, travelling through Tanzanian national parks and conservation areas (Serengeti, Ngorongoro Crater, Lake Victoria, Olduvai Gorge, and others)
- Post-Journey personal documentary creation (in process now)
- Post-Journey Africa Teachers Film Festival (scheduled for November 9th and 10th in Traverse City, MI)
- Creation and communication of multiple contingency plans and protocols for responding to various unplanned events
- Identification of “hidden skills” from participants and leaders prior to leaving on the journey
- Multiple info and contact packets in both hardcopy and digital formats for each leader
- Daily debriefings of the leadership team to share and compare notes, observations, and events (especially re physical and emotional status of participants)
- Requirement of leaders to be in top physical shape (well beyond that of participants)

Research activities and data collection efforts for the 2013 cohort:

- Pre-Journey 2013 Surveys, Individual Interviews, Focus Group Interviews
- In-Journey 2013 Individual Interviews, Observations, Focus Group Interviews
- Post-Journey Personal Video Documentaries in process (including versions with Director’s Commentary as per research protocol)
- Pre-In-Post Journey Journals Completed

Notable outcomes to date include:

1. Formulation of the Experiential Learning Variables and Indicators Scale (ELVIS) compiled from the research data acquired in this project.
2. Unprecedented “challenges” during the 2013 Africa journey (including: airline service cancellation to the Kigoma region, resulting in a last-minute diversion of the group from Gombe and the Jane Goodall research station to Lake Victoria with resulting refund complications from the airline and hotel, impacting various other trip elements; 2 cases of moderate acute mountain sickness (AMS) requiring unscheduled descent from Kilimanjaro for each; and 7 vehicle breakdown incidents in wild places). The leadership team of four (2 from Colorado and 2 from Michigan) handled the challenges extremely well and the post-trip debrief resulted in leadership design refinements based on this success, including:
 - Multiple redundancy built in for each leadership role
3. The formation of perhaps the closest-knit educator cohort XSci has ever seen. The Michigan participants have been extremely interactive both online (via the XSci social networking site for building communities of practice) and in-person through multiple pre and post trip mutual visits (despite educators being spread out across the state). This outcome is helping us to identify new elements to the “cohort effect” described in the 2012 annual report, and will further inform the research in terms of why and how this cohort has formed such strong interpersonal bonds.
4. An invited TEDx talk by XSci’s Dr. Brad McLain to discuss the XNI model (see below) and the research behind this project and other XSci initiatives. Talk date is November 1st, 2013.

MICHIGAN SATELLITE TEAM

The XSci Michigan partnership is a collaboration of several STEM organizations in Michigan including Michigan Tech and Michigan STEM.



Dr. Robert Warrington

Robert O. Warrington is currently Director of the Institute for Leadership and Innovation, which houses the highly interdisciplinary and innovative Enterprise program and the Pavlis Institute for Global Technological Leadership at Michigan Technological University. Dr. Warrington was previously Dean of the College of Engineering from 1996 to 2007.



James Emmerling

James joins the Michigan Leadership team as both a teacher and trainer. James is currently the director of the Lapeer County Math and Science Center where he directs PD programs for teachers and district leaders, as well as represents Lapeer County in statewide school reform.



Douglas Oppliger P.E.

Mr. Oppliger is a professional engineer and lecturer in the Engineering Fundamentals department at Michigan Technological University. He is the director of the High School Enterprise program which has a mission to increase the numbers of students pursuing post-secondary degrees and careers in STEM fields.



Paige Hackney

Paige Hackney is the Senior Staff Assistant in the Institute for Leadership and Innovation (ILI) at Michigan Technological University. ILI is home to several interdisciplinary programs including Enterprise, the Pavlis Leadership program, High School Enterprise, the XSci Extraordinary Experiences program.



