

**MICRON STEM EDUCATION RESEARCH PROJECT
REPORT OF FOCUS GROUP RESEARCH FINDINGS**

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INTRODUCTION

With funding support from the Micron Foundation, a team from the University of Idaho in 2010 began a five year research project designed to engage people around the state of Idaho in research and innovation directed toward enhancing STEM educational interest and achievement. The summary results from the first phase of the project (August 2010-August 2011) are described in this report. The report offers a broad overview of major themes or patterns that emerged in focus group discussions. In addition, it includes a selection of participant quotations demonstrating the nature of community, teacher, and parental experiences and perceptions.

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EXECUTIVE SUMMARY

The acronym –STEM” (science, technology, engineering and mathematics), was first coined by the National Science Foundation in the early 2000’s (Sanders 2009) and has, over the last few years, become a ubiquitous term in the educational lexicon. Research into STEM has been identified as a national priority as evidenced by efforts from the National Science Foundation, the Department of Defense and the U.S. Department of Education. These federal agencies along with professional associations are calling for universities and researchers to examine STEM education and inform educators, policy makers, parents and other stakeholders as to why the United States is not performing as well as other countries respective to student success in STEM fields. Ultimately, these agencies believe a thorough understanding of the factors that influence STEM participation will improve American students’ performance in and pursuit of STEM fields.

Private industry has joined federal agencies in recognizing the importance of STEM education from the viewpoint of preparing the workforce and corporate leaders of tomorrow. With a significant gift from the Micron Foundation, in 2010 a multi-disciplinary team from the University of Idaho began a five-year research project designed to understand the issues surrounding youth and STEM education in Idaho.

While significant national concern has been raised about student proficiency and public literacy in STEM fields, the Micron STEM Education research project is designed to generate understanding of the individual, community and state specific factors that shape the interest in and pursuit of STEM education and careers among Idaho youth. The project will engage people in selected school districts and associated communities in research and innovation. The research project will gather data from students, parents, community members, teachers and school administrators to gain insights into the contextual, community and familial influence impacting students’ decisions on STEM education and careers.

Drawing from an analysis of the research findings, the team, in collaboration with stakeholders, will develop, implement, and assess innovations in STEM education that are sensitive to locally-specific opportunities and constraints. The Micron STEM Education Research project brings together social science researchers, scientists, educational practitioners, community members, and policy makers together as a team. Faculty and scientists from the Colleges of Science, Letters, Arts and Social Science, Education, Agriculture and Life Science, Engineering and Graduate Studies have built the project to take advantage of the unique expertise in each college and share in the challenge of the multi-disciplinary nature of the research.

PROCESS

The project will be completed in five phases over a five year period. Phase one will take place during 2010 and 2011 and will utilize community focus group discussions. Phase two, the state-wide telephone survey, will begin in 2011 and run through early 2012. Phase three will be conducted in 2012 and 2013 and will survey educators, parents and students in selected

classes. Phase four will begin in 2013 and run through 2014 and target the partner districts and communities with strategic implementation of STEM education focused innovations. Phase five will run from 2014 to 2015 and will resurvey the same populations as in year three and perform outcome assessment of implemented innovations.

Twelve Idaho communities were selected to participate in the project. One large district and one small district were selected based on athletic classification in each of the six educational regions in Idaho. The partner districts are: West Bonner; Post Falls; Kamiah; Lewiston; Melba; Boise; Jerome; Camas County; Pocatello; North Gem; West Jefferson; and Idaho Falls. In addition to partnering with the school districts the project team coordinated community efforts through University of Idaho Agricultural Extension and through other community groups.

In phase one, the team conducted and analyzed focus groups in twelve communities throughout the state selected through stratified random sampling. Within each community, three different groups of local people were assembled for focus group discussions: teachers from grades 4-12, parents of children in the local K-12 educational system, and community members who have no children currently participating in K-12 level education. Questions consistently used in all the focus groups explored nine thematic areas related to the socio-cultural contexts shaping STEM education.

Focus groups comprise one type of qualitative method that seeks to understand the perceptions and meanings individuals and groups attach to social phenomena. The team's goal was to access community members' perceptions, beliefs, and attitudes associated with STEM fields and STEM education. Unlike surveys that are efficient because of their predominant reliance on closed-ended questions, focus groups enable researchers to ask open-ended questions and to probe for further description and explanation. The depth of the data collected through open-ended questioning, such as in focus groups, in most cases requires a relatively small sample size. In addition, selecting participants for each focus group often entails purposeful sample selection (rather than random selection) in consideration of certain population attributes relevant to particular research questions. For example, in the current study we limited participation in one focus group in each location to parents of K-12 children. During the recruitment process, the team sought parents with children from a wide variety of grade levels and who represented different socioeconomic and ethnic backgrounds. Although efforts were taken to randomly select communities in which to hold focus groups, the relatively small sample size of focus groups and the purposeful sample selection for participation in focus groups is such that the focus group results are not necessarily generalizable to the general population in Idaho.

The focus group process in phase one served a range of purposes central to the project. First, it established a presence in each of the communities upon which future research efforts can draw. Relationships were built with communities, schools and parents. These relationships were key in establishing a longitudinal research partnership which will allow for, and support, subsequent data gathering in future phases. Second, it compiled a deep and comprehensive data set of community attitudes and perceptions related to STEM education enabling ongoing analysis.

Third, the data set helped direct the team in constructing questions for the statewide survey scheduled for implementation and analysis in phase two.

In the coding and analysis of focus group data, the team aimed for “theoretical saturation” (or “redundancy”) which was identified when patterns of thought and experiences consistently emerged for different focus groups and communities (Krueger and Casey 2009). Further analysis both identified the parameters of themes vis-à-vis the research questions and also identified a set of unique issues arising in the focus group discussions for which survey data could be useful. As such, the team also considered seemingly anomalous responses in the focus groups to capture the range of perspectives and experiences across Idaho. The focus group process also documented and revealed Idahoans’ perceptions and experiences in rich description. This enables the team later to relate the general experiences that will be summarized in the descriptive and inferential statistics drawn from the survey (Phase two) to Idahoans’ daily experiences in rural and urban communities. With this, the team will be able to better develop targeted innovations in local communities.

FINDINGS

The first phase of the project utilized 39 focus groups with 361 participants. The results of the first phase of the project have led to the following findings, which will be used to inform subsequent research efforts, understand the unique context of STEM in Idaho, and design, deliver and assess innovations and initiatives in the selected communities. The findings below are purposefully not specific or identified with a certain community or group in order to protect the research sites and not influence public or individuals opinions.

Based on the analysis of the focus group data collected in phase one of the project the following 15 items are presented as discoveries which will assist the research team in understanding the complex culture and context in the research communities. The findings will also form a foundation for the development of additional instrumentation and guide the design and delivery of innovations and initiatives in subsequent phases of the project.

- Focus group participants displayed a wide-ranging understanding of STEM, from a good understanding of what STEM education refers to and its relevance to societal needs to a complete unfamiliarity with the STEM acronym. Levels of STEM understanding varied across focus group types.
- Focus group participants viewed STEM education and STEM fields as important to Idaho’s future as a global competitor and to the future of Idaho’s youth. Moreover, many participants felt that STEM education is necessary toward creating a more informed citizenry.
- Focus group discussions elicited a number of cultural themes that form the complex cultural context affecting STEM education and will impact any potential implementations to improve outcomes in Idaho. In particular, Idahoans who participated in focus groups think education in general is undervalued, perceive many students are not socialized with a strong work ethic, and highly value local autonomy in shaping education and locals’ way of life.

- Focus group findings produced knowledge about the “culture of science” in Idaho communities. The “culture of science” in Idaho includes key aspects such as: resentment of some applications of science, particularly when it comes to managing local resources; a good deal of mistrust of science and scientists; and a perception that science in important areas, notably human evolution, contradicts worldviews and religious perspectives. Participants also tended to view scientific knowledge as a belief system on par with other belief systems, and they characterized science as embattled, inconsistent and ever-changing—indicating they are not sure what to believe.
- The educational skills, experience, and knowledge (i.e. cultural capital) of some Idaho families limit their ability to adequately support student academic success and pursuit of higher education.
- Focus group participants thought Idaho children have a capacity to learn and excel in STEM education, and they recommended more use of adult and peer mentoring to support, motivate, and encourage student academic success.
- Focus group participants perceived teachers in their school districts to be competent and committed. Many are concerned that low pay, increasing class sizes, pressures to meet standardized testing requirements, and public discourse devalue teachers’ work and may diminish the ability to attract and retain good teachers.
- Communities have a wealth of untapped STEM expertise and opportunities, including applied learning opportunities that can enhance what schools do to expose students to STEM discoveries, fields, and careers.
- Focus group participants supported cross-disciplinary pedagogical strategies and curricula that respond to and integrate the local context including the environment, natural resources, and relevant local issues.
- In conjunction with cross-disciplinary pedagogical strategies and curricula, participants called for a balance between STEM education and liberal arts education, noting the importance of the communication, critical thinking, and problem solving skills cultivated in the liberal arts.
- Significant challenges exist in providing students with contextually rich academic experiences that support 21st century skill development. Specifically, these challenges include insufficient personnel and resources, a large amount of academic content to cover in meaningful ways in a specified length of time, the high stakes standardized testing environment, and the lack of curricular continuity.
- Communities struggle with inadequate resources to attract and retain good teachers, offer a wide variety of STEM courses, provide sufficient and well-maintained classroom equipment, and develop opportunities for experiential learning within and outside of the classroom.
- Developing and offering STEM-based online courses can expand educational opportunities, but this strategy has limitations due to the lack of access to high-speed Internet and insufficient funds to purchase and maintain computers in many rural communities.

- Focus group participants believed online courses may not be appropriate for all students and subject matter.
- Focus group findings indicate a need to communicate more broadly with Idaho residents about the content and relevance of STEM education and fields.

CONCLUSIONS

The results of the first phase of the project clearly show that Idahoans are concerned about their children and their future. The results also suggest that STEM education is not fully understood by many in the population and there is concern about the role and balance of STEM and liberal arts in the overall education of Idaho's children. Parents were noted as being significant partners in their children's academic success but may be challenged by the low level of parental educational attainment.

Focus group participants were able to vision possibilities where mentors, teachers, and parents could be part of the STEM education program in the schools but were cautious as they realized that students already have a full curriculum and new mandates may even make it more difficult to pursue STEM fields in schools. The participants recognized the role and use of the local environment and locations for extended learning activities and as a way to contextualize STEM with a local opportunities and expertise. Participants were supportive of teachers and identified the challenge for both students and teachers which will be inherent with the advent of more on-line learning.

Focus group participants were well aware of the challenge of resources. The participants highlighted the need to make STEM education a priority and resource it correctly. The participants are aware of the resource discrepancies between districts and the challenges of bringing more resources to the rural and small schools. They also recognize that the entire school system is not resourced enough and that teachers are doing the best they can with the limited resources. They recognized the increasing difficulty in growing resources and the additional burden teacher will face of being ask to do more with less.

NEXT STEPS

The findings from phase one are being used to build the general population survey which will be administered to a sample of Idaho households beginning in October 2011. In developing the questions for the general population survey contextual considerations discovered through the focus group process will be key in selecting questions which will elicit more direct and specific information on STEM education in Idaho. As the project unfolds the discoveries from the focus groups will continue to inform the development of additional instruments and the design, delivery and evaluation of initiatives and innovations in our partner communities.

RECOMMENDATIONS FOR FURTHER ACTION

Short term actions based on the focus group findings can be initiated by those who work in the partner communities in extension or education arenas. Initiating discussions and dialogue

around STEM education and what opportunities and challenges are unique to the partner communities should be considered an immediate action. It is possible to increase the STEM capacity in the partner districts through increased networking and collaborative efforts between the school and community members. Communicating STEM educational value and the importance of STEM knowledge, including the scientific method, across different groups of community members will establish a flow of information and continuously enhance members' STEM literacy

Long term actions will take more time but should be initiated to influence policy and program changes at the community, district and state level. Pedagogical changes in Idaho need to be a priority for the state and schools. All suggested changes need to be sensitive to the primacy of local control of the school districts. Many unresolved issues remain and caution is urged in using the findings in the report to try to influence decisions without a full understanding of the problem or subsequent analysis of the upcoming phases of the research study. Much more research is needed before long-term policies can be informed and changed. It is hoped at the end of the project local, state and national policy makers will be well informed and make decisions based on data and the cultural context of Idaho and her communities.

METHODOLOGY

SCHOOL DISTRICT SELECTION

In each of Idaho's six educational regions, two school districts (one rural and one urban) were randomly selected using Proc Surveyselect in SAS. One school district was chosen within each region from among rural school districts (as classified by the National Center for Education Statistics), and one was chosen from among large city/town or small city/suburban school districts (classified here as "urban"). The classification of urban/rural districts was based on Idaho High School Activities Association size classifications which organize high schools into different categories based on enrollment. The exception to the random selection of school districts is that Boise School District was automatically included given the community's location and population. In most cases, a region contained only one urban school district. The six rural school districts are: Camas County (Fairfield), Kamiah, Melba, North Gem (Bancroft), West Bonner (Priest River), and West Jefferson (Terreton/Mud Lake). The six urban school districts are: Boise, Idaho Falls, Jerome, Lewiston, Pocatello/Chubbuck, and Post Falls.

Figure 1. Region map of communities selected for the study.



SELECTION OF SCHOOLS WITHIN DISTRICTS

A high school was randomly selected ¹ from traditional public schools in each district (private schools, charter schools, alternative high schools, and professional/technical schools were excluded). In some cases, only one high school existed. The six rural high schools selected were Priest River Lamanna High School, Kamiah High School, Melba High School, Camas County High School, North Gem High School and West Jefferson High School. The six urban high schools selected were Post Falls High School, Lewiston High School, Timberline High School, Jerome High School, Pocatello High School, and Idaho Falls High School. Once a high school was selected, a middle/junior high feeder school was selected from those available (in some cases there was only one). The final step was to select an elementary school from among those that feed into the sampled middle/junior high school (Table 1).

Table 1. School districts and schools selected for the STEM Research Project

Region	District	Rural/Urban	High School	Junior High	Elementary
1	West Bonner (Priest River)	Rural	Priest River Lamanna High	Priest River Junior HS	Priest River Elementary
1	Post Falls	Urban	Post Falls High School	Post Falls Middle School	Ponderosa Elementary
2	Kamiah	Rural	Kamiah High School	Kamiah Middle School	Kamiah Elementary
2	Lewiston	Urban	Lewiston High School	Sacajawea Middle School	Webster Elementary
3	Melba	Rural	Melba High School	Melba Middle School	Melba Elementary
3	Boise	Urban	Timberline High School	East Junior High	Garfield Elementary
4	Camas County (Fairfield)	Rural	Camas County High School	Camas Elementary-Junior High School (K-8)	Camas Elementary-Junior High School (K-8)
4	Jerome	Urban	Jerome High School	Jerome Middle School	Summit Elementary
5	North Gem (Bancroft)	Rural	North Gem High School (K-12)	-	-
5	Pocatello	Urban	Pocatello High School	Irving Middle School	Wilcox Elementary
6	West Jefferson (Terreton)	Rural	West Jefferson High School	Terreton Elementary – Middle School (K-8)	Terreton Elementary – Middle School (K-8)
6	Idaho Falls	Urban	Idaho Falls High School	Claire E. Gale Middle School	Linden Park Elementary

¹ Using Proc Surveyselect in SAS. SAS, Version 9.3. Cary, NC: SAS Institute, 2009.

FOCUS GROUP PARTICIPANT RECRUITMENT

Focus groups were held in each of the twelve communities represented by the school districts selected above. In each community, three focus groups were held with a target size of 6-12 participants: parents of school-aged children, community members without children or whose children were not attending K-12 educational institutions, and teachers. Principals from the sampled high schools were also interviewed in each community.

The following modified snowball sampling design was used to recruit participants for the focus groups of parents:

1. University of Idaho extension office agents were contacted in each county/community, either by email or telephone, and were asked for names and numbers of potential participants (parents of school-aged children).
2. The parents were then contacted by telephone and telephone messages were left when necessary. Upon reaching a possible focus group participant, the recruiter verified that their children were currently attending the community school(s) that we were targeting in our sample. To avoid over-representation of teachers (who often are also parents) the recruiter made sure that the potential focus group participant was not a teacher. The recruiter explained the purpose of the study and why particular participants were contacted to participate in the focus group. The recruiter then asked if either the potential participant or her/his spouse (couples were not allowed in focus groups) would be able to attend the focus group in their area and provided details of when, where, how long the discussion would take. As an incentive, a meal (lunch or dinner) was provided and participants also received \$50.00 cash for focus group engagement.
3. Each telephone solicitation included a request for names of other parents with children attending the targeted schools who might be available and interested in participating in the focus group. These individuals were also called, following the same protocol described above.
4. To gain a diverse population for the focus groups, recruiters also called upon other organizations to help identify potential participants including Community Action Partnerships (specifically, SouthEastern Idaho Community Action Agency in Pocatello, Community Action Partnership in Lewiston); TRiO programs in Lewis Clark State College, Idaho State University – Pocatello, and Boise State University; community centers (such as local senior centers in Fairfield, Melba and Post Falls); Head Start offices in Post Falls and Boise; and local community activists. Outreach to churches was attempted but did not produce any participants. For West Jefferson, Idaho Falls, and Post Falls, district superintendents, principals, and school secretaries were contacted to identify and recruit potential participants. Because the team intended to avoid biasing the sample of participants toward more highly engaged and networked parents, the latter group was only contacted for communities in which recruiters had difficulties recruiting enough people to fill the focus group.

The following modified snowball sample was used to recruit participants for the focus groups of community members:

1. University of Idaho extension office agents were contacted in each county/community, either by email or telephone, and asked for names and numbers of potential participants (individuals who did not have children, or whose children were not in K-12 education).

2. The community members were contacted by phone, and the recruiters verified that they lived in the sample community, did not have any children in school, and were not a teacher. Again, telephone conversations were concluded with requests for other suggested names for participants in the focus group. All suggested individuals were then contacted by phone. In addition to the above strategy, recruiters also retrieved lists of local businesses from websites of the Chamber of Commerce in each community. A random number (from 1 to 10) was selected, and every n^{th} business was called on the list to recruit participants. To gain a diverse population for the focus groups, recruiters also called Community Action Partnerships (specifically, SouthEastern Idaho Community Action Agency in Pocatello, Community Action Partnership in Lewiston); TRiO programs in Lewis Clark State College, Idaho State University – Pocatello, and Boise State University; community centers (such as local senior centers in Fairfield, Melba, and Post Falls); Head Start offices in Post Falls and Boise; and local community activists. Outreach to churches was attempted but did not produce any participants. For West Jefferson, Idaho Falls and Post Falls, district superintendents, principals, and school secretaries were contacted to identify and recruit potential participants. Because the team intended to avoid biasing the sample of participants toward more highly networked community members, this latter group was only contacted for communities in which recruiters had difficulties recruiting enough people to fill the focus group.

The following stratified, random sampling design was followed in selecting teachers from each of the 12 districts included in this study.

1. Sampling frames were created by collecting the names of all teachers, grades 4-12, currently employed in each of the sampled schools. Lists were stratified, that is, they were separated by elementary, middle school/junior high, and high school. Teacher names were obtained through school district websites and verified by a school district administrator.
2. Once each sampling frame was completed, random numbers were assigned to individual teachers using Microsoft Excel. After random numbers (0.0-1.0) were assigned, lists were sorted in ascending order. The first four teachers sorted to the top of the list (for each school selected within the districts) were selected and asked to participate in the teacher focus group. Principals and superintendents were kept informed about the selection and recruitment process, and they often provided support in encouraging selected teachers to participate.
3. Teachers were initially contacted through a formal email invitation describing the purpose of the focus group and requesting their participation. If teachers did not reply after two email notifications, they were contacted by phone and through school administrators.
4. If selected teachers declined to participate, the next teacher on the randomized and sorted list was contacted following the process above.
5. On rare cases, for those schools employing a small number of teachers, randomization was not necessary. These were schools, such as Kamiah Elementary, in which only three teachers taught grades 4 and above.

FOCUS GROUP METHODOLOGY

Three focus groups were conducted in every community, one each with teachers, parents, and community members. The only exception to this approach was in Boise where six focus groups were conducted. In Boise, we conducted focus group discussions with teachers, parents and community members in early March. The research team determined these focus groups did not

fully reflect the wide diversity of Boise's residential population. Therefore, three additional focus groups were scheduled representing two target groups: parents from Boise's refugee populations and parents from Boise's Latino population. Because the interest in participating in a focus group was high among Latino parents, the team conducted two Latino parent focus groups in Boise. Latino focus groups were conducted in Spanish by Spanish-speaking facilitators from the University of Idaho (Professor Irina Kappler-Crookston and graduate student Ana Isabel Alcocer Arreguin). These additional focus groups are not included in this report because they were not part of the original design and they require further analysis.

Venues for focus groups varied, but they were selected largely for their convenient, private, and (if possible) neutral location. Teachers usually met in school district board rooms, although some focus groups were held in school libraries and classrooms. Most often they met right after school, although two school districts (West Jefferson and North Gem) arranged for teachers to meet during their work time. This latter arrangement accommodated rural teachers who had to travel significant distances to their homes. Parents and community members met during lunch or dinner, in an attempt to maximize participant availability and to provide a meal as compensation for participants' time. Most discussions with these specific groups were conducted in hotel conference/banquet rooms, although some were conducted in community senior centers, local restaurants, and classrooms.

