“How I do STEM” Community Awareness Campaign STEM Education Innovation Project Report

Micron Foundation STEM Education Initiative Grant

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Abstract

The purpose of this study was to investigate perceptions and knowledge of STEM (science, technology, engineering, math) careers in high school students as well as the skills and steps necessary to enter and succeed in those career fields. Students in the Lewiston, Idaho area were invited to interview STEM professionals through video documentaries, and then submit the videos for publication to the study team. The video portraits included short 3-5 minute YouTube videos in which a professional that uses STEM in the workplace (1) describes his/her job; (2) demonstrates a STEM practice (skills application); (3) comments on the college and career path he/she took or what it currently takes to have that job; (4) comments on financials of the career path, including financial aid and other cost management; (5) recommendations of high school courses and steps to pursue if one is interested in this career field.

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Section One: Introduction

The purpose of this study was to investigate perceptions and knowledge of STEM (science, technology, engineering, math) careers in high school students as well as the skills and steps necessary to enter and succeed in those career fields. Students in the Lewiston, Idaho area were invited to interview STEM professionals through video documentaries, and then submit the videos for publication to the study team. The video portraits included short 3-5 minute YouTube videos showing a professional that uses STEM in the workplace. Specifically STEM professionals were asked to describe his/her job and demonstrate a STEM practice (skills application). Comments were also requested on the college and career path he/she took, what it currently takes to have that job; financial aid and other cost issues related to that career and recommendations of high school courses and steps to pursue if one is interested in this career.

This study intended to introduce high school students to STEM professionals, providing background knowledge, real-world experience and personalization of connections to STEM career fields. The opportunity to see professionals in their places of work, and talk personally with them developed the potential in participating students to see themselves as potential STEM professionals as well. This project also incorporated social media and communications technology which was used to further interest and engage high school students in the data collection process, and made the project scalable to a larger audience participant pool.

Statement of the problem

Previous research completed by the Micron STEM Education Research Initiative indicated that residents of the Lewis-Clark valley showed a significant lack in knowledge related to STEM career fields and the necessary knowledge and skills to access post-secondary

education for success in these or other fields (Statewide and Community Survey Results, Project Reports & Data-Micron STEM Education Research Initiative-University of Idaho). Specific responses for Nez Perce county included: 46% were "not sure about how financial aid worked;" 40% were "uncertain how to help someone apply to a four-year college," and 47% were "unsure what high school classes a student should take to be successful in a four-year college" (page 63). Efforts must address these needs in a manner that speaks directly to high school students and residents of the Lewis-Clark valley. Additionally, the Micron STEM Education Research Initiative found that many stakeholders, including parents and policymakers do not have a clear understanding that Idaho students are underperforming in math and science (Statewide and Community Survey Results, Project Reports & Data-Micron STEM Education Research Initiative-University of Idaho, page 25).

Rationale

In an effort to address this need in an easily accessible and appealing way, in collaboration with Upward Bound STEM Access program, the first round of video production took place during the summer of 2013. The video project addresses the specific need for increased awareness of the path to post-secondary education, a statewide need to improve performance in math and science in preparation for STEM post-secondary education and career goals and in development of a positive attitude towards STEM professionals and career pathways. This specific project will provide students with a real-world perspective from local STEM professionals. Technology integration was also an important consideration in engaging digital natives in career exploration. As explained by Palfrey and Gasser in their 2008 book, digital natives learn through different processes, and cope with information in new ways, which generate new directions for understanding.

Content Standards

This project integrated content standards across multiple fields to address academic success, and career and college readiness through multiple national standards. The Common Core standards (In Idaho titled the Idaho Core Standards) define knowledge and skill levels expected of students upon graduation from high school. As defined by the Common Core State Standards Initiative (2010), these six principles shaped the development of those standards: (1) alignment with career and college expectations, (2) clarity and consistency, (3) rigorous content and knowledge application (4) building on current state standards, (5) informed by global academic practices, and (6) evidence-based practices. These standards address multiple content areas including Math and English/Language Arts, with a specific section of the English Language Arts Standards devoted to application in science and technical subjects for grades 6-12 (Common Core, 2012). The "Next Generation Science Standards" are also relevant to this project, addressing STEM careers, knowledge and skills, with the current version of the standards addressing engineering and technology alongside what we may consider traditional science content such as chemistry or physics (Next Generation Science Standards, 2013). As each district works to address this diverse array of standards in the traditional classroom setting, career and college readiness, especially that specific to STEM fields is addressed rarely to a depth that allows students the time to develop interests and aspirations that would lead them to investigate STEM career opportunities. This project was intended to provide that opportunity for personal growth in a scalable manner that appealed to digital natives.

Professional Significance of the Problem

The findings of this study potentially developed increased public understanding about the level of STEM knowledge, skills and related career pathways. Specifically, this public

understanding was addressed through the production of educational videos that provided information about planning for STEM careers, steps to take, and how STEM is applied in a variety of careers, avoiding jargon and terminology that could be a deterrent.