ELVIS (Experiential Learning Variables and Indicators Scale)

7 Characteristics of Experiential Learning	Experiential Score (1 = Low, 5 = high)				
Locus of Control	1 Educator directed	2	3 Equally educator directed and learner directed	4	5 Learner directed
Physical Involvement	1 Sedentary	2	3 Equally active (hands-on) & sedentary	4	5 Exclusively active (hands-on)
Intellectual Involvement	1 Reading, viewing, listening	2	3 Both equally reactive and pre-active	4	5 Pro-active problem-based learning
Social & Emotional Involvement	1 Isolated	2	3 Equally collaborative & isolated	4	5 Collaborative
Context	1 Classroom based perspective	2	3 Both equally classroom based perspective and immersion	4	5 Full immersion
Element of Risk	1 No opportunity to take physical, emotional or intellectual risk	2	3 Moderate physical, emotional, or intellectual risk	4	5 High physical, emotional, or intellectual risk
Embedded Reflection	1 No reflection or no accidental reflection practices	2	3 Moderately structured & embedded reflection	4	5 Highly structured and embedded reflection practices

The ELVIS Rubric

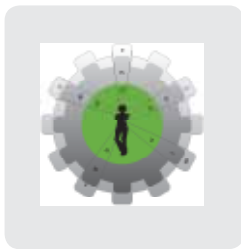
This rubric was specifically designed to bridge the persistent gap between research and practice by providing a research-based practical tool for use by educators, instructional designers, evaluators, researchers, and learners.

It features a combination of 7 notable (not exhaustive) characteristics of experiential learning, as presented in the research over the past 60 years and including notable results from the research associated with this project (specifically, the Cohort Effect as embedded within Social and Emotional Involvement, the concept of Narrative Transport as embedded within Context, and the element of Risk, including physical, intellectual, and emotional perceived risks).

ELVIS can be used descriptively for evaluation or prescriptively for design. Each characteristic can be scored separately or in combination to yield an overall ELVIS score. Cumulative ELVIS scores below 14 are considered low. Cumulative ELVIS scores above 28 are considered high.

YEAR 1 & 2 UPDATE

Goal: To examine the design and the actual experiences of two educator cohorts (one in Colorado, one in Michigan) engaged in extraordinary science professional development activities in order to understand the impacts on participants' science identities and the resulting impacts on classroom practice and student outcomes.



Objective 3 Progress

Articulate, execute, & evaluate the design process and the strategy for program export to a satellite location (Michigan).

Objective 3 Progress:

The original design template for the XSci process guided our articulation of the XSci model for export to Michigan. That template is shown below along with descriptors and progress for each of the numbered phases.

1. Program Selection

Africa was selected as the primary experience for this project - including emphasis on the science content areas of volcanology/geology, biology, and cultural anthropology.

The essential elements of this experience remain constant for both the 2012 and 2013 cohorts, while some specific aspects may vary. The associated activities for each cohort are divided into Pre-Journey, In-Journey, and Post-Journey categories. Each activity is synthesized into one of three experience maps, respectively, for analysis and evaluation for three types of impacts: emotional, intellectual, and physical. Notably in 2013, these experience maps have resulted in a new tool for the practical design and evaluation

of experiential learning programs, ELVIS (the Experiential Learning Variables and Indicators Scale) as presented in more detail on page 13.

2. Participant Selection

For this project we focused on teachers who could not otherwise participate without scholarship support and including teachers of underserved students in both urban and rural settings. The recruitment and selection process for the 2013 cohort was modeled after the 2012 Colorado process and then modified by the Michigan leadership team. It included the following:

Teachers were made aware of this opportunity through a variety of networks including the Michigan STEM Partnership, the Michigan Mathematics and Science Centers Network, and the National Science Teachers Association – Michigan Science Matters e-blast. MTU hosted the online application, which was opened for one week.

Approximately 500 Michigan teachers completed the online application during

**The Science Learning Journey
Design Process includes 7 steps:**

1. Program Selection
2. Participant Selection
3. Cohort Cohesion
4. Central Activity
5. Post Reflection
6. Dissemination
7. Extended Cohort



the one week that it was open. The applications were then sorted based on the Michigan STEM HUB overseeing each applicant's district and sent to that HUB's main office for initial review and preliminary selection. Each of the 5 Michigan HUBs chose 5 finalists from their respective groups and notified the applicants from their group whether or not they were selected to advance to the next round. The 25 round one finalists were then reviewed by a smaller state selection committee from across Michigan, which included:

- **Dr. Bob Warrington** (Michigan Tech)
- **Paige Hackney** (Michigan Tech)
- **James Emmerling** (Genesee Area Mathematics & Science Center)
- **Rebecca Wenglinski** (The Michigan Economic Development Corporation)
- **Megan Schrauben** (Michigan Department of Education).

This group hand selected and notified the 15 teachers chosen from the 25 finalists. The actual application was very similar to the one from Colorado.