Planning and recruiting for the 39 focus groups spanned February to May 2011. All focus groups were completed on schedule without cancellations. A total of 361 individuals participated in the focus groups (a number that includes the Boise focus groups with refugee and Latino parents). Focus group facilitation involved a semi-structured interview schedule which was used to ask the same questions in the same order at all focus groups. The list of questions administered, including the research questions associated with each question, is provided in the Appendix II. Focus group sessions lasted 1.5 to 2.5 hours and were digitally audio-recorded. All audio recordings were delivered to the University of Idaho Social Science Research Unit where they were transcribed. In addition to the data collected from the interviews, participants completed a short demographic questionnaire which will be used for analyzing correlations between social groups in the future and for basic descriptions of the sample (such as Table 2 above).

A team of six researchers collectively coded and analyzed focus group transcripts. NVivo 9 qualitative analysis software² was used throughout the coding process. A more detailed description of the team coding process can be found in Appendix III.

² NVivo Version, 9.1.103.0. Cambridge, MA: QSR International Pty Ltd. 1999-2011.

PARTICIPANT DEMOGRAPHIC INFORMATION

A total of 333 community members participated in focus groups analyzed in this report. More female community members participated in focus groups than males. Different generations of community members were well represented from ages 16 to 84 with a median age of 46.

Table 2. Sex and Age of Focus Group Participants by Community

Community	Total Participants	Sex		Median Age	Age Range
		Females	Males		
Bancroft	29	17	12	47	27-75
Boise	31	18	13	47	22-66
Fairfield*	27	17	9	46.5	25-63
Idaho Falls**	31	16	14	49	25-66
Jerome**	30	22	7	46.5	32-64
Kamiah	32	22	10	46	19-76
Lewiston	30	16	14	42	22-61
Melba*	27	16	10	46.5	22-84
Pocatello	24	17	7	34	16-65
Priest River	23	14	9	52	34-80
Post Falls*	24	16	7	48	22-63
Terreton**	25	17	7	45	26-65
TOTAL	333	208 (63%)	119 (36%)	46.5	16-84

* Complete demographic information is missing for one participant in this community.

** One participant in this community did not indicate her or his gender.

The community members (see Table 3) who participated in focus groups were more likely to have some college or a college degree than the U.S. census average in each community (even when removing teachers from the sample). A significant percentage (48%) of parents and community members held a higher education degree which is not representative of any community (for more information on community demographics, see appendix).

Table 3. Parent and Community Member Focus Group Participants' Educational Attainment by Community

Community	# Part.	Educational Attainment						
		GED	HS	Some College	2-year	4-year	Masters	Doctoral
Bancroft*	17	0	1	4	1	9	1	0
Boise	21	0	1	2	2	12	3	0
Fairfield	18	0	2	5	3	7	1	0
Idaho Falls	19	0	0	1	0	9	6	3
Jerome	19	0	2	2	1	7	7	0
Kamiah*	20	0	2	5	3	8	2	0
Lewiston	20	0	0	14	1	5	0	0
Melba	18	0	4	9	3	2	0	0
Pocatello*	16	4	1	3	0	4	2	0
Priest River	16	2	1	8	1	1	3	0
Post Falls	14	0	1	3	2	6	1	1
Terreton	17	0	1	8	5	3	0	0
TOTAL	215	6	16	64	22	73	26	4
TOTAL %	98%	3%	7%	30%	10%	34%	12%	2%

* Some participants did not indicate educational level in Bancroft, Kamiah, and Pocatello.

Table 4. Teacher Focus Group Participants' Educational Attainment by Community

Community	# Part.	Educational Attainment				
		Some College	2-year	4-year	Masters	Doctoral
Bancroft*	12	0	0	6	4	0
Boise	10	0	0	2	7	1
Fairfield*	9	0	0	6	1	0
Idaho Falls	12	0	0	11	1	0
Jerome	11	0	0	5	5	1
Kamiah*	12	1**	0	7	2	0
Lewiston	10	0	0	6	3	1
Melba*	9	0	0	6	2	0
Pocatello	8	0	0	8	0	0
Priest River	7	0	0	7	0	0
Post Falls*	10	0	0	3	6	0
Terreton	8	0	0	7	1	0
TOTAL	118	1	0	74	32	3
TOTAL %	93%	0.8%	0	63%	27%	3%

* Some participants did not indicate educational level in Bancroft, Fairfield, Kamiah, Melba, and Post Falls.

** One participant in this focus group was a library staff member, a position which does not require a four-year degree.

The majority (306 out of 333, or 92%) of participants identified Caucasian as all, or at least part of, their racial-ethnic family background. Of those who indicated different ethnic backgrounds, sixteen indicated Hispanic background, fifteen indicated Native American background, seven identified as Asian/Pacific Islander, and three identified as African American³.

³ These figures exclude Boise refugee and Latino parent focus groups.

STEM DEFINITIONS AND MEANINGS

STEM, the acronym for science, technology, engineering and mathematics, is used commonly by educators and policy makers. While some contend there is a degree of familiarity with the STEM acronym (Sanders 2009), Pitt argues, “there is little consensus to what it is, how it can be taught in schools, whether it needs to be taught as a discrete subject or whether it should be an approach to teaching the component subjects, what progression in STEM education is, and how STEM learning can be assessed” (2009: 41). How the general public understands STEM education, learning, or careers is also an open question, and it is particularly relevant in a focus group methodology wherein participants are encouraged to express their thoughts about STEM education.

The opening question used in the focus groups was directed toward understanding what people thought of when they heard the STEM acronym and their perceptions of each field it contained. We began each focus group asking participants to talk about what STEM means to them. On the one hand, we wanted to elicit overall general responses prior to asking specific questions about STEM education. On the other hand, we wanted some measure of what people would refer to in responding to questions about STEM education and a sense of where people were starting from with their knowledge about the acronym. We followed the initial question with a brief list of definitions, our conceptions of STEM, to help enhance the chances that people were referring to the same thing in the subsequent discussions (see Appendix IIA). The responses to the first question proved interesting in that the question elicited initial perceptions and reactions to the acronym. With the public discussion nationally about STEM education, and certainly with a project designed to create innovations to enhance STEM education, it became evident that a key component to successful innovation implementation would be to understand and work with the popular understanding of the acronym and its fields. Several themes emerged as particularly salient in these initial discussions including overall sentiments toward STEM and perceptions of each of the components of the acronym.

FAMILIARITY WITH STEM

As is illustrated in Tables 3 and 4 in the methodology discussion, focus group participants held higher levels of education than Idahoans statewide. In addition, it was evident in recruiting focus group participants that the team was more likely to obtain consent from people with an interest in STEM education than from individuals who held no interest or (which was quite typical) who felt they had no expertise in the subjects. Given this, it could be assumed that participants would have demonstrated a good degree of awareness and literacy in STEM. However, the range of awareness ranged widely across focus groups.

Many people did not understand what the acronym referred to. A surprising number of participants revealed a lack of knowledge about the acronym, STEM, or lack of knowledge about particular disciplines within STEM. Although this may not be surprising among community members and parents, many teachers were also unfamiliar with the STEM acronym. Teachers' unfamiliarity, in part, can be attributed to the fact they do not specifically teach in STEM content areas. For instance, one teacher attributed her/his lack of familiarity to an “English cocoon”:

I had no idea what STEM was. I have been in this English cocoon, writing projects.

This unfamiliarity, though, was also evident among teachers involved in science and mathematics education. A teacher with some background in these fields similarly stated:

I didn't know what STEM meant actually. I certainly have a lot to learn about it, I guess.

Another attributed it to the range of subjects that are taught in her/his grade:

I didn't know what STEM was either. I teach reading and language arts and math. And we are supposed to get in a little science if we have time, and a little social studies if we have time. So consequently very little science gets in.

This lack of familiarity with the acronym also prevailed among community members and parents who were employed in STEM-related professions. For example, a participant working as a wildlife biologist shared:

I do wildlife biology here in this area...I was thinking a little bit about STEM education. I'd never even heard of it before, didn't even know what it meant until you told us.

On the far end of the range of familiarity with how the STEM acronym is used in education, some participants assumed the STEM education focus group would be discussing something altogether different. For example, one parent told the focus group:

When I heard STEM, I thought, stem cell research.

While many participants were unfamiliar with the STEM acronym, many participants articulated clear understandings of STEM and its components. For example, one parent felt each component should be part of her/his daughter's education:

I guess when I hear the word STEM and STEM education I think of already preparing my daughter for the work force. And when I think of science, tech, engineering and math, those are all areas that I think that should be incorporated into her education from 4th grade clear through 12th grade, a little bit of everything to prepare her for a career.

Many participants were also familiar with the components of STEM and had a sense of their integration or interrelation. One parent stated:

I think it's the integration of science and technology and the mathematics. When you can go out there and run the equations and the math and then show it in the physical world—that when we said the ball was going to shoot here and go this far and it does—that's pretty cool. It's like, okay, hey, the math works with the physical world.

Teachers discussed STEM's relevance to career paths and the necessity for interrelating the four areas in solving complex problems. For example, one teacher said:

When I think of STEM, I think that science, technology, engineering and math are used to answer our questions that we have. That's the way that I see it. We come up with questions, we come up with problems, and those are the things we use to answer those, to solve them.

Thus, participants understanding of the STEM acronym, its individual components, and the relationship between those components ranged widely. However, even those not familiar with

the usage of the STEM acronym very often pointed to the importance of science, mathematics, engineering or technology. This will be discussed at more length in the next section, but a few quotations illustrate that a strong sentiment existed that STEM education is important to youth, Idaho and U.S. society.

One participant pointed to the competitive edge STEM education gives to individuals and, collectively, communities and countries:

When I think of STEM, I think of the critical components to make at the individual level, community, the state, and from the nation-wide to be able to be more technology savvy and economically competitive from the individual all the way from the nation. Yeah, it has a lot of critical components. I think that's part of being a competitive edge today.

Often, participants described STEM education as geared toward upper-tier jobs, although some argued that most of the necessary jobs are not so specialized. Adding to the ambiguity by stating we do not know the possible jobs in the future, one teacher pointed to the need for STEM education to prepare students for the 21st century workforce:

The STEM is 21st Century learning. I know it's a buzz word, but that's what we're all focused on and the kids are going to need it because there are jobs right now that haven't even been created for our kids and our kids need it.

Some participants expressed concern that young people, and the U.S. as a nation, were falling behind in this 21st century learning. One parent said,

When you first brought up the topic of STEM, the first thing that kind of went through my mind was the same thing that [another participant] was talking about was that I heard on the news today that our nation is falling behind in the world in a lot of those areas, which is kind of scary especially when I look at how great our nation is.

The parent's first thought is not surprising given the degree of national discourse, or at least media coverage, of the concern for the educational outcomes of U.S. students in STEM fields, as the reference to hearing something on the news indicates. The concern was repeatedly expressed in focus groups across the state.

Finally, a parent echoed that the combination of each STEM component was a necessity in daily life and good citizenship:

These are really fun fields when they are taught right, when the kids can do stuff with it. And they're the basis of our society. Our lives depend on good scientists. We use technology in every other field. We need engineering. We drive over that bridge every day. It's a feat of engineering. We've got to understand math. We can't be good citizens if we don't have these skills, but I don't think the kids see it in this way.

Focus group participant familiarity with the STEM acronym and STEM field content ranged widely and somewhat surprisingly given the educational attainment of our focus group participants. Those familiar with the fields recognized the relationships between them and their importance for complex problem solving in the future of young people and of the nation. The sentiment concerning the high importance of STEM education for the workplace and for the

challenges young people will face individually and collectively in the future was commonly voiced.

CHARACTERISTICS OF STEM FIELDS

Many participants perceived that the content in STEM fields is difficult to learn. Many also expressed anxiety around STEM learning, often with roots in their own negative experiences with STEM content areas. These experiences reinforced the common view among participants, generally, that education in STEM fields is “hard,” “scary” or “boring.” The findings are significant in light of research that reveals there is a relationship between feelings of anxiety in response to STEM and individuals’ behaviors. For example, Ashcraft (2003) found that people who fear mathematics tend to engage in avoidance behavior – they take fewer math classes in high school and in college and maintain negative attitudes toward mathematics.

Several instances from the focus groups parallel Ashcraft’s findings. For example, a community focus group member revisited past experiences with science and mathematics in which she/he had achieved little success. Illustrating how fears around STEM education are maintained, the participant’s anxiety reemerged when asked to reflect on what STEM meant:

So when I hear the word STEM - the science, technology, engineering, math - it still does the same thing to me it did when I was, like, a kid, or in high school. It sounds scary... I never really did well in science or math.

Some teachers, likewise, harbored anxiety about STEM education. Although they tended to recognize these fields’ importance to student learning, the anxiety felt among individual teachers could compel some to avoid integrating STEM content across subjects. For example, one teacher told the group:

I still think...when someone says, “math and science,” it still scares me. If the kids ask me a math question in my class, I tell them there’s one reason I’m a social studies teacher...It was hard for me, but I do know the importance of them.

Participants also described the anxiety as prevalent among their students’ parents, in their communities, and in society at-large. According to teachers, students carry this socially instilled fear into their classes, which requires teachers to take additional steps to build student and parent efficacy toward STEM. One teacher pointed to the anxiety students feel toward science and mathematics when she/he noted:

I teach 8th grade reading, and I was thinking about we’re starting to work on four year plans with our students. And the kids that say they’re so worried about taking the science and math classes at the high school.

The anxiety, of course, is related to the very salient perception across all focus groups that the subject matter is hard. One parent summed it up this way:

And these are perceived as hard fields. Those are for the nerdy, smart kids. And I don’t mean that in a bad way, but these are perceived as hard fields and they aren’t necessarily that easy.

The parent indicates another factor in the avoidance of STEM courses—the common stereotypes associated with students who excel in STEM fields (although that is not the exclusive purview of STEM fields as students find many phenomena upon which to rest the label of “nerd”). A statement from a community member reinforces the point of the perceived difficulty of STEM learning and the associated stereotypes:

When I think of STEM, I’m a little more pessimistic than everybody else. I remember back to when I started in 7th, 8th grade really understanding what science was. It was hard. Math was hard. Science is hard. It’s not fun. It’s not cool at that age. It’s not cool to be a math geek. It’s not cool to be a science nerd. It’s not cool to have pocket protectors and big thick glasses and all the stereotypes that you hear about. I talk to the kids.

Based on responses to the first question and subsequent discussions through the focus groups, some patterns emerged in perceptions specific to each of the STEM components. Science and mathematics were more likely to be seen as foundational to the other two components. Participants were least familiar or knowledgeable about engineering, but it was understood to be a key component in comprehensive STEM problem solving. As indicated above, STEM content was perceived as hard, and this was particularly the case for mathematics, but participants also often pointed to the importance of mathematics to everyday functioning. Participants had much to say about science and technology. The ways participants characterized science is discussed at length in the section below on “Community Cultural Context.” After a review of the discussion of mathematics and engineering, this section elaborates on the varieties of ways participants discussed technology.

Of the four components of STEM, participants had the least to say about engineering. Primarily, this is a reflection of the lack of engineering curriculum in K-12 education and the relative lack of knowledge participants had about engineering. While many people saw the relationship between all the components of STEM in general, many struggled with integrating engineering. Some teachers pointed to the lack of engineering instruction and curricula, and others discussed their discomfort with engineering. Community members also expressed a lack of understanding as well.

Although many participants did not have a good sense of engineering, many had the conception that it fits with the other components of STEM as this teacher’s quotation illustrates:

The idea behind an engineering team is you have different people with different sets of expertise, each one of them having a great deal of value. You have your scientist. You have your engineer that’s going to be overlapped with mathematics, and there’s the technology piece. One of the things that I underlined when I saw this is design projects in the physical world for an engineer.

All focus group discussions included an array of comments about mathematics. One common perception was that mathematics is the foundation of all other STEM fields, and, once students understood the principles of mathematics, all the other fields expanded upon them. Community members also felt that, “math was the basis of everything,” and students must have a grasp of mathematics to accomplish anything in the other fields. A common sentiment expressed by focus group members concerned the avoidance of mathematics because of its difficulty. For example, the following parent described student attitudes about learning math and then her/his own:

They've learned to hate math, even at a young age, because of the way math is taught. Same thing, I hated math, the way it was taught. They're like me; they can do a math problem, but if I have to show you how I got it and when I got it, I can't do it.

Despite the common references in the focus groups to anxiety about STEM fields and the difficulty of mathematics, some participants said they enjoyed math. Participants also commonly discussed the importance of mathematics to daily functioning, illustrated by this comment from a teacher:

I think they will need more mathematics. I think it's important that students know how to make good financial decisions, and part of that is a good mathematical background on things like mortgages or debt or buy the car with good fuel efficiency, all those kind of things tie in. I just think that it's really important for students to get a good background in that.

Finally, a small number of people pointed to a couple of characteristics of mathematics that set it apart from other STEM areas. Some loved mathematics for its "order" and some liked it because they felt it taught reason and logic.

While knowledge about STEM fields and familiarity with the acronym varied widely, most participants seemed to agree that STEM learning was difficult. They harbored a degree of anxiety about learning STEM subjects, but they commonly felt that STEM education was important for youth in Idaho. Across the focus groups, participants discussed engineering the least among the STEM components, although they commonly recognized the role all STEM fields play in complex problem solving. Nearly all participants agreed with the value of mathematics education to the other fields and to situations in daily life. We now turn our attention to focus group participant discussions of technology because this was discussed in length and in many different ways.

TECHNOLOGY

Comments about technology permeated the focus group discussions, particularly in response to the first focus group question. The discussion covered a variety of topics from the understanding, in general, of what comprises technology to the competitiveness of U.S. youth today in technology education. Participants discussed extensively the impact of technology on the lives and learning of youth.

Participants consistently associated technology with computers or digital technology, although many often pointed out that technology includes everything from a pencil to farming equipment to alternative energy. A couple of conceptions about technology were common in focus groups. One conception involved learning the processes involved in innovating and applying technology. A second, more common, conception described technology in terms of tools, whether as tools for gaining and generating knowledge, tools for teaching, or tools for carrying out physical work. Technology included the tools or avenues for entertainment. A third conception that most all recognized was that technology pervaded the lives of students and the school environment. They regularly recognized the proficiency of youth with new technology, but they repeatedly discussed concerns about how technology is used by youth and in education.

Much of the discussion about technology addressed concerns about students using technology but not understanding the STEM-related processes behind how it works or not using it in ways

related to workplace skills. One teacher expressed concern that, despite the familiarity with and the amount students use technology, students don't always use it to explore possibilities or learn about the full functions of the tool:

It's helping our kids because they're extremely adaptable, but they never get into the stuff deep enough to really understand what it had except for the functions that served them, whether it was making music or taking a video off the internet or whatever it was. You ask them about any other functions, if it wasn't important to them, they still don't know how to use that technology.

Considerable discussion in the focus groups focused on the use of social media and entertainment. Recognizing that young people adapt to new technological products and tools rapidly, participants often wondered if young people were learning the technology they need. As one community member pointed out:

So they know the social type of technology and entertainment technology, but not perhaps the professional software and things like that.

A teacher also expressed concerns that, for all the use of technology by young people, they aren't learning the skills they need:

As far as STEM, I teach the computer apps. Kids know how to play. They know how to surf the net. They know how to get into games, but as far as the essentials like PowerPoints and Excel and Access and Word and all the documents that are required out there in the real world, they don't have a lot of that.

All focus groups discussed technology as something people use daily, as rapidly changing, and as a driving economic force and a necessity for being qualified for future employment. A comment from a teacher stressed the need for workplace preparation in technology:

When I think of technology, I think about how we need to prepare our students to be ready to use it at any point because almost any job is getting to the point. Well not every job, but a lot of jobs are getting to the point where they're going to use some form of technology. Whether it's simple technology or advanced technology, they're going to use some form.

A central topic in the discussion of technology related to the role of technology in K-12 education. While students use social networking and entertainment technologies extensively, teachers wondered if the enthusiasm for using technology extended to an interest in engaging the academic study of technology or technology-oriented fields. Many participants agreed that technological tools are an important resource for teaching and learning, and an important part of this theme points to the difference between using technology to assist teaching and learning and teaching about the technology. One focus group parent shared the following sentiment:

Technology is supposed to enhance the learning environment, not replace what we have there.

An exchange in another focus group considered the difference between using technology and teaching about technology. As demonstrated, it is often difficult to disentangle each use:

Teacher 1: Don't take this wrong. Is using a document reader or a projector a teaching tool, or is it a technology tool?

Teacher 2: It's a teaching tool.

Teacher 1: Ok, so is that learning to use technology? Or is that helping our students learn using a tool? Are we talking about the same thing here or is it two different things?

Teacher 1: It's great that we got this grant, and we've got projectors in our classrooms, and we have 200 and some computers in our school district, but are we teaching students using technology...is it a teaching tool or are we actually using the technology to help our students become more savvy, get a job, and actually use the technology to design games or...

Drawing from other focus group discussions helps clarify the difference. As one teacher noted:

Using technology can allow you to do the same old stuff either more efficiently or more accurately or get more results with the same amount of time that you would have before. I just think you're teaching students to do it more efficiently than when you did it in high school. Even though you may not be teaching them the makings behind the computer, a spreadsheet is so much nicer to put a list of 40 things in there to check your math.