Previous research through the Micron STEM Education Research initiative identified a significant lack of this knowledge in the Lewiston area, which was selected as a target location for the project. (Statewide and Community Survey Results, Project Reports & Data-Micron STEM Education Research Initiative-University of Idaho, page 61). This study expands the knowledge base of available information related to this population, creating opportunities to address the primary concern that the general population, and high school students in particular do not receive sufficient information to prepare effectively for success in STEM career fields.

Overview of the Methodology

This project utilized a mixed methods data collection process through focus groups and an online survey. Students participating in the 2013 Upward Bound STEM Access summer program created the first videos and participated in face-to-face focus groups about this process. Students in the Lewis-Clark valley were invited to participate through online and in-person activities, followed by statewide requests for participation to all PTE funded high school Engineering and Technology Education programs in the online survey, following viewing of the student-created videos. Administration of the online survey took place through Qualtrics.

Section Two: Theoretical Framework and Applications

As this study progressed, the ability to guide teaching and learning practice, as well as the direction of the study emerged from the collected data and the experience of creating the videos with students. One such area was specific teaching practices in STEM fields. Changes in this

practice that provide personal connections to learning have the potential to improve student achievement and educational and career aspirations (Plank, Deluca & Estacion, 2005; Bevins & Ritz, 2011). As described by Kember, Ho and Hong (2008) students in any classroom can be more motivated to learn if they see the relevance of what they are learning, through daily life, current events or practice.

Teaching and learning through this project had the dual purpose of providing lessons in using video technologies to edit and produce a video for public viewing, as well as exposure to a variety of career fields in a real life setting. It was interesting to note that the student group completing the first videos was a population of digital natives, but still struggled with the technology on a hardware and software level due to not previously taking the time to master skills necessary to use their own devices.

Prior to the video composition and production lessons, it was expected that students were well versed in the technology necessary to complete the production process. As it became apparent that this was not the case, additional time was devoted to teaching students to utilize the technology to meet the primary goals of the project. Once the use of the technology was addressed, the focus again turned to the exposure to STEM careers in real settings, allowing students to make a personal connection with a STEM professional out in the field. This exposure to real world settings was intended to address statewide issues in the discrepancy between Idaho's high school graduation rate and post-secondary educational enrollment.

Multiple sources indicate that Idaho students rank in the top 25% nationally for high school graduation rates and in the bottom 25% in post-secondary educational attendance (Alliance for Excellence in Education, 2009, National Center for Higher Education Management Systems, 2012, Luna, 2007). The current system does not appear to meet student needs in

making a successful transition to career or post-secondary education after high school. Previous research indicates that employers from multiple industries are unable to find qualified applicants (Bevins, 2011, Bevins & Ritz, 2011), with others reporting industry changes that will require post-secondary education (Bevins, 2011, Career Readiness Certificate Consortium [CRCC], 2005). It is critical that students develop a greater understanding of STEM fields as they prepare for careers and post-secondary education. The Career Readiness Certificate Consortium (2005) stated, "In ten years, over 90% of occupations will require knowledge beyond that which is received in K-12 education. Post-secondary institutions will be expected to provide additional training and education to nearly the entire existing and future workforce" (CRCC, 2005).

Idaho will face specific challenges in addressing statewide academic persistence and achievement in address the shortage of STEM professionals. The Alliance for Excellence in Education (2009) reported Idaho high school graduation rates of 77-88%, with an 11% gap between state and independent sources, (AEE, 2009) which placed Idaho in the top 25% of all states in terms of high school graduation from public schools (National Center for Higher Education Management Systems, 2012). In a 2007 report to the Joint Finance Appropriations Committee, Idaho State Superintendent of Public Instruction Tom Luna stated, "We recognize that Idaho has one of the lowest percentages of high school students who go on to college. About 45 percent of high school seniors go on to college upon graduation" (Luna, 2007). The Alliance for Excellence in Education expanded on the impact of Idaho's high school graduation and college enrollment data:

> There is a well-documented earnings gap between high school graduates and dropouts—an annual difference of nearly $10,000. There is also a growing challenge for individuals with only a high school diploma to find stable, well-paying jobs. The costs of dropping out are born not just by individuals, but also by the communities in which they live, and the rest of society. The potential economic benefit of improving students' academic

> outcomes should be a wake-up call to the importance of reforming America's high schools. Dropouts from the class of 2008 will **cost Idaho almost $1.3 billion** in lost wages over their lifetimes. [emphasis original] (2009).

Providing students with the necessary knowledge and skills to pursue post-secondary education and career aspirations in and out of STEM fields will be essential to the quality of life that students can expect in Idaho, with a potentially significant impact on the state's economy.