The following application questions, among others, were used to differentiate applicants:

1. Describe your prior travel experience.

- The less prior travel experience a teacher had, the more impactful this experience would be. Teachers with greater travel experience already had stories to use in their classrooms, more likely had the means/knowledge to travel, and might already possess the expanded world view that travel provides.

2. Why would you like to go to Africa?

- Answers that expressed enthusiasm for the experience; such as, "I have always dreamed of going to Africa, but never thought it would be possible!..."

3. How would you bring this experience back into your classroom?

- Answers that described actual experiences they might have in Africa and how these experiences could be aligned with the goals of their lessons were given preferential treatment. Responses that mentioned other travel experience and its specific use in their classroom also received higher scores.

4. What do you think your strengths and weaknesses are as a teacher?

- Answers that reflected a passion for their students, teaching, etc. received more points.

Other favorable attributes were comfort with technology, or physical endurance.

It is worth noting that an important difference for the Michigan cohort was that no full scholarships were offered. Applicants either received $\frac{1}{2}$ or $\frac{3}{4}$ scholarships, based on need. This meant that all participants had to partially support/invest in their experience financially. We speculate that this may have contributed to the highly committed and successful nature of the Michigan cohort.

3. Cohort Cohesion

Cohort Cohesion includes activities that support cohort formation as a “Community of Practice”.

The 2013 cohort activities were similar to the 2012 Colorado group, and included:

- First fireside meeting (literally around a campfire)
- Two online and one in-person video workshops (training on the creation of documentaries and the operation of cameras and equipment)
- Altitude physiology training class including Acute Mountain Sickness treatments and prevention strategies)
- Social Networking & intro to XSci Africa online tools (see website: www.xsciafrica.com)
- Pre-Journey online content presentations on volcanology and African geology (including the biomes of Kilimanjaro), biology (including biodiversity, African and Serengeti ecosystem science, and animal behavior), Tanzanian culture, schools, and AIDS. Importantly for the 2013 cohort, participant teams themselves researched and prepared these materials via live online video presentations. We speculate that this too increased cohort cohesion and generated a closer tie to the science and other content encountered during the journey.

4. Central Activity Engagement

This includes the actual journey and associated activities with embedded reflections and research activities.

The activities within the journey itself included:

- 5-day ascent / 2-day descent of Mount Kilimanjaro (19,341 ft.) including participation in an altitude physiology science project using their own bodily changes for data (note that the 2013 cohort climbed Kili near the end of the journey rather than near the beginning)
- Teaching in African Schools and orphanages (including St. Timothy’s school in Moshi). This included the development of prepared lessons by participants working in teams prior to their journey as well as the assembly and dissemination of materials to African teachers and students (the 2012 cohort only made brief visits to these locations)
- Travel through the national parks and conservation areas (Serengeti, Ngorongoro crater, Olduvai Gorge, Lake Victoria, and others) for close encounters with the vanishing wilds and wildlife of Africa.
- Embedded reflections, journaling, focus group discussions, and filming for documentary creation.

5. Post Journey Reflection

Post-Journey Reflections include video editing, journal completion, extensive online group sharing via the XSci site and Facebook, the upcoming film festival, course product delivery, curricular development for their classrooms.

Activities in support of post-journey reflections included:

- Post-production of their video documentaries using iMovie editing software
- The XSci Africa 2013 Film Festival on November 9th -10th, 2013 in Traverse City, MI
- Submission of Director’s Commentary versions for each film (an important component for the

research)

- Journal finalization and submission

6. Dissemination

- Classroom implementation - resource sharing, classroom collaborations, networking with partners (e.g. Roots and Shoots), sharing videos of sharing with class, etc.
- Professional / Collegial Outreach
- Conference presentations, research papers and articles, collaborative curricula creation, website distribution of resources, short films, documentaries, etc.
- Activities and plans in support of broader dissemination are now being pioneered by the teachers and are a focus of the research for this cohort through 2014.

7. Extended Cohort

Extended Cohort Involvement includes alumni activities, involvement in other projects, further curricula development, involvement with other alums -- a continuing menu of opportunities to interact.

In addition to upcoming activities, it is important to note that the XSciAfrica.com social network continues to be a vehicle for 2013 teachers to share lesson plans and information. It also allows other teachers who were not selected for the scholarship to join and benefit from shared resources.