This teacher and many others point to the use of technology to teach more effectively and efficiently—using technology for teaching. Others pointed to the need for more teaching about technology. One community member emphasized that we should not equate using technology with students learning about technology:

There's a misperception, too, especially in K-12 schools, that technology in schools is equal to the presence of computers and Smart Boards in the classroom as opposed to teaching people what technology is... we can't think that a computer in the classroom is the technology.

This teacher supported "teaching people what technology is" along with using technology as a pedagogical tool in teaching. Another teacher made a similar point in saying:

There's a gap there. Most people would think that if a student takes a course online that they've used technology. Well, they really haven't used technology. They've just used a computer. There's a huge difference between the definitions in terms.

Again, the difference lies in using technology to facilitate teaching and learning rather than teaching about the technology itself. These different purposes or uses of technology, however, are often conflated, and many focus group participants were compelled to comment on the need to understand the difference, and, often, to do both. A primary concern was the development of teaching about technology or how it "is actually done." According to the following focus group participant, students need to move beyond using technology as a tool:

When you go to Micron, I'm sure they have a whole bunch of people who sit there at a screen and type documents and input data. That's whatever, the paper shuffling that used to be all paperwork that's now done on a computer. Where the rubber meets the road, where Micron makes their money, is a group of scientists that sit in a room like this with maybe a white board maybe a paper and pencil, and they just design a new circuit that they can put in

a computer. That's how technology is actually done or used, not just how it is a tool to get a job done. To me there's a major difference between the two. In a school setting, I don't know how you'd do it.

Another teacher points to a way to combine the use of technology to teach with teaching about technology while also appealing to the fondness of students for high-tech products:

This is where I think technology has really bridged the gap to a lot of kids. I like to kind of call it info-tainment. They're so wired with technology, be it an iPod, a computer screen, an iPad or whatever, and, although I don't teach this area, I've witnessed in our tech labs...that when kids are learning through simulation or just computer screen it just seems to grasp some of those kids rather than here figure out this engineering problem. If they can do that through some kind of simulation, hands on.

The statement does not go fully into teaching about the technology, but, in a tech lab and with the reference to an "engineering problem," it may be safe to assume that students are learning to build simulations and using the capabilities of the tools to solve problems. If this is the case, or even if this is not the case in this particular situation, it may be a direction for resolving the difference between using technology to teach and teaching about technology.

In summary, focus group participants discussed technology in a wide-ranging manner, from discussing what it is, to the need for technology education for workplace preparation, and to understanding its role in the context of K-12 education. Part of the role in K-12 education is using technology as a pedagogical tool which will be explored further in the section on "Curriculum and Pedagogy." Throughout discussions surrounding the meaning of STEM to focus group participants, it was widely shared that STEM is valued and considered critical to Idaho youth's preparation for a 21st century global economy. The following section discusses these views in greater detail.

REASON FOR STEM'S IMPORTANCE

In a recent national study, Johnson, Rochkind, and Ott (2010:1) found that “88% of the public agrees that students with advanced mathematics and science skills will have an advantage when it comes to college opportunities.” Similar to these national-level findings, focus group participants often viewed college education as the gateway to Idaho youth’s future employment opportunities. STEM education was most commonly connected to preparing students for the industries with current job opportunities and relatively high wages. In fact, several focus group sessions began immediately with one or several participants describing STEM as “where the jobs are.” Below, we discuss the ways in which focus group participants’ associated STEM education with employment opportunities.

STEM AND EMPLOYMENT

Participants in the focus groups commonly agreed that careers closely associated with STEM fields were among the best paying in the job market. Some of the central reasons stated for this higher pay were the technical difficulty of such fields and the ability for these careers to solve critical societal problems. In connection to this latter reason, participants often expressed that youth are even more obliged to obtain education in STEM because many future jobs will develop in those fields. For this reason alone, participants felt it imperative for youth to have a solid foundation in STEM.

One urban focus group community member observed:

If you look at society as a whole, we see probably even greater people going back or going to school for science and technology kinds of jobs once they’ve been out in the market for a while and recognize that that’s where the value is.

Another urban focus group community member felt that STEM related careers were also among the highest paying. This person explained:

People who have education, specifically in STEM, are going to earn more money through the rest of their life, and it doesn’t matter if it’s a four year degree [in] STEM education or if it’s just some kind of post-secondary certification in it.

A common understanding was evident throughout Idaho that STEM education provided a foundation from which youth could have many job opportunities. At the same time, some participants felt that many of the jobs youth will have in the future currently do not exist and are difficult to imagine. These responses, too, were consistent with Johnson, Rochkind, and Ott’s national study (2010:1) that found, “While only 3 in 10 Americans see a demand for science and math-focused jobs in the current economy, 84% agree that there will be a lot more jobs in the future that require math and science skills.” Moreover, the current economic slump was seen as forcing new channels of development with STEM fields spearheading a radical shift in the sorts of jobs needed in the future. An urban participant observed:

If you follow any type of science literature, you realize that there is a new science-related field opening just at a constant rate. There [are] large amounts of opportunities to be employed by a field that didn’t even exist when your teachers were in school.

STEM was consistently discussed as representing fields through which discovery and societal progress are advanced via new job categories and opportunities.

From a slightly different angle, participants often had a limited view of what STEM education was intended to train youth to do for their careers. Discussions among participants often revealed that they thought STEM education equated to high-level careers in engineering and scientific research that emphasized abstract thinking and planning. They saw this type of education as different from the kind of education necessary to work as electricians, carpenters, machinists, and other trades. Many participants argued that such professional and technical education should also be considered part of STEM education (but they suspected that this research project was emphasizing the “high-level” training). Several participants argued that professional and technical trades needed attention and were just as important to society as the high-level careers in engineering and science. A community focus group member argued the following:

I work in the environmental field. I see this broad spectrum of everybody who’s really, really good with their hands, and maybe they’re going to be our plumbers and our electricians, and they’re going to be the people that keep our society running. We need to make sure kids know that those are career paths that are available to them and they are valued. Those are important things in our society.

In the same study mentioned earlier, results showed, “9 in 10 Americans say studying advanced math and science is useful even for students who don’t pursue a STEM career” (Johnson, Rochkind & Ott 2010:1). Despite the unforeseeable opportunities tied to STEM fields, focus group participants described the difficulty of getting young people interested in STEM education. In part, this was because young people failed to see how STEM education was connected to their personal or family lives and to the types of jobs they thought they were realistically going to pursue. One revealing comment from a teacher focus group in an urban community revealed the type of job aspirations of some young people in Idaho:

I had a little girl one time who said, “Why do I need to do all this because I am just going to work at McDonalds? It’s all I’m ever going to do.”

The individual inability to connect STEM to fundamental skills across different career trajectories was attributed to parents as well. One focus group teacher from a rural community complained:

The parents come up and ask, “Why is my child being forced to take a technology class? How is this going to benefit them?” It’s like, “They’re going to...almost every job now uses a computer of some sort, whether it be a cash register, if you are flipping burgers.”...Are you going to flip burgers for the rest of your life? Well, you’re still going to have to run that register to take an order and stuff. The parents don’t always make that connection of why it’s important that they have to be taught these skills.

In many instances, participants complained that young people failed to see the connection between STEM education and their own current or future experiences. Focus group participants were frustrated as they could see how important STEM-related skills were to available work opportunities in the local community. Many felt that youth in their communities did not understand how much STEM fields were utilized in their very own hometowns. A member from one rural community explained:

My husband and I have come back, and we farm. STEM—science, math, technology—has allowed us in this community, and in agriculture, to stay even with the rest of the world, or ahead.

Fairfield's website boasts itself as "Idaho's best 'undiscovered' small ski town." When we visited Fairfield, the whole community was bracing itself for a busy weekend with winter sport enthusiasts who were coming to the area for the 3rd annual Kite Soldiers Snowkite Event, described by locals as the largest such event in the country. Because of the deep snow, flat mountain meadow landscape, and high winds, the area surrounding Fairfield is perfectly equipped for snowkiting. Thus, it was not surprising that some focus group participants from this community described the relevance of STEM education to winter sports:

As parents and as teachers and educators we need to be looking for, —"What does this kid want to do? Does this kid want to be a machinist?" Well he's gonna need some mathematics. He's going to need some technology... If the kid wants to be a ski bum, well he's going to need some mathematics to know what width of skis he needs to go down the fastest.

The connection between STEM education and locally available work was discussed at length amongst participants in Jerome. Known throughout the state for its economic concentration in the dairy industry, some individuals were afraid that youth had no obvious examples of STEM's relevance to their daily surroundings and experiences. Yet, one of the focus group parents pointed out the relevance of STEM when driving around town:

You see the piles with the white plastic and the tires on them. There's as much STEM technology in that pile as there is anywhere. I'm telling you, there's a science to putting up solids the proper way. There's a ton of technology used from choppers to inoculates. You engineer that pile... There's a science and engineering to putting that pile of silage in right. And then the math of how many tons of feed do you have there? How many days is this going to feed a cow? ... You know, and that's something that we drive by every day.

Agriculture was another industry that several participants felt was misunderstood as having little to do with STEM. A community member, indicating that farming is highly integrated with the STEM fields, stated:

Then there was this stigma that being a farmer was... "He's just a farmer." ...you can't be just a farmer any more....[Y]ou have to have all this STEM education.

A community member in another rural focus group echoed a similar view when describing her husband's experiences:

When my husband was in college, this has been a long time ago, but his professors told him, if he was planning on farming, he was wasting his time in college. He quit college and came home and farmed. Now you almost need a degree to do all the chemigation and to do all the things that really need to be done.

Focus group participants' perceptions about the role of agriculture in the state are true -- agriculture and other resource-based production sectors such as mining continue to be essential to the State's economy (Smutny 2002). In addition, their perceptions that agriculture is enhanced by STEM fields is supported by professional literature that points to new technology

and science as essential in improving safe agricultural outputs in environmentally thoughtful ways (Federoff et al. 2010).

IDAHO'S ECONOMIC DEVELOPMENT

Throughout the state, individuals were convinced that STEM education was necessary for good jobs and for the future. As the above comments reveal, they believed STEM education was relevant to local communities' livelihoods. It is no surprise, then, that several expressed STEM education's importance to Idaho's livelihood in general. Participants often stated that these fields are critical, specifically, to Idaho's economic development and advancement.

Some participants expressed interest in Idaho connecting more explicitly to national and global economies. In their view, Idaho has great potential to be a leader in certain industries, but the state is in acute danger of falling behind. As one urban focus group participant said:

We have to become better educated, better aware....We cannot continue to think that we are an isolated society in Idaho.

In a similar tone, another participant in the same community commented:

I don't think that Idaho wants to be considered a backwater. If you don't want to be a backwater and be forgotten as things progress, you have to be able to offer a variety of things to global businesses that have the jobs to come to a place like Idaho.

A few times, participants said they were concerned that Idaho was not doing enough to draw interest from companies and industries that seek highly skilled employees and offer higher pay. According to them, the state has not provided residents with sufficient education in the STEM fields to build a reputation and an educated workforce prepared for high skilled employment. As one focus group participant described:

I suspect that Idaho may be behind the rule a bit of other states in that we don't have the scientific infrastructure to give those people careers once they get them.

In one of the urban communities, a participant thought Idaho was in danger of not being competitive in the global market largely because it was neglecting education:

If they [businesses] see an education system that's a backwater and doesn't offer and promote these global issues in technology and mathematics, then we're not going to be high on the list for them to choose to come here, which just perpetuates the whole problem of Idaho not having high paying technological jobs and offering and promoting those sorts of jobs and businesses here.

Focus group participants' concerns are affirmed by scholars who note that, "the perceptions of Idaho as an economic backwater persist" (Smutny 2002: 442) despite the fact that high tech industries are a significant production sector in Idaho.

In a similar discussion, participants in another community focus group talked about how the rural nature of the community – and Idaho generally – interfered with building a workforce prepared for these better-paying, STEM-based industries. One participant pointed out:

You know, if you're going to build this kind of a culture into a community, then they have to start because we have to have the workforce that's available for a company to come in and hire these people to begin with. If the workforce isn't there, they can't come.

In one of the rural communities, a recent university graduate described the need to leave the state to secure the best job in her/his field of expertise. This graduate would prefer to stay in Idaho, but the opportunity was not likely available. She/He explained:

It's all about which school I need to go to, to get the best education...I just graduated from [a] university in civil engineering, but...to do what I want to do...I need to get more education. I can't do that in this state because it's not offered at the university... Looking around the country, about the only place that has my degree is in California where they've done a lot of structural code-work themselves...Once I leave, I probably won't come back just because I got my degree in that state which means all the jobs for my degree are gonna be in that [other] state.

Despite the concerns illustrated above, many participants (including the civil engineering graduate above) argued Idaho was a great place to live. In several instances, participants expressed pride in Idaho and pointed out the assets that could make it a leader in strategic fields. In an urban community focus group, a participant pointed out:

We've got two mines in Idaho that are being proposed to come online to supply strategic metals. Idaho has some of the only strategic metal resources that are mineable in the entire United States. Those metals are critical to the development of hybrid fuel cells. So you think that the pressure isn't going to be on Idaho to become a major producer of these kinds of materials in the future, and that's the near future?

Although critical of Idaho's current conditions and worried that Idaho was in danger of being robbed of its wealth, an urban community member highlighted the tremendous potential of Idaho's natural and energy resources:

The state of Idaho, until about the past 20 years, was a front-runner in alternative energy with geothermal energy. The first nuclear power sited in the free world was in Arco, Idaho. If we don't have an education system that is capable of supporting education and an outcome that's going to manage those resources, we're going to have outsiders coming in and managing. None of Idaho's wealth is going to stay in Idaho.

STEM EDUCATION HELPS DEVELOP AN INFORMED CITIZENRY

One of the focus group questions asked participants whether they thought STEM education was important for youth to be informed citizens. Some participants gravitated toward discussions surrounding scientific inquiry and method as fundamental skills in evaluating the credibility of STEM information in media, politics, and society at-large.

Some participants thought it important that youth comprehend how scientific method and inquiry are a means to develop and test knowledge. Understanding “what is happening with science” and how knowledge is used politically facilitate decision making as pointed out by many participants. One community member from an urban focus group remarked on understanding the knowledge in STEM fields:

Knowledge means understanding. Rote memorization and reciting information on a test is not necessarily having knowledge, it's information. I can get information at a moment's notice on any smart phone you've got in the country. That's information. [Instead] we need to develop an understanding. We need to understand the why's and how's and what is happening with science, technology, engineering, and math so that we can we can make good decisions in our own lives, as well as around us.

Similarly, a parent from another urban community elaborated on how she/he thought STEM education and being an informed citizen are integral to one another:

How can you have an opinion on the matter of stem cell research if you don't even know what it really is? There's a certain level of literacy that, because we are a scientific, technology-based world now, that you have to have. So much of legislation in politics, and even education decisions that are being made, go back to assuming that you understand what they're even talking about. So, while we can't all be experts in everything, I think there's a certain level of literacy in these areas that we all need to be good citizens to be able make responsible decisions.

Community focus groups shared the view that STEM education and STEM fields are important to the future of Idaho and Idaho's youth. In addition, they articulated support for initiatives to enhance STEM education. Participants felt that these fields will be critical in solving our nation's problems and in making Idaho competitive within a global economic system. Many of the participants felt that STEM education is necessary for creating a more informed citizenry. Focus group participants encouraged policy makers to consider the importance of STEM in building a skilled workforce and the need for gaining greater public STEM literacy in general. The latter enhancement, according to focus group participants, would enable residents and citizens to make more informed assessments of contemporary problems locally and nationally.

COMMUNITY CULTURAL CONTEXT

How do you change that...how do you change society to say, you know, that science is important, technology is important, engineering is important, I mean, and math. How do you change it...?

Learning and STEM education are not “acultural” (Bang and Medin 2010: 1009). The cultural context and worldviews of communities, parents and young students shape their perceptions, motivations, interests and values of higher education and K-12 STEM education. As such, understanding this cultural context is particularly important. Considerations of local cultural context (also referred to as local cultural knowledge or indigenous knowledge) in researching educational questions has largely been confined to studies concerning “minority” or “non-dominant” groups or populations or people in “developing” areas (Ujam and El-Fiki 2006; Bang and Medin 2010; Warren et al. 2001). However, the basic anthropological tenet, that local groups maintain and are shaped by local cultural context, most certainly applies in the local contexts in the United States and Idaho—culture is shaped locally, and local people, particularly young people, are shaped by that local cultural context. To be sure, and increasingly so with the varieties of social networking, media, patterns of consumption, physical mobility and the like, the local is also affected by broader cultural forces at national and global levels. Yet attitudes toward and participation in STEM education is in no way immune to the impact of culture at the local level as students’ behaviors, attitudes, motivations and interests are shaped most directly by local cultural forces.

Focus group discussions elicited a number of cultural themes potentially affecting interest in and pursuit of STEM education that provide some insight into the ways people are thinking and the kinds of things people are thinking about with relevance to the broader category of culture. We begin this section with looking at perceptions of broader national culture as they pertain to STEM education. We then narrow to look at cultural patterns in the state relative to STEM education. We have not included every cultural factor that emerged in the focus group discussions or that could be interpreted from the data. We also recognize that each theme discussed in this report is “acultural” at some level. However, below we focus on a few specific cultural factors salient across many focus groups.

BROADER NATIONAL CULTURE

A. Work Ethic

One type of cultural factors emerging from the focus groups can be identified as general cultural factors in the United States that participants believe affect the interest and pursuit of STEM education. One is that our national culture has “become a society of instant gratification” in general and particularly in the younger generation. This idea is a fairly common perception in both popular and professional literature (Buchholz 1998), so it should not be surprising that participants identified it as a common hindrance to STEM participation. For instance, one participant said:

One of the things that hinders kids going into science, engineering and mathematics is, we’re a “we want rewards now” society. It’s a social factor. Kids don’t want to work for it. You see it

all the time. Everything is high reward, reward me now. Stimulate my brain now. [This] is why things like technology appeal to so many more kids, because in a lot of ways it is that stimulant they seek. Whereas science, mathematics, engineering, mathematics, book keeping, things like that, I'll just be honest sometimes it's not the sexiest work out there and it requires a lot of intuitiveness and furthering your education.

A related recurring perception in the focus groups, again reflecting a common perception and research literature (see, for example, Twenge et al. 2010) about youth in the United States, is the assertion that young students have not been socialized to have a strong work ethic. A string of examples from three different focus groups, both rural and urban districts, illustrates the concern with student work ethic:

Example 1: He can't do the work. You've got to do the work. We have to start teaching our kids that that's their responsibility.

Example 2: The work ethic is not what it was 20 years ago.

Example 3: Once again, though, as society, we look for the easy way out. It's easier to quit than it is to go back and take that calculus class four times. I mean, and it...we don't teach our kids that anymore.

Focus group participants saw a relationship between what they perceived as young people's diminished work ethic and their unwillingness to embrace the challenges in STEM curricula. This, of course, presumes or reflects a more basic assumption about STEM education—that it is harder than other curricula. The perception is that kids do not want to work at things, have not been taught the need for and persistence to work hard, and, thus, don't want to work at the “hard” thing that is STEM curricula.

B. Valuing Education

Another salient theme in the focus groups in relation to the United States in general pertains to the values associated with education. Despite the rhetoric on the positive value and importance of education in the United States, focus group participants' believed that the distribution of resources reveals actual national priorities and that the general public in the United States does not value education enough. This is particularly salient when it comes to voting for public funding and cutting public spending in education as compared to other areas. Spending choices, of course, impact successful STEM education in many ways as participants pointed out almost universally that the lack of resources available for STEM education is a primary barrier facing students and teachers.

Numerous focus group participants offered comments related to the low priority or value placed on education in the United States. These two examples illustrate the perception concerning the low priority of education in a couple of differing ways:

Example 1: The way that we can encourage Idaho kids, American kids, and all kids to really be interested in [STEM education] is to actually have a mental paradigm shift as a society and really place value upon intelligence. We have such an anti-intellectualism...

Example 2: I will go down here and work out in the rec center, and I look down there on the floor and I'll see fifty girls practicing volleyball. I think to myself, -Okay, they're spending...

between five and ten hours a week practicing volleyball. Two or three may get to college and get a scholarship out of it. The rest of them are wasting their time.” They should be out doing something else and be it this or whatever else for a career, learning something...But our society is like, -We want to be entertained...”

These examples point to a perceived low value placed on intellectual achievement and higher value, and thus more energy and time, placed on entertainment as indicative of the low priority of education in the U.S. Another key indicator of devaluing education is the investment or expenditure of public funds on education at the national, state and local levels. Specifically at the state level, some participants were concerned that education is not spared but, rather, regularly cut in funding decisions. According to one focus group participant:

I am deeply concerned about the direction that we’re taking, and I don’t know how it happened in the state this year. Again, I don’t know what to do, but we do need to talk to people. When I hear that we don’t have a budget crisis but we cut education, I just...I can’t reconcile those two facts so...that’s what I talk about to anybody that will listen...but it takes time to have a voice. It’s a lot of energy like you said, like all you guys have said. It’s discretionary effort over and above your families and your jobs to try and make a change.