Section Three: Methodology and Research Design

The Participants and Data Collection Procedures

Multiple student groups participated in this study. The initial phase of the project was designed to have Upward Bound STEM Access students create videos and to offer participation the wider Lewiston area community. An article in the local newspaper made the workshop open to the public (Appendix G), however only participants of the Upward Bound STEM Access project attended. The Upward Bound STEM Access students created a total of nine videos as well as participated in the subsequent focus group discussions. The videos meeting the qualification criteria (eight out of nine videos) are accessible to the public on the webpage http://www.uidaho.edu/ed/trio/stemaccess/student-videos. To create the videos, students participated in a workshop held at Lewis-Clark State College in conjunction with the Upward Bound STEM Access summer program. The workshop provided instruction in video editing and production, writing interview questions and emphasized professionalism in all contact with STEM professionals in the community.

In the second phase, student videos were posted in a public forum through the project website allowing viewers to see each video, followed by an invitation to complete an online survey. Participants in the second phase were targeted as science teachers from the public high

school in Lewiston, Clarkston, and Asotin (the Lewis-Clark Valley) and Engineering and Technology Education programs from around the state were invited to participate via e-mail.

Sources of Error

The primary source of error in this study was non-response error. Due to the age of the participants, parent or guardian permission was required to complete the survey. In the online survey, a question prompted participating students to obtain parent permission. If the student clicked no, indicating that permission had not been received, the survey could not be completed. With the diverse settings in which the survey was distributed, it became very difficult to obtain parent permission at an appropriate time. For example, a teacher could elect to show the videos during class time, but students would be unable to complete the survey at that time without parent permission, making it very unlikely that the survey would be completed.

The Results of the Collected Data

The target group of participants for this project was high school students in the Lewis-Clark valley. Due to this group being minors, parental consent was required to participate in the survey portion of the project. As submitted to the Institutional Review Board, a signed paper permission slip was necessary to complete the survey, returned to the student's teacher. This process greatly reduced student participation in the survey. The first response item of the online survey refers to age and parent permission. If students are unable to click "yes" due to age or parent permission, they are unable to proceed. Seventeen participants began the survey, but only ten were able to complete it. Descriptive statistics for these respondents are presented in section four. Primary data analysis will center on the data collected from the focus groups.

Section Four: Data Analysis and Results

Focus Group Data

Focus group discussions took place following the completion of the student video production workshop with students in the Upward Bound STEM Access summer program. Students were randomly divided into two homogenous groups to allow better participation in the discussion. Students were asked to discuss their responses to a series of eleven questions regarding their perceptions of STEM concepts and the process of preparing for and attending post-secondary education. The first question, "Do you think students must do well in math to get into college?" generated a 100% positive response. While students felt that some majors would require higher abilities than others would, they agreed that mathematical application was essential to all career fields and daily life. An example of this is seen in the student statement, "Yeah, because everything you do has something applied to math, whether it's currency, or just doing measurements, cooking, baking, everything has, everything applies math, either way you're going to have to learn it or at least understand it. You don't have to learn it to a degree where you're super good at it, but you'll eventually need to know it to excel in life."

The second question, "Do you think math is mostly about using formulas correctly?" generated a mixed response with many students believing that correct formulas were essential, while other felt that there was room for theory in mathematical application, specifically with development of new concepts. This difference of opinion may have been related to the ability level of students, in that those who were focused on formulas may not yet have been introduced to theory in mathematics.

Students agreed to the third question, "Do you think students must do well in science to get into college?", again referring to the major selected by the student. Overall, they appeared to

feel that it was slightly less important than math, but that it too was important for college admission and academic success. One student stated, “Like, I agree if you’re going for your arts degree in like music, or just fine arts, anything like that, I wouldn’t say it matters that much. I mean you will have to learn, you’ll have to know some basic terms and all that, but really not that if you went into like radiology, or something that required science. . .”

To the fourth question, “Do you think science is useful for solving practical problems in life?”, students cited many practical applications, as well as mentioning the use of science for fun, “You always, you need science for almost everything. I mean for practical purposes, I call it ‘Mentos and soda pop science’, because it’s just practical things that you know”. Students appeared to rely on scientific knowledge at different levels to address a variety of problems in daily life, ranging from physical, to chemical to biological.

The fifth question, “Would you like to be a scientist?” generated varying responses with students who were interested, some who definitely were not, and several who were undecided. “I think it might be cool to be a scientist, but I just, I don’t know if I could do it.” Students were also easily able to see the connections between science and their academic or career interests, extending to engineering and other fields such as psychology.

Student responses to question six, “Do you think scientific work is exciting?” also generated varied responses, based on student interest and aptitude. It appeared that those students who were interested in scientific subjects found it more exciting, and described prior classroom or personal experience that related to their interests. Those who were less excited by science appeared to have negative or uninteresting experience in science classrooms, based on responses.