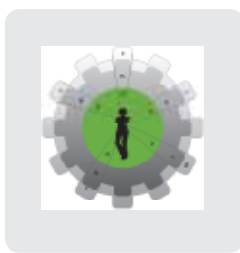




Sometimes the most rewarding and memorable risks we see teachers take are the ones they don't see coming. Pre-trip focus and nervousness typically lie with climbing the tallest free standing volcano in the world. Then when they least expect it, they take a risk even bigger than the one they feared the most. These transformative experiences shape and change how teachers see themselves as people, and as educators.

YEAR 1 & 2 UPDATE

Goal: To examine the design and the actual experiences of two educator cohorts (one in Colorado, one in Michigan) engaged in extraordinary science professional development activities in order to understand the impacts on participants' science identities and the resulting impacts on classroom practice and student outcomes.



Objective 4 Progress

Create the infrastructure for in-person and online collaborative tools to support XSci cohorts into the future.

The online components for the XSci-Merck Extraordinary Educator Experiences project proved once again to be essential tools for journey preparation, social cohort cohesion, the dissemination of course materials and communication, and the coordination of the research effort between researchers and participants. This has been especially true for the 2013 cohort, who have used and are continuing to use the site extensively. Recall that the online tools created for these purposes include:

The XSci Africa Social Networking Site (XSciAfrica.com). Built in WordPress and customized iteratively as cohort needs evolved. The site allows participants to post profiles, blogs, pictures and video, online journals, send personal and group messages, receive announcements and materials (rather than via email alone), share links and curricula.

The XSci Africa site also provides cross cohort interaction. The 2013 Michigan cohort has been interacting online with the 2012 Colorado cohort since awarded their scholarship. This interaction has

led to fundraising partnerships, teacher interactions and communication with other Africa teachers, and guest presentations from 2012 teachers during the 2013 online trainings.

The 2013 cohort will continue to upload class projects and resources to the site.

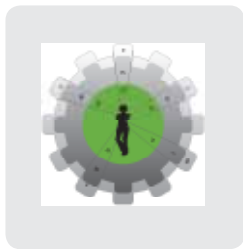
GoToMeeting Video Conference Service
We used this platform to conduct each of our online sessions as it features document and screen sharing as well as the best video conferencing quality available for mobile networking.

XSci Africa Basecamp Site
This online project management system formed the conduit for the XSci team to collaborate online and keep track of timelines, deliverables, and share and store materials and messages.

Additionally, it is now the archive of the many documents constituting the XSci Model Playbook – articulating the design process and details for the export to other locations.

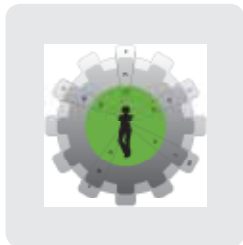
ORIGINAL YEAR 3 GOAL

To create a national conference on science identity construction through extraordinary experiences and poise the program for national expansion to additional satellite locations.



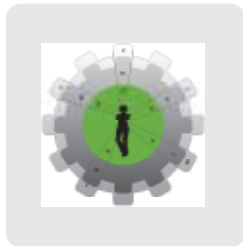
Objective 1

Conduct the first annual conference in the summer of 2014.



Objective 2

Identify future satellite locations and program collaborators.



Objective 3

Release research findings for national dissemination.



500
Participants

The 2014 Xperience STEM conference will be limited to 500 participants due to the nature of the experience. Participants will mostly consist of informal and formal K-12 educators as well as Higher Ed and research faculty.

3.5
Days

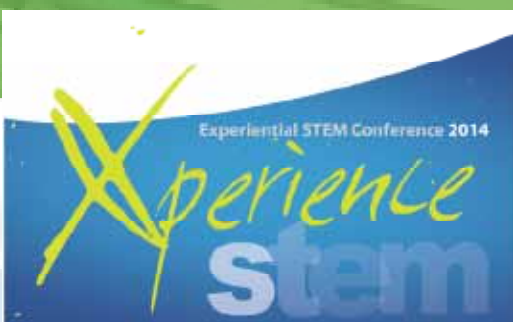
Xperience STEM will consist of pre-experience, experience and post experience days. Participants will have a pre - experience kick off, 2 days of experiences, and a hands on day for strategic planning to bring experiential STEM back to learners in all domains.

18
Experiences

Partnering with REI, Go Pro, Lego, Anatomy in Clay and others, the conference will consist of 18 experiences for participants to choose from. Since experiences last all day, participants may only choose 2 out of 18 to participate in.