While this participant acknowledged it takes time to have a voice, and many are not willing to expend their time in this manner, others noted it is a challenge to garner support for educational funding even when people are given a voice in local matters. Several participants mentioned the difficulty of raising funds locally, and some referred specifically to local school bond failures as evidence of a lack of support for education from the broader community. Other participants implicated local leaders and business people as this participant discusses:

It’s interesting that the business community here, personified by the Chamber of Commerce of [this community], would not come out and support the bond issues. They said, -I’m going to remain neutral.” I won’t mention the chairman’s name, but I talked to him personally to the side. He said, -It’s crazy. They should have, but our executive committee wouldn’t do it.” Here you have the business community who supposedly stands the most to prosper by an elite and educated workforce to draw from that can’t stand behind education...and why? Because the business leaders figured that they’d have to kick in a few more tax bucks.

The lack of support from the business in this case was attributed to an avoidance of further tax burden which, in turn, demonstrated a lower priority placed on local educational needs.

The devaluation of the teaching profession in the United States offers another indication of the value system in the United States. Many participants felt that teachers are not compensated fairly for their expertise nor are they compensated adequately. Like with the funding issue, participants discussed the devaluation of teaching at the national, state and community level. One participant indicated the lack of support for education tied to compensation for teachers:

Well...if the state says that we don’t have a budget problem but we cut education, that shows everybody in the state what our legislature thinks of the importance of education, doesn’t it? If that’s the only thing that got cut, doesn’t that automatically trigger that it’s lower on the totem pole? To me it kind of does. It says that we can make the Green Belt look wonderful. Different budgeting, I know, but you can make the Green Belt look wonderful, but we can’t pay teachers. I don’t know. To me in a very simplistic, it looks like, even from our own legislature, that education is not that important.

The devaluation of the teaching profession was also referenced by focus group participants in terms of the scrutiny teachers experience vis-à-vis their expertise due to educational reforms or policies including standardized testing. The following examples illustrate these sentiments:

Example 1: Yeah, I don't think it's the teachers. The barriers that I've hit have always been policy at the district level or even higher where you're talking about how much of a teacher's time has to be focused on trying to meet test objectives.

Example 2: But our educational system is so broken and we've got so many patches and band aids stuck on it to try and help these kids to get where they need to be that you can't take a good mastered teacher and let them teach. It just doesn't happen anymore, there's too many rules, too many pitfalls, too many tests, too many regulations, too many...

Example 3: We have stupid politics that are making it very difficult to do what the teachers need to do.

Concluding the attention to values and priorities, much of which can be measured in the discussion by the allocation of resources, a few participants in one focus group discussed this issue and concluded that the allocation of public funds may not only be an indication of how legislators value education but also reflective of the reality that, -education, health care, they're the biggest political footballs in the state."

LOCAL CULTURAL CHARACTERISTICS

Two cultural themes, specific to the State of Idaho, were central to focus group discussions. These include notions of "local autonomy" and a more complex theme we refer to as "a culture of science" defined below.

A. Local Autonomy

Many focus groups exhibited a broad sentiment concerning a commitment to local autonomy and a desire for a measure of control over the local way of life. The sentiment was demonstrated through, among other things, a perception that local control in the schools and the education process was highly valued in Idaho. Two participant examples capture this sentiment well:

Example 1: Well, and nobody likes being told you have to do this, especially in Idaho. We're such independent people.

Example 2: Part of the issue, I think for Idaho in particular, is that they want to isolate. They do not want to integrate so much so because they want to be in charge of their children's education and they want to drive their leaders. They want to have it this certain way.

A comment from a focus group participant in a farming community extends this theme of local autonomy, indicating many Idaho youth, particularly in rural areas, are closely tied to the local community and its way of life. As such, going away to college is a significant personal life change many rural students may not be interested in. Holding close ties to the local community and enjoying local community life and security are likely factors in why many young people in

the Idaho do not elect to attend college. By extension, these cultural factors should be considered in efforts to improve STEM education. The participant stated:

A lot of times farmers, their kids stay with them. I think a lot of times that's one of the reasons that some of the kids don't go on to college or they go to college and they decide, "maybe this is too hard" or "it's not really what I want. I want to farm."

This sense of local autonomy and a commitment to a local way of life are likely powerful cultural characteristics in many places, but our focus group discussions revealed they are widely shared in Idaho. While regional cultural distinctions in Idaho exist (Alm et al. 2001), the state is also characterized as strongly individualistic where Idaho residents value privacy and prefer limited intervention, by government and non-government entities alike, into what they see as private activities (Weatherby and Stapilus 2005). This cultural factor likely shapes resistance to new knowledge and its application, which is a characteristic we think poses a key challenge to STEM education in the state.

B. The Culture of Science

Attempts to change science education will be more effective if they take into account the local culture and how the general public perceives, envisions, and thinks about science, what we refer to as the local "culture of science." The "culture of science" is part of a person's worldview, a comprehensive set of beliefs about how the world works and humans place in it. Our focus on science is a result of focus group findings which indicate this disciplinary component of STEM is what people found most compelling to comment on and which challenged their worldview. Mathematics, although almost uniformly viewed as "hard" or "scary," was somewhat benign to the cultural worldview of people. People did not comment very thoroughly on engineering, and technology in terms of their worldview – these fields were perceived as having significant impact on daily lives and defined more or less as the application of knowledge with known but largely non-threatening effects. Science was anything but benign.

Focus group participants perceived scientific knowledge as something that can be used and manipulated to fit the special interests of particular groups. This application of science is often resented, particularly when it comes to managing local resources. We found in focus groups concrete, experiential, and daily examples in which people felt a threat to local culture and local control. The following example about the re-introduction of wolves into the local environment illustrates how many see the application of science as something that can be manipulated and/or misused to support personal or political agendas:

The problem with that is Fish and Game has their scientists, their research scientists, who came up with all of the facts and figures about the wolf reproduction. But then it became a political thing and as soon as politics got involved, it felt like the facts were being skewed to accommodate the political views of the areas... So yeah, there were people mistrusting science when what they should have mistrusted was the politics. I mean facts are facts.

Many focus group participants indicated a lack of trust for individuals outside of their community, particularly scientists, who did not understand the local economy or culture. They also saw such outsiders as limiting their freedoms and choices, a reflection of the individualistic political culture of Idaho. The following examples illustrate this:

Example 1: You can't bring a Washington D.C. person out and put them in our area without some training, and when they do that, that's when we get our problems. And that's where we get our distrust. When you put somebody that's been here all the time, they understand what the area...what goes on with the area, they understand the farming community

Example 2: People aren't afraid of science, it's not the dark, they understand a lot. Even the folks that understand the so called layman's terms, they're not afraid of it. They just don't like the application and who applies it.

Example 3: ...a lot of people's exposure to scientists is government affiliated or regulation affiliated, and government is probably one of the dirtiest words in the state of Idaho to most Idaho residents or if you look at Idaho as a whole. If you bring up the word government, it gets everybody's hackles up just a little bit...

In addition to the heated topic of the reintroduction of wolves in some areas, which was seen both as a threat to livestock and as a threat to a way of life, another culture of science issue raised by focus group participants focused on perceived regulation in dairy farming by outsiders:

Well, I've got all those regulators that come in and visit me, and I've got a really good guy that does our quarterly audits and stuff like that. He understands what we do... Then I've got this other guy, and I'm not going to say that he's from Washington D.C. because I think he's from somewhere in the Northwest, who doesn't understand what we're doing. He comes in, he makes these stupid remarks.

Another focus group participant noted the politicization of science with a focus on mining:

There's a lot of political interest. You take a look at our mining industry and the forest service. The major reasons they don't want to do mining...has to do with a lot with the selenium levels that they're supposed to get out...There are also interest groups that fudged their numbers....You can take numbers and do whatever you want with a number. I think a lot of it just falls into politics.

The questioning of science also extends to broader issues involving science—the issue of global climate change in particular. The topic was discussed repeatedly in the focus groups with comments ranging from extreme skepticism to defending the science. Commonly, focus group participants questioned the science, as these examples from focus groups illustrate:

Example 1: I would say in discussion, there's some level of politics that play into it. Like when people talk about global warming. Is that really something that's happening or is that just government propaganda? There's that debate on weather. And this guy says this and this guy says this. Who do you trust?

Example 2: I think we've seen it in the last five or ten years especially with global warming. We've been sold these goods and all a sudden there's an equal amount of scientists that refute that information. So what do you believe? You've got two groups of well-educated individuals promoting two different views of a bad situation. So which one is the most credible?

Topics involving the interaction with science and religious beliefs are another area that potentially raises resistance to scientific knowledge. Evolution, stem cell research, and cloning

emerged as contentious topics. The following example illustrates focus group participant concerns regarding evolution and her/his scientific literacy:

We call it the theory of evolution because it's a theory. While it may have some science trappings on it, there are still aspects of it that we have to admit, if we're honest, we can't go back and perform definitive experiments on to say that, "yes, this is what happened." We can't do that with creationism either, because you can't go back and do those experiments. I think there are a lot of these science things that we are distrustful of because we go, "Wait a minute, that doesn't really make any sense." It may be because of our religious upbringing or it may just be, "how do you know that that's what happened?"

Another area of local concern focused on the use of stem cells in research, as the following example from a rural parent illustrates:

Now I can't think of what the word is, but creating another thing that's the same, and evolutionary type stuff or the science that goes behind the stem cell research. Some of that [is a problem] because you're taking away from another life to help another life. Or the genetics of, "well, pick what kind of baby you want. We can make it a boy or girl for you now." That kind of thing that, for religious reasons, they feel should be God's place, not the scientists' place to say or to create.

A rural community member also brought up the issue of cloning illustrating the conflict between religion and science:

I think that they're taking science to a level that it's not meant to be. When they start cloning things and they start doing the DNA and cloning things, to me, and it comes down to a personal thing because of the religion, because of the way you were raised, there's a lot of subjectivity to that. And it's a personal thing, and I don't trust a lot of science because I think they try to replace God. And they're not to do that. There's some things that we just have to realize the human body is a creation that God made, you're not supposed to replicate it by science.

Attitudes toward science are complex and, at times, contradictory. Focus group participants articulated a critical view of science as challenging local authority and suspect in terms of a political agenda at the same time they recognized its value. For example, one participant offered the following in response to criticisms of science, noting its value in terms of farming:

I would say to look on the other side of the fence, though. We put trust in science every day. We have a dairy and we farm and we put trust in science because the new breeds of wheat that come out or the new medications we use on our cattle. We have to put a lot of trust in science and the professions to develop new breeds.

Another aspect of the culture of science expressed by focus group participants had to do with how they viewed the scientific method. The scientific method is not well understood by focus group participants as they often characterized science as a system of thinking or a body of information that one can elect to "believe in" or not. This perspective was at least partially due to their belief that science was unclear, uncertain, always changing or up for debate both within the scientific community and between scientists and other citizens.

The approach best suited for STEM education, according to some focus group participants, is to use STEM education to inform students of this set of perspectives and let them choose whether to “believe” in it or not. The implications are potentially far-reaching in terms of fostering science education. Treating scientific knowledge as similar to other belief systems is potentially problematic because it impacts the understanding of science itself. It is a different matter for a student to choose to study a belief system than to study a knowledge system based on systematic method and inquiry. One example from a focus group teacher illustrates the perspective of teaching science content, such as evolution, as a belief system and letting students decide whether they want to believe it or not:

It’s how you teach it. You don’t teach it that this is the way it is, [instead you teach that] this is somebody’s opinion, and we’re just going to explore and learn about it and talk about it.

Another teacher echoed a similar strategy of presenting “different pieces” and argued:

You’re not telling them what to believe. You’re showing them all the different things that are out there.

In a different focus group, another teacher was critical of teaching science in this way, and pointed to the way that parents shape student attitudes towards science as a belief system:

It’s all coming from the parents. You say “evolution” to the kids, and it’s like over their heads. They have no idea what you are talking about, but they go, “my parents say I can’t learn about that, and I am not supposed to believe that.” And it’s like, “science is not a belief system, you have to break away from that.”

A community member from another rural focus group agreed, arguing science is not a belief system and should not be taught as such:

I think a perception that is sort of a conservative point of view is that there’s a lot junk science out there, you can get into a whole lot of controversy, evolution, origins of the human species, all these kinds of thing, and then science becomes subjective because people just don’t want to believe this, you know what I mean?...Science should be just science. It is empirical, you prove your hypothesis and so on, and yet some people are not going to accept that because it doesn’t square with what they believe.

Related to the sense that science is a belief system on par with alternatives, science itself is characterized as embattled, inconsistent, and ever-changing. Focus group participants revealed that they are not sure what to “believe” because things seem to be constantly changing in terms of science. Participants also perceived that scientists are embroiled in endless debates, rendering the entire enterprise of science questionable:

You can’t even get the religions to all agree on one thing let alone try to get the science and the religions to agree on something. The scientists won’t agree on anything together either. They’re kind of like lawyers.

The focus group discussions provide cultural context to the complex ways in which people think about science and science education. The patterns we identified reflect broader national cultural influences and local attitudes and perceptions of local culture. The attitudes toward science, or the perspectives on science, potentially have an impact on the support of and interest in STEM

education in Idaho. If people mistrust science, see a conflict between science and their religious beliefs, or see science used in a manner that appears to conflict with local interests, they may be less likely to embrace its teaching in their local schools or to cultivate or support interest in STEM in their children. Understanding how Idahoans view these relationships with science will help understand potential barriers to STEM education.

Efforts to improve participation and success in STEM education are indeed efforts toward change, and those efforts will be impacted by or will confront cultural context on a variety of levels, from the individual students to families, the community and the state. Such efforts will necessarily be better designed if informed by further understanding of local cultural context and adapting efforts toward change in accordance with cultural patterns. The characteristics or patterns in this context are not inherently “good” or “bad” per se, and they may not ultimately be barriers or hindrances to STEM education, but efforts to change have a set of conditions with which to interact. These efforts also may benefit from more systematic, intentional, and planned engagement with the community—collaborating with and empowering local community members in implementing change in an effective and equitable manner. This engagement can build on the dialogue already begun in the focus group phase of this research.

PARENTAL ENGAGEMENT

Research on student achievement reveals the significant role parents and family play in shaping students' STEM and overall educational success. A robust body of literature points to parental engagement shaped in large part by parents' cultural capital -- parents' educational skills, experience, and knowledge that conform to institutionalized educational standards and expectations (Lareau and Weinger 2003). The relationship between parental abilities to comply with educational standards and students' educational achievements has been studied extensively. For example, Fosse (2005) found parental cultural capital shapes value orientations instilled in their children that are conducive to educational success. Others have found parents who are engaged in their children's schooling in middle school contribute positively to their children's educational success particularly because of academic socialization, also a function of parents' cultural capital (Hill and Tyson 2009). Academic socialization includes parents' communication of their expectations for successful achievement and value of education, fostering educational and occupational aspirations in their adolescents, discussing learning strategies with children, and making preparations and plans for the future, including linking material discussed in school with students' interests and goals" (Hill and Tyson 2009: 14).

Our analysis explored focus group participant perspectives on the quality and nature of parental engagement in the State of Idaho. More specifically, we sought to understand parental engagement relative to the concept of cultural capital and community expectations for parental support. Such understanding is important given that parental engagement and parental cultural capital are important factors in shaping students' academic success.

Focus group participants were asked "what" and "who" encouraged students to pursue STEM education. In all focus groups, parents emerged as significant in supporting students' academic interests in general and in STEM in particular. Analysis of focus groups revealed at least three ways in which participants perceived that parents shaped student educational success, particularly in reference to STEM fields. These include: 1) levels of parental cultural capital; 2) parental work demands that constrained their level of engagement with children's educational experience; and 3) parental attitudes and values concerning STEM disciplines shaped by their own work and educational experiences.

CULTURAL CAPITAL

Parents, community members, and teachers generally perceive many parents to have insufficient cultural capital to support their children's academic success, particularly in mathematics and science.

Parent focus group members indicate they value STEM education and hope their children will succeed in learning content in these disciplines. However, a significant pattern emerged revealing parents themselves felt an educational inability to assist their children with STEM education. For example, one parent clearly demonstrated her willingness and attempts to support her child's success in mathematics by purchasing an algebra book just so she could "keep up on that." When she attempted to help her child with homework, she discovered she had made errors:

I had to sit there and redo that problem three times before I realized that I'd forgot this part even though it looked like I did all the steps. I had it wrong.

Others simply recognized they were unable to assist because they had been unsuccessful as students themselves in STEM education or simply didn't have enough knowledge. The following examples illustrate this:

Example 1: As far as science and math and that kind of stuff, I never did well in that kind of stuff. If my kids need help in that I send them to my husband, or I send them to the older kids in the house. I was able to keep up through 8th grade, and then it kind of got out of control for me.

Example 2: I don't understand math enough to help my kids, so I get really frustrated with that.

The importance of community and parental cultural capital was made evident as parents discussed the type of STEM activities available to them and their responses to living in rural areas. As an example, one parent realized the rural community they lived in provided less opportunity for her/his child to be exposed to STEM experience. She explained the actions she took to compensate for living in a fairly isolated community:

When [my child] was younger we'd try to give him videos when we can. Or take him places, vacation. You could live here your whole life and never leave. We try to expose our kids. That's doing our best as parents with what we have where we live, because we don't want to move.

Another parent in an urban focus group described how she/he engaged with her/his son on a daily basis and defined such activity as good parenting:

I try to stimulate and encourage conversation at the dinner table. We sit at the dinner table. My son will be there on his little phone or PDA or whatever. I say, -No, no, put it down. What did you do at school today?" The other day I said, -Right, here's a question for you. What country had a tragic earthquake or series of earthquakes?" None of them knew. It's not even being discussed in schools...If you can communicate, you're a good parent. If you can't communicate, no matter how many degrees, whether you've got an IQ of 1, you won't be a good parent.

Focus group teachers also recognized parents' limited incomes inhibited their ability to expose children to educationally rich experiences. A teacher described how it was obvious which children had access to computer technology in the home and which did not by whether they understood his lessons. He explained he had limited time to provide instruction in the classroom and, as a result, students who did not have the privilege of accessing computer technology in the home suffered. According to him:

We can only provide so much during school time. I teach the keyboarding and the technology going through researching on the Internet or whatever. That's what I teach. Some kids, they know how because they've been taught at home. They have experience at home with their family. The ones that don't have access to a computer, they're completely lost.

The role of families in supporting digital literacy is linked to parental cultural capital and expectations in the schools. Seiter (2008) notes the increasing importance of computer and digital literacy in schools, showing the similarities between piano and computer use and skill. She reveals “the privileged role of early domestic learning in gaining the ‘right’ skills” (2008:29). Mastering such skills takes time, money, and exposure, all linked to parental cultural capital. Focus groups revealed many families in Idaho simply didn’t have these skills or resources:

Parent 5: But I think here, now, we don’t spend enough time teaching these kids because you can’t write a book report or doing a mobile or anything else if you don’t know how Word works. We spent probably three hours on Word just showing him what he was supposed to do. After he got everything written, he was like, —“ow what am I supposed to do with it?” It’s a teaching process, but I feel sorry for those kids that don’t have parents that are computer literate. What do they do? There’s some that aren’t. Luckily, I am, but there are a lot of parents that are not computer literate. What do those kids do?

Parent 1: They depend on learning it at school.

Parent 7: Some kids don’t even have computers.

Parent 5: Yeah, but I think that’s a void that can be filled either with workshops for the parents on the weekends or something. I think we’re missing the mark with the younger kids. They’re expected to do these projects. They’re expected to be type written, but yet nobody’s teaching them how to use the program.

Parents who participated in this focus group realize other parents do not always have the time, money, or knowledge to engage with schools in culturally expected ways.

Other focus group participants recognized the broader role of parental cultural capital and socialization practices including differential exposure to vocabulary. For example, one community member who had previously worked as a teacher and a principal described the following ways she/he assessed family context:

One of my favorite things to do...[is] listen to the conversations in a grocery store that a parent would have with a child. You learn so much about the knowledge that the kid is picking up from just the vocabulary in the conversation that the parent has about the fruits and vegetables in the market and what it takes to get them there versus sit down and shut up. Think about that. That impacts classrooms today. Our classrooms are filled with kids at all these different levels and bringing different vocabulary, different prior knowledge, different experience and exposure.

Cultural capital is transmitted in the home through every day practices such as conversations. This community member’s recognition that parents’ vocabulary impacted classrooms is supported by research on social class differences in linguistic codes. For example, middle class parents typically use longer sentences and more vocabulary when speaking with their children in comparison to working class parents (Bodovski and Farkas 2008). Differences in class-based parenting practices in language are well documented – we know middle class parents are more likely than working-class parents to name more objects, pursue longer conversational topics, and elicit more responses from children during conversations (as cited by Bloomquist 2009). Such differences begin early in childhood socialization. For example, in a study of preschool children, Bloomquist (2009) found middle class children were more likely to provide labels for

images than working class children and used longer descriptive responses to questions concerning images suggesting their heightened comfort with this type of tasks and experience, all related to cultural capital.

Parental lack of academic socialization was identified by focus group participant teachers as important in understanding student academic success. For example, teachers often characterized their low performing students as failing to engage in academic behavior that would improve their performance, such as studying and doing homework. Such students were defined as “lazy” and “unmotivated” with poor “work ethic,” and families were often seen as responsible for failing to instill this at home. This is clear in this focus group teacher’s observation:

Well, and I think with math, to me, math is hard work. The kids that are good at math, they can sit down and work hard for 40 minutes. We talk a lot about hard work in my class and how it applies. I think that that work ethic, like what [another member] said, at home, if they’re not getting that work ethic at home, it’s really hard to teach it to them.