To question seven, “Do you think you should be able to choose what to believe and what not to believe from science?” students cited multiple reasons on both sides. Some felt that

religious implications created that right, as well as hindered discussion of new ideas in some cases. Others cited new research and changing ideas as positives, citing the need to be open-minded, "I guess it depends on your beliefs. Like I said before, like a lot of people have different like religious beliefs, and some people go just based on science and so it kind of just depends on how you want to take it."

Question eight, "What value does technology or engineering knowledge and skills have for you?" helped students to relate to a definition of technology that went beyond personal electronics. Students cited examples from medical science to transportation as generally positive impacts on their daily lives. One student stated, "Okay, so like the engineering skills part, a bunch of people, I mean we have all of the transportation people, and it would be completely chaos without them, and we all have our own engineering, because we engineer ourselves to look good every day. I mean, getting dressed is a type of engineering…" Students viewed engineering as advanced problem-solving, addressing criteria and constraints to develop a potential solution.

Question nine asked, "Do you think you know the steps of going to college, the financial aid challenges to pay for college education, and the college admission exams?" The majority of the students felt that they were unprepared to make the transition to post-secondary education. Cited reasons included a lack of information provided at their schools, college preparation efforts taking place exclusively in the senior year, and limited counseling resources available at their high schools. Those students who did feel prepared to transition to college had made additional personal effort to gain necessary knowledge or had the opportunity to take a specific course at their high schools. Additionally, it appeared that those students who were better prepared to make this transition were older and therefore closer to the time that this would take place.

Only one of the two groups was able to respond to question ten at that time, because the

second group had not yet completed the video production process. The group that did respond to the question, “How did your perspective on STEM careers shift by making this video?” responded positively, such as, “I didn’t realize how wide of a variety there were that STEM reached out to. STEM is literally in almost everything we use. Everything that’s out there almost has STEM in it. Literally.” Students also generated more realistic perspectives of STEM career options, such as “And I wasn’t really that interested in the engineering part, so I thought that it was basically just sit in an office and do equations and look at data and figure out, ‘What am I going to do? How am I going to fix this?’ But I found out that you actually have both the in the office perspective and then you also go out into the community and have the different change of environment, and that’s what I thought was really cool was that you’d be able to have that variety in your everyday.”

The final question, “What did you learn about the pathway to get to a STEM career by making this video?” developed a variety of positive responses. Students gained a realistic perspective on the need to perform their best academically, to consider a variety of options, to seek ways to finance post-secondary education and to pursue their passions. “Especially like as an engineer, you know, like when *(name redacted)* said something about dedication. Dedication to an engineer means hard work, long hours of math, of data collecting, of multiple just ways of math and science and so it takes you to those harder, those longer roads, and that’s what businesses are looking for, those dedicated people, that are, ‘I can do this, and I’m going to do this’.”

Survey Question Data

The survey consisted of 23 Likert scale items with a 4-point response scale of Strongly Agree, Agree, Disagree and Strongly Disagree. Four open-ended response items and eight

demographic items completed the survey. The Likert scale items were generated in collaboration with the Social Science Research Unit who had generated the respective Micron survey questions through the Micron STEM Research Initiative (Project Reports & Data-Micron STEM Education Research Initiative-University of Idaho). Of the seventeen total respondents to the survey, three respondents (17.6%) were unable to complete the survey due to lack of parental permission. Removal of an additional six participant responses (35.2%) due to non-response error generated by omitting responses to six or more Likert scale items was necessary for data analysis. Based on descriptive statistics, the eight remaining response sets indicated agreement to strong agreement with sixteen of the twenty-three Likert items. (See Table 1 and Appendix D for further information.) The items that participants indicated some level of disagreement with were: "I find it hard to know what to trust about science because science is always changing"; "I know how to (help somebody to) apply for financial aid to attend college"; and "My family talks with me about plans to prepare for college admission exams, such as the ACT and the SAT". Items that generated an ambiguous response with a mean between 2.25 and 2.375 included "Scientific work is dangerous", "Scientists are as cool as other people", "I would like to be a scientist", "I should be able to choose what to believe and what not to believe from science" and "My family talks with me about me going to college".

Those respondents who indicated that they were students agreed that the financial challenges of attending college were discussed with family, but preparation and going to college were not. None of the student respondents had a parent with a post-secondary degree. Based on the reported ages of participants, the majority was not students, so were likely teachers or parents. It may be helpful in future iterations of this project to further delineate questions based on role, such as student, teacher or parent.

Data Analysis Summary

Overall, this project appeared to generate a variety of positive outcomes for participating students. These students were able to participate in the production of an educational video, gain insight and information on their post-secondary and career options as well as learn more about real STEM professionals in their local communities. Student responses would suggest that existing college preparation efforts are not meeting their needs, specifically not the needs of first generation students. The survey portion of the data collection process will need to be modified to allow broader participation by younger audiences. Expansion of the project beyond Idaho will create a greater knowledge base through the opportunity to view other videos, gaining exposure to a wider variety of STEM careers.