1
Mission

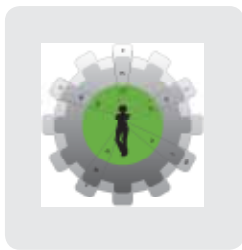
Xperience STEM is not your typical parade of Power Points. This conference get participants up and out of their comfort zone, and more importantly gives them tools to create and evaluate experiences they can take back to STEM learners in all domains.



Jul 29- Aug 1, 2014
Colorado Convention Center

YEAR 3 UPDATE

Goal: To create a national conference on science identity construction through extraordinary experiences and poise the program for national expansion to additional satellite locations.



Objective 1 Progress

Conduct the first annual conference in the summer of 2014.

Objective 1 Progress:

Work on this goal continues at a steady pace. Recall that the project team articulated the following goals for the conference:

- The conference will be experiential in nature. That is, attendees will be provided multiple opportunities to directly participate in experiential STEM learning short programs during the conference. Such experiences will include a range of opportunities from the very physical outings in the Colorado Rockies (to experience altitude, rock climbing, kayaking, orienteering, botany, etc) to the very intellectual (technology deconstruction labs, mobile Apps design workshops, etc).
- The conference will focus on raising the level and understanding of experiential learning theory as it is applied to STEM. This will be done through a combination of the conference activities, keynote speakers and special presentations, and nightly facilitated fireside chats following each day's experiences.

- The conference will include three primary tracks: K12 formal educators; informal educators; and higher education and research.

Recall that in order to reach a national audience, the project team formed the Colorado Experiential STEM Learning Network (www.CESLN.org) and is now representing the state of Colorado within the larger STEMx multi-state network formed by the Battelle corporation and supported by the new STEM Solutions annual summit sponsored by U.S. News.

Note that Michigan is among the newest members of the STEMx national network, thus increasing the possibilities for XSci program expansion to the other states (19 total) as a result of this project.

Also recall that XSci had formed two new partnerships to help sponsor the 2014 conference. The first is with REI, the recreational retailer. REI runs a non-profit outdoor skills schools with a complete menu of exciting training courses taught by a staff of knowledgeable instructors.

They have agreed to work with us on customizing several unique experiences for the 2014 conference. Additionally, we have discussed the possibility to mature this partnership in the future through REI's hundreds of locations nationwide to expand the reach of our Merck-supported efforts as well as the possibility of joining forces to offer their suite of programs as for-credit courses, similar to the Africa experience for teachers.

Secondly, Rocky Mountain National Park has agreed to support the 2014 conference by dedicating several of their ranger-led education programs. This will likely include an alpine cross section tour from foothills to arctic tundra along the continental divide, as well as several wildfire sites where re-introduction and re-habitation of species can be observed. To this list of progress items we now add the following:

- Inclusion of Les Stroud (Discovery Channel's *Survivorman*) as the conference anchor keynote presentation
- Partnership with the Lego Foundation (providing additional funding and a keynote)
- Participation and additional funding from the Battelle STEMx national network. Members of the national STEMx Network consisting of 19 states will be sending 1 representative from each state to attend the Xperience STEM conference. This is an important partnership and medium for a national marketing campaign for the conference.
- Partnership with Anatomy in Clay medical training solutions to provide unique experiences to participants
- Release of the Request for Proposals for participant-led sessions <http://www.xsci.org/session-rfp-2014-xperience-stem-conference/>
- Securing the Colorado Convention Center in downtown Denver, and associated surrounding hotels for block rates, for presentation events and lodging.

In order to provide meaningful in-depth experiences to participants, attendance will be capped at around 500 participants. It is our hope to make this an annual conference if successful.



Conference Content Update:

The conference will be divided into 3 areas:

- **Pre - Experience**
- **Experience**
- **Post - Experience**

Each section of the conference builds on the previous one. Therefore the attendees will leave the conference with a better understanding of how to create experiential learning opportunities for their students.

PRE-EXPERIENCE



The Pre-Experience portion of the conference will occur on Day 1 and prepare the attendees for their upcoming experiences by giving an overview of the experiential process and what they can expect in the days to come. The pre-conference will also touch on inspiration as an important component.

The key note for this portion of the conference must be inspirational in nature as well as experiential. Les Stroud from Survivorman fits both of these criteria and will be our keynote for the pre-experience and conference kick-off.

The Pre-Experience night will also include a STEM Gala and dinner for attendees to meet and greet one another prior to their 2-day experiences.