In another rural community a focus group participant agreed, arguing that kids needed to be “pushed” in their educational pursuits:

Parents play a huge role in pushing that kid but also in helping to develop the kid. If you don’t have that push, kids will, they are like a puppy, they will get away with whatever they can to just get by.

A focus group community member in an urban area argued that parents needed to reinforce in students that academic success takes work on their part:

You’re never going to learn anything unless you do the work... You’ve got to do the work. We have to start teaching our kids that that’s their responsibility.

Another urban focus group parent shared a similar sentiment and explained how she responded to her son who came home from school one day and complained he was bored. She told him, “And whose fault is that?” This parent’s response is based on her academic expectations that her son was responsible for engaging in school. Such responses are ways in which parents socialize children to respond to education.

WORK/TIME CONSTRAINTS

Teachers’ experience with children in the schools gave them a particular perspective on the role of the family. Teachers were often critical of parents who did not comply with their expectations for engaging in their children’s education or schools, but they were also sensitive to the constraints parents faced that prevented such action. For example, one focus group teacher noted a shift in parental engagement during the last fourteen years she/he had been teaching in her/his rural community:

When I first started there was more...if I called home, the parent was home or at work in town and they would, if there was a problem, they could come get them. Anymore, it’s becoming the majority of our kids, the parents work [in other communities.] They aren’t getting home until 7 o’clock at night. If they do need their parents, their parent isn’t here, and

they text their parents or their friends. They go to friends' houses. They're not having the support of parents because parents aren't getting home until 6 or 7 because they're driving [long distances from work]. That's a definite shift in our school from when I first started.

Another focus group teacher identified the challenges single parents often face:

I was just talking to a parent in my classroom this morning, and she's a single parent, so she has to work, and her job has to work at night. Both of her kids are older, so they can be home alone. She was talking about how she gets home so late that she literally puts her children in the shower and in bed, and that's how much time she gets to see them. When I think about that, it's almost like you're not a parent at all because you don't have your kids. What I kind of tend to see is that, when parents are finally with their kids, they almost have less patience for them because they haven't been around them for all this time and suddenly they have to deal with them. I've seen even the negative side of that where the parents don't want to deal with their kids because they haven't had to deal with them all day long or all night.

Regardless of family structure, a rural community member argued that the limited number of quality jobs available in the community often required both parents to work to make ends meet. As a result, students often did not have significant time with parents:

Simplot used to be the highest employer, and now Simplot's way down on the bottom of the scale of high paying jobs. I think in a lot of areas, too, there is not a mom and a dad both in the house because either they both have to work in order to make house payments. So there are a lot of kids who are going home alone or starting to go to school alone. They don't start out with anybody there much to teach them.

Another focus group parent shared her experience as a single mom with a high school degree who worked long hours to support her own children. She explained her challenge:

Sometimes it's difficult to turn around and, after a long day, try to help your child. You're exhausted. If you're not always consistently every day involved, then somehow you kind of find yourself lost on where they're at. They do so well for a few months, and then somewhere they start running into some problems. You're like, "How can I help you?" You don't know how or you don't know where exactly they're at in the book. You just know that there's a problem. You're trying to understand it. There was times where I used to work from 6 o'clock in the morning until 6 at night. It would be almost 7 o'clock by the time we get home to make dinner. I think the last thing on my mind was helping anybody with homework.

Participants discussed the importance of the positive parent-school relationships as central to students' academic success. This included participating in parent-teacher conferences, asking teachers questions, and advocating for their children. For example, one focus group community member explained how involved she/he was when her/his children were school-aged:

We would go to the teacher conferences. If I had a problem with the teacher, I would try to go and discuss it with them. And I feel like as a parent that's the best thing. If you feel like your child isn't passing the test, if your child isn't meeting the criteria, I think the teacher's the best one to tell you why they're not succeeding with it.

Focus group teachers indicated not all parents behaved in this way for a variety of reasons:

The other side of that is, too, as a parent, they're your kid, and you might want to spend some quality time reading a book or something else so...if the teacher is supposed to be teaching them, and I'm doing my job, why should I have to do a practice homework thing with them when I want to read a story or I want to play a game. If the teacher isn't teaching them and they're bringing this home and we're battling it because I don't understand how to do it, then that's a waste of time too.

Some community focus groups revealed other structural barriers to parental engagement that included language/cultural differences in communities with high numbers of refugee or Latino student populations. In addition, in one community, teachers pointed to their students' inability to complete homework "because they have to watch their little siblings for after school until bedtime." Another teacher noted she/he had "four parents that are in jail or prison in my class."

ATTITUDES AND VALUES

Teacher and community members identified parental values and attitudes towards STEM fields as central in shaping students' interests and motivations. For example, some teachers pointed specifically to parents' failure to communicate positive expectations for achievement in STEM fields. One focus group teacher discussed how she/he struggled with parental negative attitudes towards STEM:

I have parents come in, and they will go, "I couldn't do a thing in science, so this is genetic, my kid can't do it either." I'm like, "No, it's not." And I hear it about math too. They go, "Well they can't do math, and I hate math, so they hate math." It's like, "Be quiet! Just say you love it whether you do or you don't!" I think some of it comes from parents saying, "I can't do it, you can't do it." Because I hear them saying that, and the kid's going, "My mom can't do this either."

Teachers were frustrated that parental cultural capital significantly shaped student interest, ability, and achievement in negative ways. For example, most teachers noted a relationship between parental knowledge and understanding of STEM fields with their children's interest. One teacher explained:

What I notice is the parents themselves don't understand it. If the parents don't understand it, their opinion is what the kids come to school with...If the parents don't like it, the kid doesn't like it by association, and then it's hard to get them excited if they go home and their parent doesn't know how to help them. Then the parent is frustrated, and it all just kind of spirals that way, so I try really hard to get them to like it and want to learn it. So then if their parent doesn't know it, it doesn't matter.

Another focus group teacher echoed this, characterizing parents in her/his community as devaluing STEM educational fields because of their own educational attainment. She/he said:

I really do not think there is a huge, huge push by parents to take these kinds of classes and to do well. I don't see it. I think it's there, but we have an uneducated community.

According to teacher perceptions, some of this devaluation was tied to the type of work students' parents and grandparents engaged in. For example, one focus group teacher argued parental influence was important, but the influence could decrease interest in STEM if family

members' work did not seem related to STEM fields:

It's important that they have parents, but, if dad or grampy has farmed out here for 50 years without a computer, why do I need one?

A community focus group member from an urban area echoed this perception, pointing to parental socioeconomic experiences as limiting their knowledge:

I think sometimes that parents, they're so busy just trying to make the paycheck and help the kids and do whatever they do that they don't realize what the job opportunities are out in communities not only right here ...but beyond and what the global market, how it's changing the way lifelong learning has to take place. They don't even have any ideas of what type of skills, knowledge, and abilities need to be acquired in order to land jobs not only today but to keep jobs, and then what are the jobs of the future going to be.

Some community members blamed parents for not teaching their children to enjoy learning or to value education. For example, one community focus group member who worked in social services argued the parents she/he interacted with did not have very much education:

I'm dealing with parents on my end. They don't have the education. And to be truthful, [to] some, education is not important. You don't see that passing on to their children. I see a lot of individuals that made choices in their lives to not finish school, to not go on, things along those lines. And I see their children making the same choices, and, for the majority of those parents, it seems as though it's okay.

Some teachers spoke of parents' low expectations of students. For example, a focus group teacher shared a story of a bright student who failed to go to college because of low parental expectations:

I had a kid...but he's still here in this town. He's probably one of the smartest kids I've ever taught, but his mom was happy with a C. He had the potential to be 4.0 and valedictorian and out the door just a couple years ago. It's just sad because mom was content with, "Eh, passing's fine." But there was no push, so he's still here. We've all pushed him. I know [another teacher] was really giving him college information on engineering things and really trying to get him out of here. It just fizzled because mom didn't keep pushing.

Another focus group parent from a rural community felt fortunate that her/his oldest daughter was planning to go to college. According to her/him, many parents in the community did not encourage students to pursue higher education:

You just don't have people coming in to vote on this because we're not an educated area. A lot of people here aren't educated as parents and don't really care if their kids don't progress after high school. My daughter's actually even said that she's heard some of her classmates say, "You know, well, I'm just going to get married and have kids after I get out of high school," which is great for some individuals, but I think they should look beyond that too.

A teacher from another rural community shared a similar story:

If the parents have attitudes that they want their kids to do better, the kids do better. We had one here a while ago where mom [thought], “whatever happens in school, happens in school. It’s no big deal.” The kid didn’t even graduate.

A community member from an urban focus group also identified low parental expectations as important in explaining the failure of some students to complete high school:

With my children, you know they have all graduated, and we have great discussions, we have great expectations for them at home. I think that parenting has to have that. I see a lot of their friends that went by the wayside, didn’t finish high school, they didn’t have parents that cared what they did.

Not all community members shared this sentiment. In particular areas of the state with higher percentages of racial-ethnic diversity, focus group participants believed that some types of families value education differently than other types of families. Thoughts were mixed on this potentially volatile matter. Often it was perceived that Hispanic families value education more than white families but also that the education they have in mind is a high school education and not post-secondary education. One example serves to demonstrate a cautiously stated perception that Hispanic families may not value education:

So I think that’s where maybe the breakdown as far as our community would come is not that they can’t do it, the push from the culture and the family may not be there to not go into those fields as much.

Another participant from a different focus group in the same community thought differently:

I don’t want to speak for the Hispanic community, but in [in my line of work] we have a certain amount of population. In visiting parents, they value education, and they’re here to make sure their kids do better than they did. And I guess, just kind of a general, overall it doesn’t go for everyone, but I think generally speaking, that’s the way they feel. They value the teacher; the teacher is at the very top of the social ladder. The teacher is very important.

Another participant from this focus group added some thoughts differentiating between the value of high school and of college education in Hispanic families:

Their families are very driven. I think if there’s way we can try to get their parents, because I’m not sure how much they value higher education. They’re here, and they want them to get that high school diploma, but there are a lot of the parents that don’t necessarily value ongoing education beyond high school, even though they place a high value on education. I think it’s just a matter of their parents not really engaged, and it’s somewhat out of fear and somewhat of a language barrier. But I think if there’s ways if those parents of those kids can be engaged, it will certainly help, but standardized testing I think really hurts our Hispanic population.

And yet another added further clarity on the issue noting the variation on attitudes toward higher education within both white and Hispanic families:

I think I’ve known a lot of non-Hispanic classified people, though, that their families don’t necessarily value these as well... I don’t think it’s just Hispanics only. And I think there’s a lot

of Hispanic cultures that, that, people that I've known that really do value these too so I think it's hard to draw a line like that, personally.

The focus group finding that parental engagement is central to understanding student academic success is best understood in geographic context. Much of Idaho's counties share the common characteristics of having small populations and being distant from large cities and agriculturally based. Many parents are employed in agricultural or service sectors, and only two of the twelve communities we conducted focus groups in have any notable STEM industries. The percentage of adults with four-year college degrees or higher varied from 4.2% to 36.2% in these communities, which is a notable contrast to the educational status of the focus group participants' educational attainment, of whom 48% had earned at least a bachelor's degree. The overall low higher educational attainment rates in Idaho put in one context why many focus group participants point to the parental cultural capital of others in their community as significant in student's STEM success. Likewise, family income was perceived as significant in shaping student success. Participants acknowledged the increased cost of higher education and the economic downturn that has hampered family financial support for students' pursuit of post-secondary education.

TEACHERS

Along with parents, focus group participants typically identified teachers as most influential in students' ability to learn and pursue STEM fields. Such sentiments are consistent with studies investigating the role of teachers in STEM learning. Indeed, Deiro (2005) claims that of all the various professionals who influence students, teachers have the greatest potential. Eccles and Harold's (1993:581) suggests that, "teachers are uniquely situated to help both students and parents think about each adolescent's unique talents and aptitudes in terms of future educational and occupational choices." The influence of teachers on student success, however, becomes complicated by conditions, often times outside of the teacher's control, that can usurp efforts on behalf of student academic achievement.

Teacher quality has been the focus of many federal and state initiatives to improve academic achievement. Although researchers have come to understand many indicators of effective teaching, initiating systemic change poses complex barriers. In terms of STEM fields, Harris and Sass (2007) explored the relationship between teacher productivity and teacher training (including formal university education, professional development, and informal training) and found teacher professional development in STEM content and more experienced teachers improve student achievement, particularly in mathematics. Others have found teacher expectations for children's mathematics ability and success are shaped by actual performance but are also shaped by child's family income, and that expectations have a lasting effect (Hinnant, O'Brien, and Ghazarian 2009).

TEACHERS' INFLUENCE

Many participants in our study addressed the general positive influence that teachers can have in encouraging students to succeed in STEM subjects, to pursue them in college, and to seek STEM careers. These views are exemplified by the following participants in different focus groups:

Example 1: Everybody that I've ever seen that was really good at a field credits a teacher somewhere in their history of their education. They said, "This person saw that I could do it. They pushed me through. They showed me. They helped me."

Example 2: I think that kids that are good at STEM are kids that have had enthusiastic teachers in STEM. No matter where you look, if there's a teacher of the year somewhere, they have succeeded in whatever they're teaching because they've gotten the kids so engaged and so enthused about it. They don't have time to consider whether they're good, bad, or otherwise. They just really enjoy the heck out of it.)

Many other focus group participants provided particular examples of how students were influenced by teachers, such as this parent who explained that a teacher inspired her/his son to pursue a STEM major in college:

Mr. Reynolds⁴ is our science teacher. He's wonderful. He's inspiring; he's fun. The kids want to please him...[M]y son set his major based upon what Mr. Reynolds exposed him to his senior year.

The view that teachers are an important influence is also illustrated by examples that some participants gave of teachers who discouraged students in STEM studies. One parent provided the following:

[My daughter] had a math teacher that would not explain to her how to do it. He would do the problem for her and that was it. So she never really learned, and to this day she's not confident. She would not take chemistry because she didn't think she could pass it. It all stemmed back from this teacher that was too busy to take his time to teach her how to do it rather than show her how to do it.

SUPPORT FOR LOCAL TEACHERS

Although current national discourse places much blame on teachers for perceived educational failures (Goldstein and Beutel 2009), community and parent focus group members were generally supportive of the teachers in their local schools. Statements that particular teachers were *-awesome,* *-inspiring,* *-wonderful,* and *-fabulous* were common, and many focus group participants commented positively about the teachers within their schools or districts. Examples include an urban focus group parent who said:

I think there's a lot of good teachers in Idaho. We've been in two districts, and I've felt good about a lot of teachers.

And a rural community focus group member who said:

We do have a good school. We have teachers there that could teach any college level there is.

When parents and community members identified problems associated with teaching, they did not often blame the teachers themselves, but, instead, pointed to insufficient funding, lack of teachers, or policies that restrict what and how classes can be taught. According to one focus group community member:

They do care, especially in [this community]. They want to inspire these kids, but they are up against a system, and the local system is up against the federal system.

One parent from another focus group said she felt her daughter was just a number to teachers. Here is how she described her experiences at teacher-parent conferences:

I think teachers have a pressure to fill a certain quota in the semester. Then they're pressured to kind of force the kid to...because it reflects on them. When I go to a parent-teacher conference...they give me [my child's progress] in point systems... It almost seems like they're a number, you know. I know they think [of our kids] like that because I think that there's so much pressure from the school system and from the state. It's almost like it's hard

⁴ Names used in quotes have been replaced with fictitious names to maintain participants' and community members' confidentiality.

for them to relax enough to think about teaching. It's almost like they have to jump and run through these little hoops.

Rather than blame teachers for this experience, the parent explained she/he felt teachers were subject to outside pressures. In several focus group discussions throughout the state, communities perceived that teachers experienced pressures from school districts, the state and federal governments to meet certain – often narrow – expectations and standards. Though fewer in number than those who were supportive of teachers, there were some focus group community members and parents who did identify teachers as responsible for the lack of student success in STEM subjects. Most of these, however, either stated that there are a few teachers who are incompetent or blamed particular teachers rather than teachers in general, such as one focus group parent who said:

We're stuck because we went and we've complained about this teacher, and we said that our kids are going to be lost in high school. My kid loved math. This year he hates it.

Although parents and community members were generally supportive, some of the focus group teachers themselves perceive that teaching has become a stigmatized profession, that their efforts are not appreciated, and that they are blamed for educational failures. This view is exemplified in what this rural focus group teacher shared:

For a lot of years, I was pretty proud all the time to say I was a teacher, professional educator, whatever. It seems like in the last couple of years, especially because of budget restraints and all that stuff that's been going on statewide, I'm not so open to say I'm a teacher anymore because automatically, like [another teacher] said, you have to start defending yourself.

Some parents and community members recognize teachers' frustrations as well, illustrated in the following excerpt:

We also hear all the time in the media about everything that the schools are doing wrong, and so seldom do we hear any celebrations of what they are doing right. If a kid does very well, then, of course, it's the kid and the parents and stuff. But it's not the teachers necessarily; it's not the school system. But if somebody doesn't score well then it is the teachers who [are at fault]... I think that we really have to look at how we frame all of education.

TEACHER QUALITIES

Teacher qualities most often mentioned by focus group participants as important for influencing students included their academic preparation, the extent to which they kept up-to-date, and their competence with respect to learning styles. Participants also attributed teachers' personalities, level of enthusiasm for teaching, and concern for students as critical in engaging students.

Several focus group participants expressed concern that some teachers might not be receiving adequate preparation in their teaching disciplines, training in pedagogy including classroom technology, or information about STEM resources and programs. Discussions of teacher preparation were more often stated in general terms. A few focus group parents described conflicts they had with teachers about methods used for teaching mathematics, often because

the methods differed from those they had learned in their childhood. Complaints that some teachers were not qualified to teach STEM subjects were less common, but did occur, as exemplified by the following statement made by a focus group community member:

You get a teacher who means well, but doesn't have enough background themselves. And my daughter said that, in her career here, there were times when her teacher had to stop, reread it, use a calculator, get online, get a lifeline question to come up with the answer. I mean, she had no idea of the answer, so how is she going to teach the topic? If the teacher doesn't know how to get the answer, how is he or she going to teach it to someone else?

The following is a statement from a teacher who was among those focus group participants who believed that teachers might not be receiving sufficient training in classroom technology:

I really see a lack of technology being used effectively in our school. There's some going on, but I think it needs to be used effectively, and the teachers need to know how to use it. So I think the teachers are behind in the technology.

Teachers' enthusiasm for teaching and for their fields was mentioned often as important for motivating students to learn, as was teachers' care and concern about their students. However, some suggested that low salaries and other working conditions, such as larger class sizes and the emphasis on standardized testing, might contribute to teachers' frustrations and therefore impact their level of enthusiasm for teaching. According to one focus group parent:

I think the pressure's gotten so hard on a lot of the teachers to make sure these kids are passing the state tests that are required. And that paperwork gets done. The focus has been torn away from the actual student in the classroom. Therefore, the joy of teaching is lost. They don't have the ability to say, "You know what? Today, let's just have fun. Let's do this experiment." There's no playfulness in the classroom anymore.

Clearly, focus group participants believe that teachers are one of the most significant influences in students' successes and failures in STEM education as well as in their decisions to pursue STEM fields in college and careers. Not surprisingly, they believe that, to be effective, teachers need to be proficient in the subjects they teach, be enthusiastic, and care about their students. Overall, participants believe that teachers in their school districts are doing a good job, though many are concerned that low pay, increasing class sizes, and pressures to meet standardized testing policies might negatively impact teachers' level of enthusiasm and the ability to attract and retain good teachers (more of which is discussed in the following section regarding curriculum). Focus group teachers are frustrated with what they perceive to be a public that devalues their work and views them as overpaid and the source of youth's educational problems.

STUDENT CHARACTERISTICS AND EXTERNAL INFLUENCES

In a reflective article envisioning what a new STEM education or “school science” might look like, Stephanie Marshall imagines how we might “ignite and nurture STEM talent” (2010: 50,59). While her primary concern is with specialized STEM academies, she attends to the fact that “our students already come to us with minds decidedly different from our own” (Marshall 2010: 50). In highlighting students’ global connectedness, she alerts us to the fact that they are a unique generation having grown up in a new technologically complex and interconnected world. Thus, a focus on what young people are like, what they face, and how they respond to our increasingly global and technocratic world is important in improving their higher education aspirations and achievements, particularly in STEM. While focus groups did not engage young people (student surveys are planned in Phase 3), we asked our focus group participants who have different types of relationships with young people, as teachers, parents, and community members, several questions concerning the type of students who excel in STEM and factors that elicit such success.

Focus group participants identified a variety of student characteristics in responses to questions about what and who contributed to students’ success in STEM education. Analysis of focus groups revealed two different types of student characteristics that were seen as significant in shaping student academic success: individual differences in interest, motivation, and ability in STEM areas, and differences in social context including exposure to role models and/or mentors. The relationship between these two factors shows the intersection --- role models and mentors often shape and direct student interest and motivation.

INDIVIDUAL INTEREST, MOTIVATION, AND ORIENTATION TO LEARNING

There were a number of individual characteristics that focus group participants perceived as necessary for student academic success, particularly in STEM fields. The most significant individual attributes identified were interest and curiosity, motivation, and mastery/ability.