Section Five: Discussion and Implications for Practice

Discussion of the Results

Frazier (2001) stated that stakeholders need evidence of success to gain support for integrated STEM as a model in preparing our students to be productive global citizens. This project has the potential to expand into both a tool in providing students and their families with the necessary information critical to success in post-secondary education and STEM careers as well as to provide evidence of the success of STEM as a model.

While the survey results were limited due to participant age, those who did respond, along with data gained from the focus groups indicated that this project brought a realistic perspective to students as they complete high school and prepare for the transition to college and career. It is often assumed that students are prepared to enter college, but it would appear that at

least with this group of students, that is not necessarily the case. Due to limited exposure, they have biased perspectives of future career prospects and are unprepared, in some cases academically, and in some cases in navigating practices, but it appears that further efforts should be made to meet this need. Continuing and expanding the "How I do STEM" project may help address some of these problems locally and beyond.

Implications for Practice

As previously stated, the survey process will need to be modified to allow greater participation from a younger audience. The process of creating the videos appeared to be very beneficial to students, and could likely be incorporated into a variety of formal and informal educational settings. The ability to share this opportunity with students while balancing anonymity and privacy will be challenging. However, these issues may be addressed through careful deployment of online technologies. Expansion and continuation of the project could take place through a variety of forums, including contacting local STEM professionals to bring the project to schools, contacting building administrators directly, and creating a greater online presence may aid in raising the participation of targeted student groups. It is clear that this was a positive experience for participants, but some of the barriers to further participation will need to be addressed in the next phase.

Dissemination of results

The results of this study and plans for expansion beyond the Lewis-Clark valley as well as the State of Idaho will be disseminated through a variety of venues. At the International Technology and Engineering Teacher's Association (ITEEA) national conference in March 2014, a formal session presentation entitled, '"How I do STEM"- Community Video

Documentaries' and a Showcase/poster session entitled, '"How I do STEM" – creating video documentaries of STEM professionals in your local area' will be presented.

The STEM Access Upward Bound project is planning on a second phase of this video production project to expand the amount of videos on its website. This will increase the variety of STEM professionals and number of videos available of the website. Students will engage in a brainstorming session on how to increase dissemination of the videos as resource to high school students and the wider community. The plan to utilize the Idaho Career Information System, the local Lewiston library, and other potential venues as outlined in the original proposal will be pursued in this second phase.

Suggestions for Additional Research

Due to the limitations imposed by the requirement of parental permission, it would likely produce greater response if the survey were modified to allow parental permission to be reported in another way, providing more opportunities for student participation. Maintenance of participant anonymity while collecting this permission would be challenging but essential to the success of the project.

Multiple respondents indicated that STEM career studies often overlook the connection to Career-Technical Education, focusing solely on four-year degrees. It could be discouraging to students and families who are more interested in Career-Technical Education options. Based on our statewide population and industries, it may be helpful to align the presented STEM options within a broader field of career options.

Information from this study will be disseminated nationally, providing opportunities to expand this project beyond Idaho in the near future. As these preparations are made, students

must be able to participate in the survey to determine the direction for the future of the project. Viewer numbers are easily tracked through video services, but in order to develop an understanding of the impact of this project, some kind of data collection is necessary.

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Appendix A Parent Introduction Letter

Video Survey to Assess Career Pathway Awareness

Dear Parents,

I am sending this letter to let you know about the Lewis-Clark Valley career videos and to ask permission for your child/children to complete an anonymous survey after watching the videos.

High School students from the Lewis-Clark Valley STEM Access project produced several videos showcasing professionals who work in the Lewiston area. In the videos the professionals talk about their jobs in the fields of science, technology, engineering, and math and explain the training expected to fill their jobs.

The survey we would like your children to complete is designed to collect feedback about skills and careers in science, technology, engineering, math and to determine if the videos are helpful. For additional information on the survey please see the footnote. *

To take a look at our videos you can go to http://www.uidaho.edu/ed/trio/stemaccess/student-videos. You also are welcome to complete our survey.

If you have questions about this study, please contact Kirsten LaPaglia at 208-885-5819 or stemaccess@uidaho.edu anytime.

Sincerely, Kirsten LaPaglia,

Director of the Lewis-Clark Valley STEM Access Upward Bound project

*The participation is voluntary and it should only take approximately 5 minutes to complete the survey. The information collected will be anonymous and collated by age groups and general location (town, county): up to 4th grade, 5th through 8th grade, 9th through 12th grade, and adults. Participation is voluntary, and you may skip any question you do not wish to answer. The University of Idaho Institutional Review Board has reviewed this project and has certified this project as exempt. Data collected from groups with less than five participants will be combined with overall data to ensure participant confidentiality.