EXPERIENCE



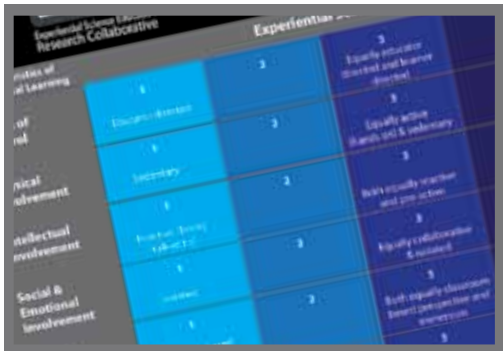
The conference experience includes 18 different indoor and outdoor experiences for participants to choose from. Experiences last all day for 2 full days (Days 2 and 3).

Participants will have a chance to choose their experience for both days upon registration. All participants must choose one experience per day unless they have registered for the 2-Day outdoor Wilderness Medicine experience.

Therefore, participants can only choose 2 experiences (one for each day). These range from indoor skydiving

(covering the science of flight, and the physiology of the vestibular system) to Lego indoor engineering, and much more.

POST-EXPERIENCE



The Post-Experience is the key component participants need in order to bring experiential programs back into the classroom.

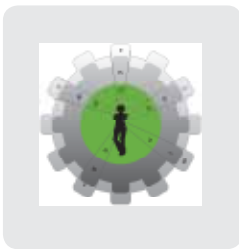
The Post-Experience is the “So-What” to the experiential process and examines the experience through the eyes of research in order to break down the components of a successful experiential learning program.

Participants will not only get hands on tools to replicate the experiential process, but they will also have the opportunity to see other successful programs, share

ideas and break into smaller groups to develop their experiential strategic plans.

YEAR 3 UPDATE

Goal: To create a national conference on science identity construction through extraordinary experiences and poise the program for national expansion to additional satellite locations.



Objective 2 & 3 Progress

Identify future satellite locations and program collaborators.
Release research findings for national dissemination.

Objective 2 & 3 Progress:

Work on Objectives 2 & 3 include the newly formed STEMx partnership. XSci represents the state of Colorado in the 19 state Battelle STEMx Network. The network was designed as a means for dissemination of best practices and programs, among other things.

Dr. McLain currently sits on the STEMx committee that oversees the dissemination protocol and has been able to mutually align many STEMx dissemination protocols with XSci's research and program development methodology.

STEMx will be sending 19 representatives to the Xperience STEM conference in 2014. One representative from each state will convene and use the conference as a annual meeting.

The XSci/ STEMx connection helps to identify additional satellite locations and program collaborators across the county.

Research

Research activities have progressed as described above along with the early release of partial findings through the new Experiential Learning Variables and Indicators Scale (ELVIS).

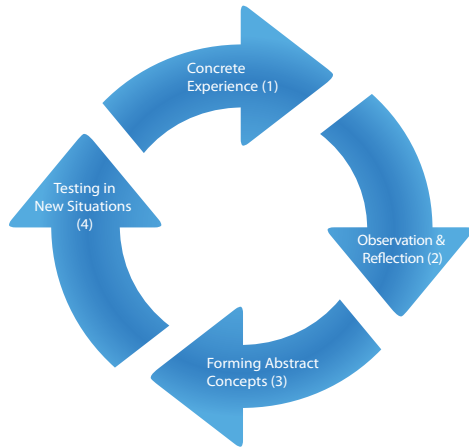
ELIVS is already seeing dissemination locally through XSci's work as part of the Center for STEM Learning and nationally through the U.S. News STEM Solutions Summit and national STEMx meetings.

A 3rd party Evaluation team has been brought on to examine success of the export of the XSci model to the satellite location in Michigan.

This evaluation will help to identify where the "road map" can be improved and how we can create and support better satellite locations nationally.

RESEARCH BACKGROUND

Experiential Learning Cycle



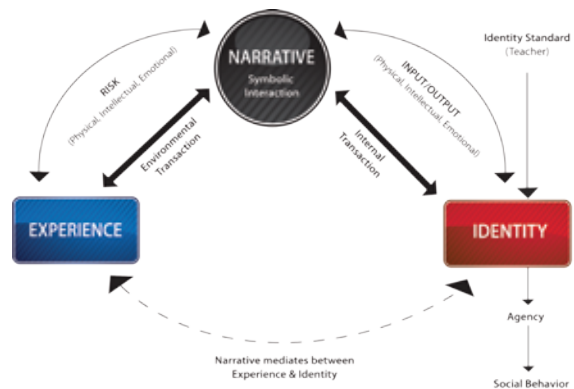
The research protocols for this project focus on the issue of science educator identity construction through extraordinary STEM learning experiences. The social science tools we are using serve to provide triangulation upon key factors known to impact identity, including self-appraisals and reflected self-appraisals, risk-taking decisions and behavior, embedded reflection, cohort effects, and capacity building.