A. Interest and Curiosity in STEM

Researchers have explored the role of interest in the pursuit of academic domains and revealed complex dynamics (Wigfield and Cambria 2010). According to Randler and Bogner (2007), prior interest, prior knowledge, and structure of knowledge increase achievement and correlate with higher interest. Scholars have also distinguished types of interests, noting personal/individual interest is relatively stable while situational interests can be induced (Hidi and Renninger 2006; Schiefele 2009). Our focus group findings are consistent with this research, as participants noted the importance of student interest and curiosity in answering the question, “What kinds of kids are good at STEM?” For example, a teacher in one focus group stated:

They are the kids that are always trying to figure it out, the curious ones. The ones who first are in nature are curious about everything that happens. They’ll be the kid that tries to...looks at a pen spinning and is trying to explain why it is spinning in that direction. That’s a trait that they have to have.

A computer science teacher pointed to student interest as a factor in success when describing who did well in her/his courses:

The kids who really do well... are the kids who just really like it. I have some kids who are just there because they didn't want to take Spanish. I have other kids who just really want this stuff. Those are the kids who really excel at it.

Likewise, another focus group teacher argued students do well in fields in which they are interested:

I don't care what you study. If you have an interest in it you are going to do better than you do in the other subjects...some kids really like to write. They are going to be better at English than maybe they are in math because that's where their interest is...It has more to do with an interest than anything else.

Another focus group teacher was critical of the idea that increasing the number of mathematics or science courses required to graduate would strengthen student performance in these areas. She felt student interest as well as "innate ability" was more influential:

One of the other things that they do especially in the area of science and math is continually increase the number of classes they have to have to graduate. I think they have the cart before the horse...They make statements like, "those who take more math courses do better in college or something"...Well, that's because they already have the innate ability, and that's why they take more math courses.

This focus group teacher argued that requiring students to take more mathematics classes usually led to "more dislike for that subject" and emphasized the importance of cultivating student interest.

B. Motivation

A robust body of research documents the relationship between motivation and academic achievement (see Winne and Nesbit 2010 for a thorough review of this literature). Studies on achievement motivation are based on expectancy-value theories that posit student engagement and achievement are linked to the expectations and values students ascribe to success. Students who expect to perform well on particular tasks and who ascribe utility value to particular task domains are more likely to be engaged and motivated to pursue learning (see, for example, Eccles, Wigfield and Schiefele 1998; Chouinard and Roy 2008).

Participants identified student motivation as important in understanding student success in learning STEM fields. Despite the difficulty of mastering STEM concepts and content, participants across all groups agreed that students who were academically motivated would be successful in any field, including STEM. For example, a parent from a rural community said:

You know what, here all of our kids are involved in a lot of things. I think about our best kids in STEM right now, those are our best kids in everything. They're very motivated, well-rounded, involved kids.

A teacher argued students successful in STEM have to be "determined" and motivated in mathematics and science since they were challenging subjects. Another teacher agreed,

arguing student motivation was central. He explained:

I think for me it all boils down to that desire. Do they really want it? Do they want to learn this material? Because, if they don't, they're the kids with their hand in the air, going, "I don't get it. I don't want to do it. Just tell me what the answer is. Tell me how to do it." Those kids that really want to be good at math whether they want to improve a score or they want to get a good grade, they have some kind of a motivation there. They have some kind of desire.

How to motivate students was discussed in focus groups and participants pointed to role models (teachers, peers, mentors, etc.) and family as central in shaping student motivation.

C. Mastery and Ability/Aptitude

The vast majority of our focus group participants believed all students were capable of mastering STEM fields if given appropriate resources, support, mentoring, and engaged STEM learning environments. However, a smaller number of focus group participants suggested that students who were successful in STEM fields and education are more innately inclined toward these fields. For example, the focus group discussion among community members in one rural area focused on a number of things children learned from their family that led to their aptitude for STEM. One focus group teacher acknowledged these were important but emphasized "nature" in her/his explanation for why some students do better than others at STEM:

I think we are talking a lot about nurture which is very important, but I do think there is a little bit of a dominant left brain/right brain. That is true. There are more artistic sort of people not that they are not going to use math and science and stuff in what they do too. But there is the more artistic: music, or fine art-oriented, dance, those sorts of people who express themselves that way who aren't necessarily hard wired to be as much as the analytical thinker...So, if I had to say there was a difference, nature wise, I think that is true, that some people are a little more hard wired one direction, left brain/right brain.

A community focus group member echoed a similar perspective, arguing:

Some people are more equipped with a certain side of their brain or something to learning those things. Some people just get it, and some people don't.

A teacher from another focus group referred to different aptitudes people have that shape their ability to learn STEM. She characterized her husband, whose profession was engineering, as an example of someone with an aptitude for engineering and noted, "I think a little bit of genetics makes a difference in that."

Focus group teachers, in general, concentrated less on innate intelligence in favor of an overall disposition toward learning, early success, and ability as explanations for why some students do well in STEM over others. For example, more of the teacher focus group participants believed students who were good or successful in STEM disciplines were simply those students who tended to be successful in all fields, linking this success to their overall disposition to learning. For example, a teacher from a focus group stated:

Most of the ones that succeed at STEM education succeed in other subjects as well, for the most part.

Teachers and parents were also likely to point to early student academic success as factors in shaping future aptitude. As this focus group teacher explained:

I don't think it's anything more dramatic than we have in any other subject matter. They experience some small success, they build on that success.

Parents were also likely to note early success in mathematics as important in shaping their children's future abilities. For example, a focus group parent said children who disengaged from STEM fields did so because of previous challenges and lack of success:

But if they kind of got lost in elementary, they struggled. They didn't feel good about it. They didn't enjoy it. People don't go into things that they don't enjoy or they don't feel like they're successful at.

Reinforcing the idea that students successful at STEM have a particular orientation toward learning, one participant stated this about students:

They know how to learn. They know what they need to do. If they don't get a concept they're going to try the problem again.

However, importantly, the participant added:

If they don't get it, they're going to try it again or they have different people helping them out. If they can't learn from me, they'll go ask a friend or they'll ask another teacher or maybe they'll take it home.

The statement makes a key connection between an orientation toward learning and the opportunity to have others to whom to turn for assistance. Individual motivation, interest and an effective orientation toward learning are assisted by an environment where others provide encouragement and assistance, and they are likely also a result of having such an environment as the two levels—individual characteristics and social context—work hand-in-hand. The importance of others, from parents and teachers to STEM professionals and peers, was a recurring theme in the focus groups.

INFLUENCE OF STEM PROFESSIONALS

Focus group findings indicate STEM professionals are important influences in shaping students' interest and motivation in STEM fields and careers. These included professional scientists from local companies and professors from nearby colleges or universities. Students interacted with role models through field trips to companies or when professionals provided demonstrations in classrooms or special workshops.

A parent from an urban community provided an example of how STEM scientists can serve as important motivators for students to consider STEM areas as viable educational options through her/his own son's experience. She/he explained:

The thing that got my seventh grader going when he was back in seventh grade. One fellow was a nuclear physicist, he came and talked. And [my son] still thinks he wants to go to ISU because of that one guy telling what he did.

Parents who lived in communities near colleges and universities were pleased with opportunities for their children to engage in applied STEM experiences provided by these institutions. They described how their children's interactions with STEM professionals often broadened their ideas on possible careers, encouraged them to pursue higher education, and offered hands on STEM experience. For example, a parent from an urban community talked about a special science camp for girls at a nearby institution:

At one of the colleges they have programs just for girls coming up this spring. It's a science camp thing ... You get a whole slew of girls crammed in there, and they sleep overnight, and they look through the telescope, and they do a whole bunch of different kinds of projects that are available for them to go and check out. And I think it's those girls out there, they get exposed to a whole...they get to see, you know, hey, there's other girls, you know, doing science type stuff...they may not be at my own school in my own classroom and stuff, but the kids are interested. But there are other people out there of my gender that do this kind of thing."

Another set of teachers and parents praised a STEM professional who used to work at a local fish hatchery for her/his innovative programming at schools:

[She] set the tanks and they would raise the fish and then go and release them and do the whole cycle, in all the different programs.

Parents and teachers both cited this professional as an example of effective and engaged pedagogy in STEM and were disappointed that the program was discontinued when the STEM professional left her/his job at the hatchery. Focus group participants' perception that STEM professionals were important socializers is supported by the literature – such individuals help students make links to potential careers and have the potential to improve student attitudes and interest in science (Forbes and McCloughan 2010).

INFLUENCE OF PEERS

Focus group participants identified peers as important in shaping students' educational aspirations. For example, a community member from an urban area discussed findings from a survey of over 600 students who participated in a 4-H event to inform young people of manufacturing and construction industry jobs. One survey question asked students who was influential in shaping their college and career goals. The community focus group member shared the following results:

The number one person in their life who influenced them as to go to college or what career field to choose was their friends, number one. Number 2 was their parents. Number 3 was their teachers. Number 4 was their high school counselor. We just talked about that again today. Really, their own friends have a huge influence. Susie says, "I'm going to be a hair stylist and go to the cosmetology school." So her friend goes, "Me too." I mean, whether she even thinks she has a gift in that area or she's ever thought about it. It's a huge influence.

A focus group parent from a different community provided a similar story about her/his daughter:

My daughter came home last year and said, “I’m taking drama.” I was like, “Really, how come?” Because [another girl] is. I said, “No, sorry, you’re not. You’ve never been interested in drama before. You’re going to do something that...you’re not going to take drama just because your friend is taking drama.” Yes, I think friends have a lot to do with it.

Because children were quick to follow their friends’ academic decisions, this parent argued it was important for parents to stay engaged with the school system. Another parent from a rural area noted that, the smaller the community, the more influential peers could be. She believed “kids are more impressed by their peers than they are by their parents” and described young people as:

...very impressionable. I don’t know from experience, but I guess that’s even more so around here where there’s just not a lot of kids. If there’s only twenty people in your class, and ten of them are going this direction, and that’s the group that you want to run with, then you don’t have a lot of peer role models, I guess, to look towards

Students help socialize one another in terms of their academic behavior and provide important markers of social comparison. For example, a few teachers talked about students’ desire to be perceived as cool, which to some students could not be reconciled with academic excellence. Peer interaction and negative perceptions of academically strong students often encouraged students to withdraw from STEM fields. One focus group teacher described this “culture of coolness”:

I had this one kid in middle school a few years ago, and we were doing some very basic intro programming stuff. He was having a hard time and not getting it, and he asked some questions about it. He was starting to understand. You could just see that he was just starting to get a glimmer of it. Then the other kids started teasing him for asking questions and understanding it. You could just see he just shut right down and refused to do it anymore. He gave up. I lost a kid then. I never could get him back. That culture of “it’s cool to be dumb” is really, really heartbreaking. It’s a big, big problem that I face.

The teacher characterized the student culture as discouraging to academic excellence:

It’s a lot more important to be cool than smart. I mean if you can pull off being both, more power to you, but if you have to be one, it’s got to be cool especially in the middle school. I’ve seen that problem exactly what you’re talking about. Most kids, the cool kids who are, “it’s cool to be dumb.” They’re a stronger personality, and their stronger personality will pull the kid in that situation down a lot more than a kid will get pulled up in that situation that you’re talking about. In fact, a kid being a strong enough personality to pull another kid up is pretty rare from what I’ve seen in the classroom. The kids with the stronger personalities generally are the ones that are pulling down.

While our focus group findings did not reveal any specific gender differences in such attitudes, other researchers find that young boys and adolescents often conflate studying and academic achievement as “uncool” (Jackson and Dempster 2009).

Focus group participants also noted that peers could play a positive role in students’ academic achievements and STEM interests. For example, one focus group parent said some peers were detrimental while others challenged each other to improve their academic skills. She worried that all students don’t “have the luxury of positive peer relationships.”

Peers are key socializers for students' motivation and performance (Altermatt and Pomerantz 2005). A focus group teacher provided a specific example in which a student assisted a peer in challenging themselves to do better in her/his calculus class. She described both as "brilliant" but characterized one student, Paul, as simply not very motivated. Her other student, Katie, helped motivate Paul. She explained:

Without Katie, Paul would not do as well as he does. Flat out. I mean...Paul does as well as he does because of Katie. Ever since they were little, they've taken the same math class, the same science class, the same this, and if Paul doesn't do as well, he's not going to be with Katie anymore. They push themselves.

Another teacher from a different focus group experienced similar positive peer relationships in the classroom. He shared the following example of a student that "loves science":

Last Friday, we were in the middle of our ISAT. One section of the room starts buzzing... He had scored so high that all the kids around him were so excited for him because we use our ISAT numbers as one of our qualifiers for gifted and talented. Based on the number, he's definitely there. Every kid around him said, "Good job! High five!" Then when we went back to the classroom, it was like he'd just won the MVP award from a game. They were saying, "Oh my god, that is so great!"

The focus group findings suggest participants perceive peers as very influential, both positively and negatively, in shaping student academic success. The literature on peer impact on student academic success indicates complex relationships with mixed results given the heterogeneous nature of friendships. For example, the influence of peers on academic performance is often shaped by the type and frequency of peer relationships, what age/grade they occur, and academic self concept and competence. Further study of type, quality, and quantity of peer relationships in Idaho communities is needed, but it is clear, at least in focus group participants' perceptions, that a complex interplay of individual characteristics and social relationships affects student learning outcomes and success in STEM education.

CURRICULUM AND PEDAGOGY

As students move through the K-12 educational system they are exposed to a large number of different and often confounding pedagogies and curriculums. It is common for students to be well served by teachers who employ a pedagogy that aligns with the students' learning styles. Students who find this type of alignment often thrive academically. When students find themselves in a learning situation where there is discordance between the student and the pedagogy, the challenge of mastering the content increases. John Dewey recognized this struggle at the turn of the previous century and wrote extensively on the topic of aligning subject matter with method for the benefit of the student and student learning (Dewey 1902). We have not moved far from the curriculum and pedagogical struggles from over 100 years ago. Teachers, parents and communities all wrestle with how to best serve students in an educational era of unprecedented rapid curricular change. Parents, teachers, community members continue to seek answers to the same question Dewey asked 100 years ago: What is the best way to support our students' academic success? While student success is supported through the intricate balance of family, social, and school structures, focus group participants also pointed to curricular and pedagogical factors.

HANDS-ON ACTIVITIES

Focus group participants often explained their thoughts on why curriculum should involve hands-on activities for the success of all students. The following teacher from an urban focus group explained that, by providing authentic experiences to explore curricular concepts, all students have a greater chance of success:

[I] try to take those concepts and put them into an activity...We do owl pellets. We do classification with Jelly Bellys. We do all of this stuff. That's the stuff that, I think at our level, that hooks the kids that you get in your AP class...[A]ll of my kids know what erosion and deposition is. They know it, not because I stood up there and told them it was going to be on a test, or we wrote definitions in our science notebooks, it's because we did it. We actually do it. We manipulate it with our hands. We put it in a contextual situation. We don't learn a process of divide, multiply, subtract, check, bring down. We look at the big number and we look at the conceptual picture of it and put it in something real life. That's usually what hooks them.

Similarly, in the following passage a teacher from a rural focus group explained that, through authentic, hands-on activities, students are motivated to learn and more readily engage in curricular tasks:

I think, with science, my kids love science. But, when we do science, it's not textbook. We do fun activities, and I think that's a big thing for kids with motivation. We try to do language activities and science activities. Taking away from just sitting there and listening to the teacher direct instruction, a lot of times I try to do a lot of involving the kids in doing fun activities to motivate them.

Focus group participants provided numerous examples of hands-on projects that they, their children, or their students had participated in that made learning science and mathematics exciting and inspired some of them to pursue STEM fields as careers. One focus group teacher described the excitement generated by a science project as follows:

One kid was doing the happy dance because he said, “Do you realize what’s in pond scum? It’s so awesome.” They’re so excited when they’re doing experiments. I see not only having experiential learning but then bringing in the community... [T]hat’s what I’ve always tried to do is make it real world applicable and bring people in.”

Teacher focus group participants also talked about student success being derived from curricula that was “inquiry driven” or “the horizontal integration of curriculum.” Consistently, teacher focus group participants expressed that student success required, in part, curricula that connected to students’ lives through authentic content explorations and engagement.

SCAFFOLDING

This theme refers to an ideal curriculum that scaffolds student learning throughout the course of their education. In other words, each successive year of a student’s education should build upon concepts at an appropriate level of rigor from the previous year or years. The lack of continuity in one particular school setting was evident to a recently transplanted focus group parent participant as noted here:

One of the things that I did notice that I would like to make sure gets in there is that the math doesn’t have a good continuity through here, coming from Pennsylvania to here.

Teachers in many of our focus groups expressed similar concerns about curricular scaffolding and the detrimental effects a lack of continuity has on student success. In this excerpt a teacher discussed scaffolding from experiences in social studies:

I can’t separate it and take an hour in the afternoon and then take that concept further, because I don’t have the time to do it. I would love to, because my book, especially in reading, I love the concepts that it presents. It also is not in any sort of order. When you’re teaching, my 5th grade is American history, it kind of needs to go, “what’s our history?” It’s presented so randomly that nothing ties. It’s difficult that way.

Scaffolding also speaks to curricular consistency and providing students with content experiences throughout their education. In the following focus group examples, participants expressed concern on the lack of continuity in content area experiences (e.g. mathematics) from year-to-year:

Example 1: We’ve had three years of math required for several years now, but the new part is the third year, or they must take a math class in their final year of high school. For those students that we traditionally call “college bound,” that’s not going to impact them, because they’re still going to take their four years just like they normally would. But, now we’re looking at a group of students, potentially, that would take a first and second year, skip a year, and then take their third year as a senior after having laid out of math for a complete year.

Example 2: My fourth grade son last year in third grade had a report card come home, and there was no grade in science. I said, “Why is there no grade in science.” He says, “Oh, he didn’t do that this term.” You didn’t do science this term?

Scaffolding doesn't just relate to the continuity in K-12 education. Focus group participants were vocal about their perception of a disconnect between the preparation students receive in many high schools around Idaho and the admission requirements from institutions of higher education. One teacher perceived the situation in this way:

Our graduate requirements don't fit college entrance requirements, and that's a rude awakening to a lot of kids who say, "I want to go to this four-year school."

Elaborating on this issue further, another teacher focus group participant explained that the change in requirements is leaving some students wondering about what is educationally necessary:

There are certain things they have to take every year, and I also know that a newer requirement is to take a math class their senior year, and again the kids are like, "How come? Why do I have to do that?" Well, that's what the state required. When you go to college, these are the things you're going to need to know, just to get into a college. You have to have these credits, just to get into the college.

Scaffolding also comes in the form of resources allocated to content areas to successfully deliver the curriculum. In some cases, political climates determine where, and to what extent, resources are allocated, consequently creating an imbalance in priorities and attention. One rural focus group parent expressed the following:

It seems like the last few years that the focus has been almost too much on technology, and less on the other aspects of what you're wanting us to discuss. It seems like every time you read an article in the paper or anything, there's a lot of, not adoration, but a lot of hoopla over all the technology awards we get and "in this and that" and, well, how many awards can you get for technology and still have forty year old microscopes?

Focus group participants consistently described continuity (or, scaffolding) as important in education, but that there was room to improve. Similar to continuity is the idea of parity and balance and that, in order for students to be successful, the curriculum should strive for a balance versus being driven by a standardized testing climate.

FAMILIES SEEKING CURRICULUM ENRICHMENT ELSEWHERE

Focus groups were concerned with the types of curricular experiences available to students that would prepare them to be successful in a 21st century workforce. In many rural Idaho districts, the expertise, resources, and facilities prevent schools from offering courses and experiences students need in preparation for higher education. From language to AP courses, students and parents are forced to explore alternative options. For example, some students and parents are exploring possibilities of pursuing education in bigger school districts such as Boise, or communities within close proximity. Two examples illustrate this consideration:

Example 1: And then I was going to say, you will probably know, wasn't it the [one family's] kids that left, and they didn't finish high school here, and they went to Boise for a better education with more classes?

Example 2: My son did too. In his junior year he focused on what university he wanted to go to, and he realized that this school was not going to get him there. So he said, “I’m going make sure I’ve got a place to land” and he enrolled himself at Boise High, and we scrambled for him to get a place for him to live, and his sister to move over there, and found her a job. And, he took all these AP courses there, and then came back here for senior year. Again, it was about languages. He couldn’t get a strong education in the language that we wanted, so he had, we had to do that. It was terribly hard and expensive. My child left at sixteen to go somewhere else to get an education so he could get into the university that we wanted to.

Offering courses that prepare students for the 21st century workforce is a concern to many focus group participants in rural Idaho communities. The following example from a community focus group highlights a sentiment in which community stakeholders see national and global trends in STEM but are also aware of the limited resources available to their students:

Electronics, industrial education, computer science, we have that, but not probably what they offer at the bigger schools. I think we’re shorted on a lot of these. We only have maybe two teachers in our high school that I could say would fit in any of these.

The Internet has also emerged as a venue for securing requisite coursework. For communities that are unable to staff a language teacher (e.g. Spanish), online courses provide an answer, but not necessarily an ideal option as the following parent participant explained:

I know colleges want you to have a foreign language or something. We don’t have anything here, so they have to take it online...I’ve heard that the Spanish is really hard... to take an online course like that, because there’s no teacher to help you or anything...