Appendix B Survey Consent Form

Online Survey Consent Header – *first page of survey online*

We want to improve how we inform students early in their life about the jobs they may want to pursue, in Idaho, and in general. This study is investigating what people think about science, technology, engineering, math skills, and careers. The study will last until the end of October 2013.

You are invited to answer some survey questions after viewing this video and let us know what you think. Your participation is voluntary and it should take approximately 5 minutes to complete the survey. The information collected will be anonymous and collated by age groups and general location (town, county): up to 4th grade, 5th through 8th grade, 9th through 12th grade, and adults. Your participation is voluntary, and you may skip any question you do not wish to answer. The University of Idaho Institutional Review Board has reviewed this project and certified this project as Exempt.

Data collected from groups with less than five participants will be combined with overall data ensure participant confidentiality.

By checking the box below I confirm that I am 18 years old or older OR that I have permission by my parents to participate in this survey.

If you have questions about this study, please contact Kirsten LaPaglia at 208-885-5819 or stemaccess@uidaho.edu anytime.

Checkbox on online survey that then gets participants to the next page.

Appendix C Focus Group Consent Form

How I do STEM – STEM Education Innovation Proposal

The University of Idaho Institutional Review Board has certified this project as Exempt.

This form is to request permission for your child to participate in our focus group discussion. The participation is voluntary and it should take approximately 30 minutes to complete the group questions.

This form is not mandatory for participation in the STEM Access project. Not filling out this form or not participating in this study will have no consequences for participation in the STEM Access Upward Bound project or grades in the project.

Our study is looking for ways to improve how education informs students early in life about the jobs they may want to pursue, in Idaho, and in general. We want to know what people think about science, technology, engineering, math skills, and careers. The study will last till the end of October 2013. We are hoping to use the video to better understand how students see science, technology, engineering, math and will collect feedback from viewers of the video.

The information collected will be anonymous and collated by age groups and general location (town, county): up to 4th grade, 5th through 8th grade, 9th through 12th grade, and adults. Data for groups with less than five participants will be combined with the overall group to ensure participant confidentiality. Any statement that your child makes that may identify him/her will be deleted from the data.

If you have questions about this study, please contact Kirsten LaPaglia at 208-885-5819 or stemaccess@uidaho.edu anytime.

Yes, I am giving permission to my child _____ (name) to participate in the focus group and know that the information gathered will be kept anonymous.

_____(Parent/Guardian Name)_____(date)

_____(Parent/Guardian Signature)_____(date)

Appendix D Survey Items

How I do STEM Video Project

We want to improve how we inform students early in their life about the jobs they may want to pursue, in Idaho, and in general. This study is investigating what people think about science, technology, engineering, math skills, and careers. The study will last till the end of October 2013.

You are invited to answer some survey questions after viewing this video and let us know what you think. Your participation is voluntary and it should take approximately 5 minutes to complete the survey. The information collected will be anonymous and collated by age groups and general location (town, county): up to 4th grade, 5th through 8th grade, 9th through 12th grade, and adults. Your participation is voluntary, and you may skip any question you do not wish to answer. The University of Idaho Institutional Review Board has reviewed this project and certified this project as Exempt.

Data collected from groups with less than five participants will be combined with overall data ensure participant confidentiality.

By checking the box below I confirm that I am 18 years old or older OR that I have permission by my parents to participate in this survey.

If you have questions about this study, please contact Kirsten LaPaglia at 208-885-5819 or stemaccess@uidaho.edu anytime.

Please circle the answer that indicates how much you agree or disagree with each of the following statements.

	Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
1. *Students* must do well in **math** to get into college.	SA	A	D	SD
2. **Math** is mostly about using formulas correctly.	SA	A	D	SD
3. *Students* must do well in **science** to get into college.	SA	A	D	SD
4. **Science** is useful for solving practical problems in life.	SA	A	D	SD
5. **Scientists** are smart.	SA	A	D	SD

6. **Scientific** work is dangerous.	SA	A	D	SD
7. **Scientific** work is exciting.	SA	A	D	SD
8. **Scientists** are as cool as other people.	SA	A	D	SD
9. I would like to be a **scientist**.	SA	A	D	SD
10. I should be able to choose what to believe and what not to believe from science.	SA	A	D	SD
11. I find it hard to know what to trust about science because science is always changing.	SA	A	D	SD
12. Idaho needs more scientists to help improve things for our state.	SA	A	D	SD
13. Scientists have personal agendas with their research that influence their findings.	SA	A	D	SD
14. I know what high school classes *students* need to take to be successful in college.	SA	A	D	SD
15. I know how to *(help somebody to)* apply for college.	SA	A	D	SD
16. I know how to (help somebody to) apply for financial aid to attend college	SA	A	D	SD

If you are a student:

	Often	**Sometimes**	**Rarely**	**Never**
17. My family talks with me about me going to **college**.	O	S	R	N
18. My family talks with me about the	O	S	R	N

challenges of paying for my **college** education.				
19. My family talks with me about plans to prepare for **college** admission exams, such as the ACT and the SAT.	O	S	R	N