Each of these areas represent important aspects of science learning and teacher training not often associated with traditional science teacher professional development or science education in general.

To anchor this approach, we employ two theoretical frameworks, David Kolb's Experiential Learning Cycle (presented above) and the XNI Model (also above) linking lived experiences (educational research) to identity construction (identity theory and sociology) through the psychological field of the narrative study of lives.

This new model has been developed by XSci's Dr. Brad McLain. Additionally, this study

XNI Model



includes the innovative research approach of requiring participants to create their own personal video documentaries as an explicit and highly structured form of reflection within the experiential learning cycle.

The participants also provide a director's commentary for their videos to provide researchers with a unique form of self-interview. Notably, this novel approach has necessitated the generation of new data analysis techniques for examining participant-created video narratives.

Analysis of data from each of the different sources, now from each of the 2 cohorts of educators, is the work of the project team for the remainder of 2013 and into 2014.

Finally, selection of a small sub-set of the cohorts for case studies is currently underway, with three educators from the Colorado Cohort already in process. These case study efforts include classroom observations and extended inquiry into their experiences and identity impacts.

ELVIS (Experiential Learning Variables and Indicators Scale)

Note that an early research product resulting from this project is the Experiential Learning Variables and Indicators Scale (ELVIS). This rubric was specifically designed to bridge the persistent gap between research and practice by providing a research-based practical tool for use by educators, instructional designers, evaluators, researchers, and learners.

It features a combination of 7 notable (not exhaustive) characteristics of experiential learning, as presented in the research over the past 60 years.

It includes notable results from the research associated with this project (specifically, the Cohort Effect as embedded within Social and Emotional Involvement, the concept of Narrative Transport as embedded within Context, and the element of Risk, including physical, intellectual, and emotional perceived risks).

The ELVIS tool provides a more comprehensive and diverse lens for comparing, designing, modifying and evaluating experiential learning programs of all kinds. Note that it is not STEM specific.

That is, it is relevant to experiential learning practice and facilitation across domains and disciplines -- an important point considering the national emergence of STEM schools in which STEM perspectives are integrated across all curricular components.

ELVIS is already being used in several Colorado school districts on a pilot basis and a scholarly paper is being presented based on this project and those pilot usages of the tool. Research related conference and professional speaking engagements germane to this project have been both local and national, including an upcoming TEDx talk (see page 28).

For 2012-2013, they have included:

- Identity Myths and Mysteries. Boulder Valley School District, (2013)

- ELVIS (Experiential Learning Variables and Indicators Scale) introduction and training. Colorado Roots and Shoots cohort, for the Jane Goodall Institute, Denver (2013)
- Education as Identity Construction. Adams 12 School District, Denver, (2013)
- Experiential Learning Theory to Practice. Adams 12 School District, Denver, (2013)
- Science Identity & the Narrative Construction of Reality. Colorado Experiential STEM Learning Summit, (2012)
- U.S. News and World Report STEM Solutions Summit, Austin, TX (2013)
- Experiential STEM. STEMx state leaders telecons and meetings, Nashville (2013)
- Through Jane Goodall's Roots and Shoots programs in CA, CO, and NY.

Science Identity Scale

Additionally, recall that an intended outcome for this project was research in support of a future Science Identity Scale.

This is to be a quantitative research and assessment tool based on the qualitative research efforts associated with this project. As such, it represents a important component for a mixed-methods approach to issues of science identity.

It now appears as though we will actually be able to produce a first draft version of this tool as a result of the Merck funding, setting XSci up for future validation of the tool with larger sample testing.

EMERGENT OPPORTUNITIES

Below is a summary of the unexpected or emergent opportunities that have directly resulted from this project and are poising the XSci team to magnify the impact of this important work.