Local communities are sensitive to the changing school environment. School environments are changing as a result of federal regulations and the competition over resources to provide students with the tools that will allow them to successfully perform on standardized tests. Courses are being cut or reconfigured and, as a result, the curriculum students take does not have the pragmatic experiences some community members believe are needed. Thus, in some communities, students interested in a trade have to find preparation elsewhere as noted by the following community focus group member:

I am not saying that math and science and those things aren’t important, but if you don’t want to go into a field that requires all those... Let’s say you want to be a plumber, or an electrician, or mechanic. Why don’t they have curriculums for those people that want to do that in school, to train them? When they get out and say, “Okay, here you’ve got the basics. Now, you can go on to a trade school and probably come out with a better income than you would if you just hit her hard and got your...program wherever...” Not everybody can be something with sciences, or math, or the whatever. And, if you don’t want to be, you want to be a trade person, then let’s give them a curriculum where they can be a trade person.

TEACHING TOWARD THE TEST

The high stakes, standardized testing environment has affected K-12 school curriculum in a variety of ways. According to focus group data, standardized testing may inhibit STEM education because it limits the types of fields that are emphasized, results in a focus on basic knowledge at the expense of application and problem solving, and does not allow teachers to

tailor their approaches to deal with different student learning styles or incorporate experiential learning. In addition, school curriculum has been affected by some subjects getting pushed to the side that are not being tested for meeting AYP, such as science, in favor of those subjects that are. On several occasions, focus group participants described what they felt were the pressures administrators and teachers experience, as a consequence, and that these pressures have had adverse effects for students. One participant shared:

My sister is a teacher, and from what I understand if so many of her kids don't pass the ISAT she can lose her job. She has to teach toward the test or she can lose her job. However, she is one of the teachers that do try to put in art and science and different things but she gets in trouble sometimes for this. Just because she is supposed to be teaching toward the ISATs, we don't have time for other stuff.

The belief that standardized testing encourages teachers to "teach toward the test" was commonly held by focus group participants. Participants in all three types of focus groups – teachers, parents, and community members – expressed concern that state mandated standardized testing and its association with teacher promotion and job security require that teachers focus most of their time on subjects covered by the tests. A community member expressed the following sentiment:

Because they are trying to catch up to the test. They are trying to learn enough to get to pass the test, because in Idaho, and all around the United States, the teachers are being evaluated. They are keeping their job by how many kids can do well on that test that they hand to them.

In addition, participants believe attempts to improve student performance through testing has adversely affected science instruction in particular as these focus group excerpts illustrate:

Example 1: ...we used to teach science in the younger grades, but it's totally neglected because it's not one of the tests...

Example 2: The stress has changed, and so I believe there is a lack of science in the elementary schools.

Some participants mentioned that STEM subjects addressed in standardized tests are limited, inhibiting students' exposure to a variety of those fields, and often only basics can be covered since teachers do not have time to cover much else. According to one of the teachers:

In every single class you make sure you get your reading in. You make sure that you get your language arts in. Now they're saying get math, but they never once say, "Let's get science in, let's get a little music, let's get a little art." They never say anything else, but it's reading, language arts, and now they're worried about math, so now it's a little bit of math. But they never once say, and "Gosh, let's all work on science, you know, this is the week, let's do something for science."

A few participants suggested that the emphasis on standardized testing leaves some students behind as teachers are not often able to cover the basics thoroughly or in a manner that is tailored to particular students' learning styles. According to one community focus group member:

One thing that I notice, with my spouse being in the education field, is she spends more time updating to state requirements on whatever they decide is the flavor of the year or month, that she's actually spent so much time trying to transition to these new programs, that the kids aren't getting the basics. They're trying to put everything so far above them, that the basics of especially elementary ed is kind of being lost. And the kids are coming out of there slightly confused because they're trying to be forced something, and they haven't gotten the red, white, and blue of the basic primary colors. They're not getting the basics of it before they're trying to be—and the teachers are scrambling to try to keep up with it. And the system is confused.

Focus group participants were concerned with limitations on the types of fields covered and the lack of critical thinking and problem-solving skills students develop as a result of standardized testing requirements. One focus group teacher stated:

I don't think that is taught a lot, critical thinking. That's why the DMA [Direct Mathematics Assessment] was a good way, I don't think it was the best tool, but it was a good tool to make sure that teachers still taught problem solving. You don't have to do problem solving on the ISATs [Idaho Standards Achievement Test].

And another focus group teacher participant said simply, "Where in the ISAT is there problem solving?" One focus group community member echoed those sentiments as follows:

I think standardized testing is a problem because we're grading teachers' education level based on regurgitating the information that they want you to regurgitate for this test. We spend so much time getting kids focused on these tests and how it's tied into a school's performance, school district performance, these kind of things, that it doesn't allow for that, what I would say a robust education and critical thinking skills, problem solving skills.

Focus group participations also expressed concern that there were fewer experiential learning opportunities as the emphasis on standardized testing left little or no time for such experiences and because schools have less funding to provide the resources needed for them. An exchange within one of the parent focus groups addressed constraints on teachers' ability to take advantage of available STEM programs:

Parent 7: And that's a frustration that I hear from teachers a lot is, you know, you tell them there's all these programs available. There's Ag in the Classroom, and there's Wet and Wild classes and there's all this wonderful stuff you can incorporate into your curriculum to teach kids...

Parent 5: We don't have time.

Parent 7: About Ag and to teach them about wildlife, teach about lifelong skills. But yeah, teachers say, "would love to do that but I have a curriculum that I have to follow that I am mandated by the state."

A teacher discussed problems with incorporating experiential learning into the classroom given the emphasis on standardized testing and teachers being evaluated based on the results of those tests as follows:

How do you justify, especially if it's you that going to be judged by the scores that your students take, how do you justify spending four days on a hands on project when you know that in three more weeks they're going to take a test that is going to require them to multiply fractions and to find a percent and do this and that, and, you know, factor a polynomial, and, if you haven't...if we haven't drilled those things, then they're not going to do it.

The focus group participants' discussions of standardized testing are particularly significant because the facilitator did not raise this issue herself. That it arose spontaneously in nearly all of the groups, in both urban and rural communities and among parents, teachers, and community members, suggests this issue is on people's minds and that, consistently across all types of focus groups, people view this as connected to successful STEM education. Of course, national discussions and debates about standardized testing inform local and statewide conversations. Although a few participants mentioned that raising standards through standardized testing may have a positive impact on education, most of the participants were concerned that it could adversely impact STEM education. These concerns appear to be derived from participants' belief that critical thinking and problem solving skills, as well as interest, are necessary for students to pursue and be well-versed in STEM fields, and acquiring these involves experiential learning and interaction with teachers, peers, and role models. They are worried, then, that curriculum tied to standardized testing, along with reduced funding, will minimize these important opportunities.

PACE

The pace at which our current education system progresses through curriculum is a concern for many focus group participants. There is consistent sentiment that students are not given the opportunity to be successful because of the fast pace at which teachers move through the curriculum. In their estimation, this is not the teacher's fault, but, more accurately, is a result of the vast amount of content deemed important for our students to know and be able to do, particularly in light of standardized tests. Regardless, the fast pace was considered an impediment to critical thinking and a deeper learning of content. The following excerpt highlights how pushing so fast through the curriculum inadvertently turns students off to learning which has lasting effects. One focus group parent with former teaching experience expressed the following concern:

I think we push them so fast, so quick through elementary that we lose a lot of them. If we could really get them solid, the kids that came to me in the middle school that were really solid foundational, I could do whatever I wanted with them. I could throw a project at them, and they could figure it out. But if they kind of got lost in elementary, they struggled. They didn't feel good about it. They didn't enjoy it. People don't go into things that they don't enjoy or they don't feel like they're successful at.

In contrast, the following teacher focus group participant shared a justification for moving through curriculum in a rapid fashion:

It's a foundation that you build upon every single year. There's so much curriculum to cover in math that you want to build it, but you still have to get them to the end result too because you know that they're moving on next year, and they're going to build up on that.

Focus group participants perceive that today's education climate presents students with more content than ever before within arguably the same amount of time. As a result, students' interest and excitement for learning is diminished as the fast pace forces students to perform in such a way that rote memorization is rewarded over application and critical thinking. One focus group participant who, in fact, did drop out of school at age 16, felt adamant that the heightened pace and increased workload on students were major reasons some students give up on high school:

That's why we get overwhelmed. They're giving us like this much time and throwing that much work on that much time. We're like, "Okay, whoa, whoa. Slow down!"

Focus group participants had much to say about curricular issues related to STEM education. Common themes included the importance of hands-on activities, a need for stronger continuity throughout K-12, a lack of access to some areas of coursework locally, constraints encountered because of testing requirements, and the pace and volume of curriculum expected. Each of these issues emerged across focus groups providing key insights to the problems community members, parents and teachers see with educational curriculum in general and STEM curriculum specifically.

TECHNOLOGY AND PEDAGOGY

The relationship between technology and pedagogy was one other topic that permeated the focus group discussions related to curriculum and pedagogy. Although focus group teachers and parents both saw considerable advantages to incorporating technologies in classroom instruction and student learning, several participants noted the mere presence of technology does not equate with learning about technology. Participant perceptions of these differing aspects of technology and education were discussed in the section on "STEM Definitions and Meanings" so we will only briefly revisit it here. The distinction between the presence of technology or the use of technology as a pedagogical tool and learning about technology is exemplified in revisiting the following focus group response:

There's a misperception, especially in K-12 schools, that technology in schools is equal to the presence of computers and Smart Boards in the classroom as opposed to teaching people what technology is, how to use those things... You can have all the computers you want in school, but it's only as good as the person who's running it.

The following interaction between two teachers in a rural focus group is also instructive:

Teacher 1: I want to get just one more thing on record and then I'll quit. Taking a class off of a computer screen, in my opinion, is not using technology.

Teacher 2: I totally agree with that. That's not using technology.

Teacher 1: Using a paper and pencil to solve a math problem, in my opinion, is using technology because you're at work solving a problem. It doesn't necessarily have to be a computer or a gadget. It's the method by which you go about getting to an end.

The exchange between the two teachers, in fact, revealed the conundrum in many focus groups throughout the state. Is the use of technology a pedagogical tool, or is it actually teaching students "technology" as a subject? We concentrate here on focus group participants'

impressions regarding the use of technology to enhance or impede pedagogical strategies for engaging students in STEM learning. Although technology was most broadly connected to student computer use, people often discussed implementing technology in the classroom and structural shifts toward computer instruction. The following discussion touches upon two areas, technological tools for instruction and online courses.

A. Technological Tools

Technology as a pedagogical tool came up several times during focus group discussions. Among focus group teachers, most interest in technology generated around the capabilities of Smart Boards. One urban area teacher remarked after learning about its capabilities in the classroom:

Get rid of the chalkboards and move to the Smart Boards. We just had a presentation. Some of the teachers in our building got a grant and got smart boards. We just got a presentation on that. It's just astounding, just amazing.

And teachers indicated that they found Smart Boards effective for STEM education. One rural teacher shared:

I have a Smart Board this year, and we use it every day. The kids know how to use it. We use it a lot in math, making different geometric shapes and learning how to measure things. So the kids are getting really good with the tools. I teach science quite a bit [using the Smart Board].

On many occasions, however, it was apparent that the ability to teach with Smart Boards was not common across districts, or even within districts, as a result of budgetary constraints. One teacher described the lack of technological tools in her/his classroom:

The only technology that goes on, it doesn't happen in my room because I don't have the computers. But the kids will do research for different topics when writing their persuasive essays. That's how I have incorporated technology. My Smart Board doesn't work.

The subject of resources will be discussed later in this report, but it is important to note that teachers have played important roles in obtaining Smart Boards through pursuing grant opportunities. Comparing local experiences to observations while on a field trip on the east coast, one teacher shared:

I was at a high school on the east coast this summer with the drum core. We were there in the parking lot when their Smart Boards were being unloaded for the whole school. It's just an assumption that that's what would be. They were updating their Smart Boards. In fact, the document cameras they have and the recording and audio/visual equipment that they have and all that. We have a few Smart Boards in place throughout the district because those individual teachers have written grants and acquired them.

According to teachers, the Smart Board facilitates engaging pedagogical techniques to help students visualize difficult concepts and to access a variety of current programs. As with any technology, though, the costs of acquiring and maintaining them means that there is unequal access to these teaching tools within and between districts.

B. Online Courses

Focus group participant' attitudes toward online courses were mixed. A number of focus group participants mentioned that online education could provide access to STEM courses that schools cannot offer due to limited teachers and funding. A growing body of research on online learning has, likewise, found potential weaknesses in the areas of concern described below. Thus, researchers recommend careful implementation taking into account the need for face-to-face interaction and the socio-cultural barriers impeding access (Ng and Nicholas 2010; Pape 2005; Praska 2011). Small, rural schools in particular are often unable to offer STEM courses much beyond the basics, and focus group participants stated that schools could, or are, offering more advanced courses online to broaden the curriculum. One rural parent stated:

We don't even have the classes. We already have the computer classes because there aren't teachers to teach some of this stuff.

And a parent from another rural community suggested:

If there's a way to bring some classes maybe into our schools that we can't offer because we are a smaller school but we can bring them in online, heck yeah. I don't see that being a bad thing.

On the other hand, more participants expressed concern that mandated online classes, or too much reliance on them, could be detrimental to STEM education. Even those who saw some benefits suggested that the types of online courses that could be completed successfully are limited, especially for science courses and advanced mathematics classes. One urban community parent asked: "[C]an you imagine taking a science class on a computer laptop?" Another parent in the same focus group described her/his experiences with an online course:

I took a statistics course once Did I get the basics? Yeah. Did I learn how to apply it to different situations, what I was learning? No, because I didn't have someone standing there in front of me taking what the basic level that I was learning and applying it to different situations. I didn't get the input from the other students in the class, talking about how they solved a problem with this statistical formula that we were using. I got a very basic, general understanding of statistics, and I missed all of the applied part of it because I didn't have that interaction.

Also skeptical about learning STEM subjects online, the following parent from a rural focus group shared:

The one thing that I would like to say about how you guys are saying that computers open up the rest of the world is, they really do. But from some of the classes I've done, I wouldn't dare take them online. Like statistics and probability and those kinds of classes, calculus, actually understanding epsilon-delta proofs as you get close enough from your starting point here, you get close enough to your solution over here. I just can't learn that kind of stuff on a computer. I need somebody to break it down for me a little bit and say, "Well, this...you do this."

A teacher from a different rural focus group shared similar observations from teaching computer technology:

I teach basic computers. I've seen firsthand what happens when you [give] an assignment, and the student sits down at a computer, and, especially, those kids with special needs, learning disabilities, focus problems, they're not going to do it without prompting. I've seen it firsthand. Just the basics of...even after they've had a class, I know people who have computer certification classes, and they're supposed to be certified and have all the classes, but without that experience and without somebody to guide them to the right key to hit or what happens when their screen goes blue. No, you don't plug this into that port, and you don't force it if you can't.

These responses suggest yet another concern of many focus group participants--the need for face-to-face interactions with teachers and peers to help students grasp complex concepts and to expand their understanding, their ability to apply that understanding, and their problem solving skills beyond basic knowledge. A focus group teacher from a rural district described the danger to online learning in more stark terms:

I think it's an abuse of technology for kids at our age [high school]. I think if we're planning to have them take the amount of online classes that has been thrown out there, I honestly think that it's an abuse of those resources that we have because it's substituting this big idea of technology for the overall concept of an education. You can't do that. A computer can't make a connection with a child. A computer can't motivate a child. A computer can't prompt a child. Well, it can, but when that's added with a teacher and resources, I think it's great. When it's a [substitute] for a teacher and that human contact, in general, I think it's an abuse.

In several communities and districts, focus group participants described significant impediments to the use of online courses: inconsistent or unequal availability of computers, lack of high-speed Internet, and insufficient personnel or resources to maintain and repair computers and software. Inevitably, when participants thought of the various barriers to depending on online instruction for STEM subjects, they revealed their preferences for the advantages of teachers over technological tools in pedagogical strategies. These final examples exemplify this preference across the focus groups:

Example 1: But what about all this money they're going to spend on these laptops? Why not just get a couple of sets in the school and spend the money on a teacher, at night, to give the kids access? Because, have you seen that library? Those kids line up for those computers in the library. Why not have trained teachers, at night, so they can come in and access them? Instead of giving every single one one that they don't even know how to use.

Example 2: This points out the necessity of having a teacher in the classroom, not just a machine...You have to have somebody who can interact more than a machine can.

Example 3: As far as getting the facts, you can find places that you can get information, but we need to inspire, whether it's by mentors or teachers. That's where technology cannot replace the spark plug of a teacher or a mentor who inspires that child to love mathematics or love science or love Shakespeare.

STEM AND CURRICULAR BALANCE

Participants in several groups expressed concern that STEM education and careers would be emphasized over other equally important areas of education, skill, and careers. For instance, a

rural community member pointed out that STEM education could only be useful if tied to all sorts of events and activities, even in those areas of fine arts that seem unrelated. In fact, to this individual, making informed citizens was a process in which youth are exposed to a broad array of subjects and activities:

Better citizens of the world, better citizens of this country just because they have been exposed to some of these things. You might take a whole group of these kids and take them to the ballet or something and you're like, "yeah, why is that of any relevance in my life?" But again we talk about physics, you can talk about the biology of the human body and how the person can train to be that fit to be able to do those sort of things.

An urban community member voiced concern that an emphasis on STEM may diminish education in areas of liberal arts. According to this perspective, a perspective that arose in several focus groups throughout the state, liberal arts education plays an important role in creating informed citizens:

I do want to make sure that these four subjects [STEM] don't then get stressed to the expense of interaction, social interactions, and the soft science or the humanities. So I do worry about that sometimes our focus, even though it's on something that I feel passionate about and forms the basis for understanding policy and the world around us and making good decisions, it's not the only thing.

A rural community member felt that STEM education is already emphasized at the expense of liberal arts education and youth extracurricular activities:

They [students] don't have a choice. Right now, the schools are teaching to the state standard test and [the community] has cut some of the sports, the music program, the art program. I think our choir teacher is a volunteer, but if we didn't have a volunteer they wouldn't have all that. So they're being forced to pick a career in science, technology, engineering, and math, I don't think it's right. If you're passionate about art or music or sports, you want to be a P.E. teacher or a physical therapist or something like that, you don't really have a choice. You're being forced to learn these things so that, well they are important things and you do need to know them. I'm sorry, I went to school to be sign language interpreter and I don't need to know biology. It's not my job to teach the students biology. I'm there to interpret for the deaf person what the teacher is saying. So I didn't need any of that.

Echoing the above concerns, a focus group parent from another rural community said:

I'm sure that [STEM education] helps, but what's the difference if they decided they wanted to be an artist and go into art? What's the difference if they wanted to go into music? Does that mean that they're going to be less prepared to be good citizens? No. I think it's part of it, absolutely, but I think there's more to it than just these areas.

Thus, even though a large number of focus group participants said that STEM education is important for youth in preparing them for the future, for good jobs, and for making better decisions in society at-large, there was concern that the scale may tip too much toward STEM fields in youth education. Participants felt that an education in, and appreciation for, liberal arts and extracurricular activities were equally important in forming well-rounded adults and citizens.

Such perspectives argued for a balanced curriculum that avoided pitting the different fields against one another.

In summary, focus group participants had strong opinions about the type of curricula that would stimulate and retain student interest in STEM education. Likewise, they were vocal, and critical, about standardized testing and the pace of educational content. Most notably, the fact that focus group participants across communities raised the issue of online education which was not initiated by the focus group moderator is largely due to the recent State Board of Education regulations which mandated laptops and online courses. While some participants believed online and distant education was a viable strategy given limited resources, the vast majority of participants were concerned about its appropriateness in teaching all subject matters and the necessary technological access and support required in rural communities. Although participants throughout the state shared a common interest in enhancing STEM education experiences for Idaho students, many also were concerned that STEM education efforts could come at the expense of liberal arts education. This concern indicates that communities may resist STEM education efforts if perceived as diminishing youth education in these other fields.

DRAFT

RESOURCES

Not surprisingly, resource challenges were one of the main areas of discussion across the focus groups. While this is likely an issue across the nation, indicators for levels of resources available to school districts in Idaho illustrate the problem is felt more deeply in some districts in Idaho and in the state as a whole as compared to national averages. Since public education is funded primarily by local property taxes, expenditure per pupil by district and the median value of owner occupied homes are appropriate indicators of funding levels and the socioeconomic status of the community. This, in addition to the percentage of children who participate in the reduced or free lunch program, provides context to understand local resources to support student academic success. Table 5 reveals the variation of SES status across communities in which focus groups were conducted.

Table 5. Percent Low Income Students and Median Value Owner Occupied Units by District

District	Percent Student Low Income (% participating in free or reduced school food program)	Median Value 2005-2009 Owner Occupied Units*
Boise	43.17	\$196,600
Camas County (Fairfield)	55.32	\$152,200
Idaho Falls	42.88	\$134,200
Jerome	68.93	\$ 96,500
Kamiah	67.74	\$104,900
Lewiston	41.69	\$145,200
Melba	51.65	\$120,800
North Gem (Bancroft)	59.69	\$ 80,900
Pocatello	47.86	\$118,500
Post Falls	55.42	\$192,400
West Bonner (Priest River)	64.78	\$136,900
West Jefferson (Terreton)	72.33	\$ 71,400

*Source: 2005-2009 American Community Survey 5 Year Estimates, accessed June 28, 2011: <http://factfinder.census.gov/>

While wealthier districts spend significantly more per pupil than economically disadvantaged areas, research is inconclusive on the relationship between educational spending and student achievement. Some studies have found higher spending affects academic achievement while others have found little difference. Condran and Roscigno (2003) argue that district-level spending data provide averages, failing to capture spending differences between schools within a district, which can be significant. Unfortunately, district-level data are accessible, whereas school level data are difficult to find. This is the case in the State of Idaho and, thus, the table provided below provides district spending per pupil in Idaho.