If you are not a student:

	Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
*17. I know the steps of going to **college**.*	*SA*	*A*	*D*	*SD*
*18. I know what challenges students face to pay for **college** education.*	*SA*	*A*	*D*	*SD*
*19. I know how to make a plan to prepare for **college** admission exams, such as the ACT and the SAT.*	*SA*	*A*	*D*	*SD*
20. I advise students on steps of going to college, financial challenges to pay for college education, and college admission exams.	O	S	R	N

21. If you had to pick your future career today, the career you would most likely pursue is: _____

22. Did your perspective on STEM careers shift by watching this video? If yes how? If no, why not?

23. What did you learn about the pathway to get to a STEM career by watching this video?

Information about You

24. Are you…

___ female ___ male

28. Where do you live? City/Town: _____ County: _____ State: _____

29. What is your age? ___

If you are a student:

25. Who are the adults you live with at your home, not counting your brothers and sisters? (If you have more than one home, please refer to the home where you spend most of your time.)

___I live with two or more adults (some examples: mom and dad; dad and stepmom; grandpa, aunt and uncle; foster mom and dad.)

___My mom is the only adult at home.

___My dad is the only adult at home.

___Other (please describe)_____

26. Do any of the adults you live with have a bachelor's degree or higher? (examples: BS, MS, PhD)

If you are not a student:

27. If you have an occupation, in which category is your profession?

a. Agriculture, forestry, fishing, mining
b. Construction
c. Manufacturing
d. Wholesale trade
e. Retail trade [includes small shop owners and their employees]
f. Information [publishers, television, radio, Web, telecommunications, libraries, software, etc.]
g. Finance, real estate, insurance
h. Professional, scientific, management, administrative, waste management [lawyers, architects, etc.]
i. Education (all levels)
j. Health care and social assistance [includes all doctors, home health care providers, social services]

k. Arts, entertainment, recreation, accommodation, or food services [artists, museums, hotels, restaurants]
l. Other services [inc. auto repair, religious institutions, nonprofits, dry cleaning, funeral homes]
m. Public administration [courts, police, fire, city/state/Federal workers]
n. Not sure (specify occupation):
   _____
o. I do not want to answer this question.

Thank you! You are done with this survey!

Survey link: https://uidahoed.qualtrics.com/SE/?SID=SV_4IrrfRJFadrd2CN

Appendix E Focus Group Questions

How I do STEM Video Project

The participation in this focus group is voluntary and it should take approximately 30 minutes to complete the group questions.

Our study is looking for ways to improve how education informs students early in life about the jobs they may want to pursue, in Idaho, and in general. We want to know what people think about science, technology, engineering, math skills, and careers. The study will last till the end of October 2013.

The information collected will be anonymous and collated by age groups and general location (town, county): up to 4th grade, 5th through 8th grade, 9th through 12th grade, and adults. Data for groups with less than five participants will be combined with the overall group to ensure participant confidentiality. Any statement that your child makes that may identify him/her will be deleted from the data.

If you have questions about this study, please contact Kirsten LaPaglia at 208-885-5819 or stemaccess@uidaho.edu anytime.

1. *Do you think students* must do well in math to get into college?

2. Do you think math is mostly about using formulas correctly?

3. *Do you think students* must do well in science to get into college?

4. *Do you think* science is useful for solving practical problems in life?

5. *Would you* like to be a scientist?

6. *Do you think* scientific work is exciting?

7. *Do you think you* should be able to choose what to believe and what not to believe from science?

8. What value does technology or engineering knowledge and skills have for you?

9. *Do you think you know* the steps of going to college, the financial aid challenges to pay for college education, and the college admission exams?

10. How did your perspective on STEM careers shift by making this video?

11. What did you learn about the pathway to get to a STEM career by making this video?

Appendix F Budget Report

Appendix G Press Release 6/25/2013

The University of Idaho STEM Access program is inviting Lewiston area residents to submit videos for a competition called "How I Do STEM."

The University of Idaho is seeking videos up to five minutes long, which feature a professional of the Nez Perce County and how he or she uses science, technology, engineering, or math (STEM) in the workplace. The videos will highlight the professional describing the job, demonstrating STEM practices in the workplace and advising about educational preparation for this type of career.

Videos submitted by end of August and meeting the criteria posted on our website have a chance to win an ipad mini. Prized videos are chosen by a Virtual Technology and Design panel reviewing the videos for most entertaining, watched, and highest quality of information.

In addition, the videos will be publicly available on the website as a tool for anybody seeking more information about pathways to STEM careers.

Anybody interested in learning more about video editing is also invited to join our video-editing workshop on July 1st, 2013 at Lewis-Clark State College from 10AM to 3PM, Room SAC 144. For the workshop please RSVP with Kirsten LaPaglia, see below.