As mentioned in the 2012 annual report, Teresa McLain was invited to attend a small dinner with Dr. Jane Goodall and had a chance to describe this project to her. The result was an invitation from Jane herself for the 2013 Michigan cohort to come to her Gombe stream chimpanzee research station in Tanzania as part of their Africa experience. Sadly, due to the airline service issues - this was not possible for the 2013 cohort. However, our relationship with Roots and Shoots has grown dramatically in 2013, including:



- The creation of a new hub for Colorado Roots and Shoots and the involvement of Colorado teachers (many of whom participated and/or applied for the 2012 Africa experience)
- Inclusion of ELVIS and XSci video research protocols emerging from this project in a newly redesigned Roots and Shoots teacher training program now being exported to both California and New York Roots and Shoots hubs
- XSci's Dr. Brad McLain now sits on the Roots and Shoots international steering committee for the Jane Goodall Institute
- Introduction of the Roots and Shoots program to the 2013 Michigan cohort as a structure and support for integrating Africa-related educational practice into their work

Inspire Me Africa Documentary Film: Over the past 4 years, the XSci team has been working on the feature film about the 2009 cohort of Africa teachers from Colorado. The film is finally completed and premiered on Dec. 14th, 2012 in Denver. Not only does this film depict the experiences of teachers similar to those occurring



here within the Merck sponsored project, but it follows three of them back to their classrooms to explore (anecdotally) how they chose to translate their experiences to their students.

This film was what originally formed the basis for the XSci-Merck project. In a delightful turn of events, several members of the Merck 2012 cohort of Africa teachers proposed that we use the premiere event to raise money for the African schools and orphanages that so touched their lives. We are happy to report that \$15,000 was raised. Additionally, the film has been picked up for distribution by American Education Television (also a partner of the STEMx network). Stay tuned for future updates.



Dr. Brad McLain has been invited to give a TEDx talk on the psychology of inspiration, including much of the work and research involved in this project. The event will be held Nov. 1st in Lincoln, NE and posted online as part of the TED talks archive shortly thereafter.



With XSci joining the new Center for STEM Learning (CSL) at the University of Colorado Boulder, we gain many new advantages. First we join an intellectually thriving and entrepreneurial educational setting with the integration of six different colleges across the University. The Center for STEM Learning is positioned as an innovative resource for local and national communities in STEM education and is serving as a national model in this respect for similar efforts across the country. Secondly, CSL is also a thriving mecca for innovation, experimentation, and fundraising in STEM education.

With this move, XSci has increased possibilities for dissemination of the results and findings of the Merck project and more possibilities for sustainability. Finally, the XSci mission to explore experiential STEM learning and science identity construction is a new but complementary addition to the CSL family of researchers and programs. With this project and others, we hope to spark many new and valuable efforts to improve STEM learning across the K-20 spectrum.



A LOOK AHEAD

These findings will not only contribute to the field, but will also specifically serve to improve the program as it grows and evolves in a research-based manner.

2014 Conference

Year 3 will include a focused effort on making the 2014 Xperience STEM conference a success in terms of gathering talented and motivated educators from across the nation, providing powerful 1st person direct experiences of STEM, and becoming more expert in understanding and employing the philosophies and practical techniques of experiential learning and science identity construction.

We are currently in the process of receiving proposals for participant-led sessions, seeking additional funding to support the conference. As mentioned previously, we are arranging for around 18 indoor and outdoor STEM adventures for the menu of experiences (12 so far secured), and managing conference logistics, including online registrations, all legal

agreements and insurance, locations, transportation, food and lodging, speakers, additional partnerships, and other conference considerations.

Research

Finally, year 3 will include the culmination of all the research activities. This will occur in the form of publications, conference presentations (already underway), video presentations, online through the XSci site as well as partner sites.

These findings will not only contribute to the field, but will also specifically serve to improve the program as it grows and evolves in a research-based manner.

YEAR 2 BUDGET

	Fund Expended*
Program Management and Implementation	
Staff Salaries	\$84,444
Fringe Benefits	<u>\$29,179</u>
Total Program Management and Implementation	\$113,624
Travel	
Site and Conference Travel	\$5,672
Project Staff travel to Africa	<u>\$9,119</u>
Total Travel	\$14,791
Participant Support	
Participant Teachers' Travel to Africa	<u>\$116,633</u>
Total Participant Support	\$116,633
Other Operating	
Contractual: Marketing and Website services	\$56,991
Conference promotion, recruitment and other	<u>\$13,423</u>
Total Other Operating	\$70,414
Total Costs (actual + encumbered)	\$315,462
Total Budget for Year 2	\$320,694
Remaining Balance to be used for Year 3 activities	\$5,232

*The reported amounts include encumbered expenses through the end of Year 2.

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