To enter your video or find out more about this challenge, check our website at http://www.uidaho.edu/ed/trio/stemaccess/stem-video.

For more information, contact Kirsten LaPaglia at the University of Idaho STEM Access program at stemaccess@uidaho.edu or 208-885-5819.

Appendix H Video Information

How I do a STEM video.....

Lewis-Clark Valley Video Challenge

A University of Idaho video contest will encourage Lewiston students to imagine their futures as scientists, technologists, engineers or mathematicians.

Lewiston is one of three locations currently implementing an innovation that will focus on students, parents and schools to elevate science, technology, engineering and math education as part of a $1.2 million Micron Foundation grant to the University of Idaho.

Led by University of Idaho STEM Access Upward Bound Director Kirsten LaPaglia and Virtual Technology and Design Assistant Professor John Anderson, the innovation will challenge students to create a 3-5 minute YouTube video portrait of a professional that uses STEM in his or her workplace. The videos will then be linked on a web-based interactive map.

We want to see videos that highlight professionals demonstrating how they use STEM in their careers and recommendations for how to get there, in terms of educational and financial choices.

Videos submitted by August 31, 2013 will be entered for a chance to win an iPad mini: both groups, Lewiston high school students ages 13-19 and anybody else submitting a video featuring a STEM professional with a video location of Nez Perce County are qualified to win the iPad mini.

http://www.uidaho.edu/ed/trio/stemaccess/stem-video

Appendix I Video Expectations

Video Entry Expectations:

Completed videos will need to meet the following criteria

1. The video must document a STEM professional who works in Nez Perce county, Idaho.
2. The STEM professional has to sign the VIDEO RELEASE FORM.
3. The video must be in one of the following formats: .mpeg4, .wmv, .flv, .mov
4. The video must be between 2 and 5 minutes in length.

Video Content:

1. Videos must demonstrate a STEM professional in action, and address the provided interview questions. Information beyond the interview questions is also encouraged.
    1. *Have them explain what they do.*
    2. *How is that science?*
    3. *What does it have to do with math or engineering?*
    4. *Why use technology and how does it work?*
    5. *Ask the STEM professional "What do you suggest to someone wanting to do jobs like yours in the future?"*
    6. *What recommendations do you have for a high school student in terms of choosing classes, steps to get into college, the degree, and financial decision-making?*
2. Videos must be appropriate for all audiences.
3. Videos must portray the STEM professional in a respectful manner.

A Virtual Technology and Design Panel will score videos on creativity, informative content and number of clicks on YouTube and other sites.

http://www.uidaho.edu/ed/trio/stemaccess/stem-video/video-expectations

Table 1 Descriptive Statistics, as analyzed

Respondent	Item	Item Mean	Item Median	Item Mode
All participants	1. Students must do well in math to get into college.	1.875	2	2
All participants	2. Math is mostly about using formulas correctly.	2.375	2	2
All participants	3. Students must do well in science to get into college.	2.25	2	2
All participants	4. Science is useful for solving practical problems in life.	1.875	2	2
All participants	5. Scientists are smart.	2	2	2
All participants	6. Scientific work is dangerous.	2.5	2.5	2
All participants	7. Scientific work is exciting.	1.875	2	2
All participants	8. Scientists are as cool as other people.	2.375	2	2
All participants	9. I would like to be a scientist.	2.5	3	3
All participants	10. I should be able to choose what to believe and what not to believe from science.	2.375	2	2
All participants	11. I find it hard to know what to trust about science because science is always changing.	2.75	2.5	2
All participants	12. Idaho needs more scientists to help improve things for our state.	2	2	2
All participants	13. Scientists have personal agendas with their research that influence their findings.	2	2	2
All participants	14. I know what high school classes students need to take to be successful in college.	2	2	2
All participants	15. I know how to (help somebody to) apply for college.	1.875	2	2
All participants	16. I know how to (help somebody to) apply for financial aid to attend college.	2.75	3	3
Students only	**17. My family talks with me about me going to college.**	**2.25**	**2**	**2**
Students only	**18. My family talks with me about the challenges of paying for my college.**	**2**	**2**	**2**
Students only	**19. My family talks with me about plans to prepare for college admission exams, such as the ACT and the SAT.**	**2.75**	**3**	**3**
Adults only	20. I know the steps of going to college.	1.5	1.5	1
Adults only	21. I know what challenges students face to pay for college education.	1.5	1.5	1
Adults only	22. I know how to make a plan to prepare for college admission exams, such as the / ACT and the SAT.	1.5	1.5	1
Adults only	**23. I advise students on steps of going to college, financial challenges to pay for college education, and college admission exams.**	**2**	**2**	**2**

Response Scale: Strongly Agree =1, Agree =2, Disagree = 3, Strongly Disagree =4

** Bold items use the following response scale: Often =1, Sometimes =2, Rarely =3, Never =4