Data reveal most communities in our study spend significantly less than the national average, except for Camas County (Fairfield)⁵. According to the U.S. Census, Idaho is one of the states that spent the least per pupil in 2010. Variation in school spending at the district and local level impacts instructional resources and operations/maintenance of infrastructure which in turn impact the quality of teachers, student attendance rates and, ultimately, student achievement (Condrón and Roscigno 2003).

Table 6. Annual District Spending* per Pupil in 2010

District	Annual Spending per Pupil
National Average (2009)**	\$10,499.00
Average Spending in Idaho***	\$8,448.00
Boise	\$8,186.49
Camas County (Fairfield)	\$11,247.25
Idaho Falls	\$5,769.02
Jerome	\$5,359.21
Kamiah	\$7,600.20
Lewiston	\$7,973.53
Melba	\$6,293.09
North Gem (Bancroft)	\$8,978.45
Pocatello	\$5,615.03
Post Falls	\$5,293.53
West Bonner (Priest River)	\$7,026.05
West Jefferson (Terreton)	\$7,394.92

* Source: Idaho Department of Education, Fiscal Year 2010. Based on ADA (average daily attendance)

** Source: Fertig, May 25, 2011. Original source is the U.S. Census Bureau.

*** Note: Figure does not include charter schools.

Not surprisingly, parents, community members, and teachers – across all communities – cited the lack of resources as one of the major factors explaining why their schools could not always provide effective STEM education. Participants identified insufficient instructional resources including teachers and curricular offerings, classroom supplies, and a lack of funding for (or availability of) resources to provide experiential learning.

Rural communities face challenges in recruiting and retaining high-quality teachers because of low compensation, large numbers of special needs students, low numbers of college bound students, and geographic isolation (Monk 2007). Therefore, small and rural schools potentially have a below-average share of highly qualified teachers, particularly in STEM fields. In focus

⁵ The higher spending is a result of the additional expenses that rural schools often accrue from expanded bus routes, supplemental costs (such as tutoring), and the small number of students.

group discussions with community members, one participant explained how Idaho teachers' low pay served as a deterrent:

The love of Idaho and, you know, the rural-ness...[that] would keep a lot of people here, and they were willing to take less pay. But the economy is such that who is going to be able to say –you know, I love it so I'll take less pay?" That's not an option anymore; I think we're all in crisis mode...and you get all these young people, and how are we going to keep young people here? Why would you stay here when we are the lowest on childcare and health, I mean, outside of Oklahoma? We are just on the bottom of the barrel, so you think, –what would keep people here? How can you afford to do that?" And so then if you get someone that's teaching in school, it's got to be the love of teaching, because it's certainly not the pay that's keeping them.

Another issue facing rural schools is the limited number of teachers available to teach particular classes. Thus, if students failed to develop positive relationships with a particular teacher, there was often no other option for the student. For example:

Well, and the other thing too is, because we don't have two different math teachers, sometimes personalities with the teacher make it such that this kid won't get it where the other kids will. And you don't have a choice.

The lack of teachers was also linked to low student enrollment. In another rural community, focus group participants noted there was only one teacher, and, if he/she was not qualified, small schools did not have sufficient student population to justify additional teachers:

But the other thing is that the teacher that can teach him isn't necessarily the teacher that can teach you. We only get one...We don't have any more money than that. We don't have any more students to [justify] more funding than that.

A teacher from a rural focus group commented on this same problem:

And along those lines with how many teachers we get in the building, we don't have enough kids, so we can't hire another teacher just based on the formula from the state. We don't have a population that would allow it. So, regardless of money or no money, we don't have the kid population to get that.

State funding for public education in Idaho is –done through a series of formulas, mandates and appropriations" in which the average number of students attending class is one important consideration (Office of Performance Evaluations 2009:39). Focus group teachers often pointed to the liability of being in a small community as it limited their ability to hire teachers. This is in reference to the calculation of –support units," an estimation of the funds necessary to staff classrooms. Districts generate support units based on the average daily attendance of students; Idaho statute determines the ratio of staff to students by grade level and special student needs (Office of Performance Evaluations 2009). As such, the number of school aged children in communities is important in determining teacher resources and explains why student population is so salient to focus group teachers.

In yet another rural area, the lack of resources meant that teachers were asked to teach a number of different subjects, even though they may not feel qualified to do so. One focus group parent shared the following:

They lost a teacher at the high school, and so that made the art teacher have to teach math classes.

Focus group participants recognized the challenge of attracting quality teachers and speculated this was because low pay and job insecurity discouraged people from pursuing teaching careers and discouraged good teachers from remaining in their schools. This is illustrated in the following examples from two different focus groups:

Example 1: You pay more, you get a bigger pool to draw from, and you get better teachers. If you're not paying any wages, all your good teachers are going to go somewhere else.

Example 2: You worry about recruiting a master teacher. Why am I going to go into this field with the fear that my job might be eliminated or whatever?

Another challenge that rural schools face is the availability of STEM curricula. According to Anderson and Chang (2011), students in rural schools, as referenced above in the section on "Curriculum and Pedagogy," have significantly less opportunity to take AP (advanced placement) mathematics courses. In our focus groups, participants from smaller rural communities noted that there were not sufficient courses for their students to choose, not simply AP courses. Some parents and community members were concerned that their children's interests would not be met with the limited curriculum offered. In addition, they worried that students would not be prepared to transition to college without advanced courses in mathematics and science. Community members in one rural area noted the increasing limitations of the STEM curriculum in their local schools:

Community Member 5: I think we're kind of shorted on the STEM courses because there's not a lot. I mean we do have the basic math and geometry. I don't know if this year we have a physics class being taught.

Community Member 3: They used to teach physics every other year and chemistry every other year.

Community Member 4: And statistics.

Community Member 5: And electronics, industrial education, computer science, we have that, but not probably what they offer at the bigger schools. I think we're shorted on a lot of these. We only have maybe two teachers in our high school that I could say would fit in any of these.

Community Member 3: I know when our kids were in school, mathematics was really shorted. If you were good in math, you did well. If you weren't good in math, you didn't learn.

The lack of STEM courses is a clear disadvantage to students in rural communities and is shaped by small enrollments and the lack of funding and qualified teachers. One alternative avenue to accessing more advanced classes is through distance learning. In fact, as noted above, the lack of curricular opportunities led some schools to look to online education for their

students. However, the continued struggle to offer STEM courses could have further impacts on schools. For example a rural focus group parent noted that while the local school was already looking to online courses, the inability to hire teachers will lead to further declines in student enrollment which will, in turn, affect funding:

We're already implementing [online STEM courses]. To hear that they may pull even further stuff is like...how much tighter can we go? I mean, are you going to pay for us to have to send our kids someplace else?

A frustrated focus group teacher in another rural community felt the current conditions in which further cuts were anticipated would lead to a large number of students simply leaving the school altogether:

We're going to lose half our student body by the end of their sophomore year, because...they want opportunities. They're going to have to leave. I'd say that Idaho just took a gigantic step in making that a reality. I've had students who, in their junior year, looked at it and said, +really don't need high school anymore. I'm done." They've caught onto college and military and careers. My favorite kid who's a mechanical engineer, who basically did that as a sophomore, said, -Well, opportunities aren't great. I think I'll just go off and take care of it myself." That's one. I think we're going to see more of that. It really does come down to a juggle between these things and the other great opportunities that we have. What stays? What gets funded?

Another teacher during this focus group had similar frustrations:

I look at it as a parent and as a teacher and say, -We're losing community. We're losing. We're going to cut teachers in this community, because our kids are going away. Parents are moving. We have some real issues. Great idea, but at the expenses of what things?"

While some schools were integrating online courses in their curriculum because of the lack of teacher availability, some focus group members were concerned about the community's ability to access these courses. Community members from many rural areas noted the challenges students faced because of slow Internet connections or limited computer access in schools. For example, one focus group parent described his daughter's experience:

Computer science, I kind of take issue on that one because the year my daughter was there the high school kids never had computers that were up and running. They were always down. They were always broken. We had a tech that came out once a month. He cost money every single time. The kids were destroying the computers under the supervision that they had. They were then penalized double by, -we're not going to pay money to repair the computers."

Others argued students faced challenges in accessing viable internet connections. One focus group parent described limited internet access in her/his community:

In town we have a hole, right where we are at, this side and this side get high speed, we get dial-up, not a lot, a hole. No, it's out of town, five miles out, but people on both sides of us get high speed, we are in a donut hole.

A teacher from another focus group argued that wireless Internet needed to be available to all students:

I think wireless Internet needs to be available to all, and I think that's the biggest, that's why technology is limited, because of the social economics of our area. There are kids that absolutely cannot afford it, and then they go to the library, and they want to get on a site, and they say, "No, no, no, no, no, you can't go there." It's because the librarian has no idea about the technology...

Besides the above resource issues, focus group participants also expressed concern that, as a result of insufficient funding, few opportunities existed for experiential learning (such as field trips). Moreover, several focus group discussions revealed an impression that few people knew about experiential learning opportunities, even if they were available. Discussions frequently considered several potential opportunities for experiential learning: connecting with businesses associated with STEM fields; inviting local STEM experts; and utilizing university and non-profit programs that could offer experiences in STEM fields. Many described how such resources were being utilized. However, a few focus group participants said that, as a result of deficient funding, it was difficult to afford transportation to any off-campus activities. In addition, focus group participants from agricultural areas expressed frustration that experiential opportunities outside the classroom were less available to them, as represented by the following focus group community member:

Right here we're in agricultural, ... and I know from living in Boise that Micron throws a lot of money at science and math in the high schools and things like that, but we don't get the money here. We have milk here. We have corn. We don't have the INL here. That's over in Idaho Falls. I know for a fact there's hands-on learning and things like that there at the high schools at that level. And in Boise that's going on over there, but here we don't have a lot of that. The kids in the schools don't see direct input into what's available.

The relatively low tax base of rural communities was identified by focus group members as key in shaping school resources. For example, one focus group parent from a rural area compared his/her community with another that had a higher tax base, and consequently, a large technology department. She/he argued such departments were costly and should be funded differently:

I think [funding for technology] should be allocated across the board, not just to communities with a high tax base. Because our students are coming from every avenue, kids coming from ag departments, our ag communities have skills that can be applied to their state that they need to have resources allocated by the state to everyone. We should have a technology department. We've got kids, if they stay here they are gonna be working on engines, they are going to be figuring out how to grow better crops, they are going to be learning how to, to work within the weather system. They are going to be growing the food for our country, they need to have this engineering background. This school should be able to provide it. We just have to figure out how. How to get either the state to listen to it, businesses in the state to start giving that money to communities, because we are falling down hard.

One focus group parent from a rural community was concerned about the lack of basic lab equipment necessary for science education. He argued:

It's my understanding that the high school doesn't even have a science lab. And that they don't have microscopes or their microscopes are thirty years old, so how are they going to learn if they don't have the tools?

A participant from another community agreed, describing the labs in her/his public schools:

The science labs were pathetic. ... As somebody pointed out, a lack of water drops, air drops; some of the classrooms had four desks pulled together serving as a science table.

Many participants viewed a lack of resources to attract and pay teachers, provide scientific and other classroom equipment, and fund experiential learning outside of the classroom as significant barriers to STEM education in their schools. This view appears to be grounded in their conviction that teachers are a significant influence on students and that hands-on, applied experience, both within and outside the classroom, are necessary to inspire students and make STEM fields relevant to them. Participants in rural areas felt that their schools are particularly resource challenged. Indicators of spending on public education in Idaho, and particularly in some areas, reinforce the perception of an inadequate level of resources.

DRAFT

IDAHO RESIDENTS' SUGGESTIONS TO IMPROVE STUDENT STEM EDUCATION ACHIEVEMENT

The focus group process generated a good deal of discussion about perceived solutions in the form of recommendations, ideas and suggestions for change related to increasing interest and understanding in or removing barriers to STEM education. Some of this discussion came in direct response to a focus group question that specifically asked people about their perceptions of what was occurring in their local schools that might affect student experience with STEM education, but the responses relevant to the theme are spread across responses to all focus group questions.

While participants' ideas for improving STEM education can be found throughout this report, we highlight a few here either because they were particularly salient or because they are not discussed elsewhere in the report. We begin by discussing focus group participants' suggestions to improve education more broadly including a well-balanced curriculum. While focus group participants felt STEM courses were important and vital for students, they were also critical of the cuts to humanities courses and argued one solution was to ensure a balanced curriculum. Participants also suggested integrating STEM into humanities courses as a way to address budgetary concerns. In addition, many noted the need to provide more economic resources to schools to attract and retain more qualified mathematics and science teachers, to provide schools with the necessary tools and technology to promote STEM education, and to reorganize schools in creative ways.

Many participants discussed online education and voiced significant concern that online instruction was not as effective as an engaged teacher. However, some noted that online instruction might be a solution to help some students learn. For example, a focus group teacher noted:

I think, honestly, that the way we educate and the way we structure our schools is going to have to change. I don't know how, but that's where problem solving is going to come into place. And, I think, maybe the technology, don't shoot me, online technology for some students is going to be the way. For some students. Not all students learn that way, just like not all students learn paper/pencil either. We're going to have to change, and that means the society is going to have to understand that the way their grandparents learned and the way they learned is not the way their students are going to learn.

This teacher's solution focuses on providing technology and, importantly, on offering students different ways to learn. The quotation above, with the passage, "Don't shoot me," reflects the teacher's recognition of a general sentiment in this focus group that caution should be taken in implementing or relying on online courses, and that this particular participant thinks online instruction in some form may be part of the solution.

The theme of rejecting a one-size fits all model of teaching was common in focus group discussions based on perceptions that students differed in how and at what pace they learned material. Many teachers and parents favored replacing the school system organized by age with a competency model based on students' capacities and needs. One of their major concerns was that classrooms were composed of students with highly variable skill levels which prevented teachers from effectively engaging and supporting student learning. For example, a parent from a rural area explained:

[Teachers are] teaching to middle or to the lower, trying get those lower kids to achieve so the upper kids that would benefit from more challenging curriculum aren't getting that, and they get behind in a different way.

A community focus group member agreed, noting:

We do have those kids who have that, for whatever reason, whether it's parents, or teachers, or whatever, they're a little more advanced, and, by not being able to be challenged at the level of inquisitiveness that they have or whatever, they lose that interest and perhaps even come to dislike it. So I think that something that you might want to consider in this whole thing is placing kids where they are skill wise.

We now turn to two other solutions focus group participants offered including those concerned with pedagogy or teachers and the need to educate Idahoans in general on the value of STEM education.

PEDAGOGICAL AND TEACHER-FOCUSED SOLUTIONS

A. Pedagogical Integration Across Disciplines

Often, focus group participants brainstormed about the different ways in which subjects could be integrated to reinforce STEM content in seemingly unrelated classes. All three different groups, parents, community members, and teachers, described how important it is to teach subjects as related and to build interactive modes of understanding and discovery. One focus group community member suggested that, at the very least, the fields within the sciences should be speaking to one another:

And then I also have issues with the reductionist side of science education, you know. What does it help you to learn physics, unless it helps to learn that physics is just the basis for chemistry, and that's just the basis for biology, all that applies because that's life. When you make technology it's just mimicking what nature is already doing basically.

A focus group parent shared a desire to see more flexibility in how courses within the curriculum were conceived:

I guess in the perfect world I would look at the option of developing courses that were not necessarily science courses or math courses or engineering courses by name, but that, in actuality, incorporated standards [in the] curriculum that was very science, technology, math based. In other words, they would be the application kinds of things that I think are going to highly engage today's learners.

In several communities focus group participants thought local teachers were trying to make use of such innovations including creative instruction and peer collaboration. Such insights often arose in small communities, since focus group participants tended to sense that resources were scarce for their schools. One rural community focus group participant observed:

One of the things that I'm seeing in school more and more...is a lot of cross-curriculum activities...Have a project that three or four teachers are all involved with, and in the

classroom they'll talk about one aspect of it, and in the next classroom they'll talk about another aspect of it, and then at the end of the project they put that all together.

This same community member felt collaboration between teachers was so valuable that time should be dedicated to teacher discussions to support this type of innovation:

Another thing that I'd like to comment on that I think is a good thing is, in our schools we have a collaborative time where the kids are released early and the teachers can collaborate. [T]his doesn't always happen, but someone mentioned about different teaching styles. I have frequently stepped into the [teachers'] room and heard, "Well such-and-such child seems to learn better this way than this," and, "I really don't know what to do about that," and I do hear that going on sometimes, and I think that's a really positive thing...

B. Teach within the Context of the Local Environment

Besides the advantages of teacher collaboration and subject integration in schools, community focus group participants felt there were opportunities to teach STEM by connecting students to the local environment. In other words, focus group participants felt a good pedagogical strategy was to integrate the local surroundings into student learning. One community focus group member felt that the natural features of Idaho presented teachers with a powerful way to connect the study of economics with natural resources:

I think that if our science and technology were taught within a context of this amazing place then perhaps we could...all of the Idahoans, both the kids and the adults, would really see why protecting it and balancing the economy with our natural resource and making a way to make it work.

Several focus group participants in Kamiah, who are very proud of the community's natural surroundings and the fact it is a haven for outdoor enthusiasts, felt that their whole surrounding area was ripe for students to learn across a variety of STEM subjects. One parent made the following case:

There's so many programs around here, like with the Tribe. You've got natural resources, water resources, fish commission, and just other entities around here...They should utilize those more so the kids can learn what is in this area in science, math, and technology, and generally a worldwide thing. But, localize it, as well as using the resources we have right here. Show them that, "This where I live," and, "This is how it's affected," and, "This is how it can be used right where I live."

Another parent in Boise echoed a similar strategy:

I think that if we had more of that, where kids are actually experiencing science, going down to the river, taking water samples, looking at the water under a microscope, seeing all the life in that one drop of water, that these could spark those kids that have that inclination but may get dropped by the wayside, that don't have parents who were in those disciplines and are pushing them in that direction anyways.

Focus group participants argued for what educators refer to as "place based education," teaching students STEM relevance and applicability in solving problems in their own

communities and environments. For example, high school students in one rural area were engaged in alternative energy projects in which they learned about wind and solar energy and presented ideas to their community. Students helped train individual community members on how to “hook up solar or wind at their house” making science a problem based exercise that benefitted their community.

C. Make Use of Local Expertise

Another pedagogical strategy suggested by focus groups was to encourage educational collaboration with the community. This idea was mentioned in a variety of ways, but essentially people referenced some sort of interaction with community professionals to tap into local expertise in the STEM fields or to develop opportunities to expose kids to fields or projects. For example, a community member explained why it was important to reach out to community stakeholders to support education:

Change is important and being able to embrace change. As a state and as stake-holders that's something that we're going to have to constantly embrace to bring forth a focus on STEM for the future. Teachers are hungry for help. They have minimal supplies. They're very dedicated and committed to the success of their students. There are plenty of business and industry people that are there to help them, but they need that help.

Community members were also quick to point out the untapped expertise that existed outside of the school system. These were local STEM professionals who were willing to share their knowledge with others. For example, one parent said:

We have highly qualified biologists in [the local area] that travel all over the world developing systems for the white sturgeon, the Chinook salmon, a list as long as your arm, and not once has any one of those people been here to speak to the kids in our school.

In many areas, community members and parents were unsure about the extent to which schools were utilizing local experts in STEM fields. This was especially true in the rural communities. In some of the smaller locations, people held strong opinions about this topic. Some felt that their schools were aware of community opportunities but were reluctant to have community members help in providing equipment and instruction time:

There are kids out there that would continue to do those kinds of things. They're eager. They're hungry. They're just waiting for something to come along. One of the things that I'm hearing in here is that, from our personal experiences, we see the community that comes in and is there for the kids, nurturing and helping. It's everybody involved together. Then we look at our community. There's plenty of us outside that are saying, “Yes, we want to help. We want to be helpful,” but we're meeting with a brick wall. We're hearing that within the school itself they don't want to share with each other. There's a huge lack of community within the system.

However, teachers in the focus group from the same community as the above participant revealed that there was at least some cooperation occurring between teachers and parents, and that teachers welcomed collaboration with community members. For example, a teacher made the following statement that indicated shared interest in tapping into community members' experiences:

What are the things that we can bring into our program? Whether it's tying math in, integrating math into other subjects, science into the other subjects, we talked about whether it's art or biology, bringing in more of the math and the technology. The math people going down to the technology room and taking advantage of the things they're doing and building it into their class work. I think there are a lot of things we can do to create greater interest into these fields by bringing in medical people, by bringing in engineers. We have people retired from these fields. They can all be drawn on. They're willing to do things... There's a lot we can do... I think we need to talk about some new ways to create interest. We can do that by bringing people in and getting experiences and hands-on things for the students to do.

These interactions across different focus groups demonstrate a strong, shared interest in integrating local community members' expertise and resources into classrooms. It was evident that a communication divide existed at times between educators or schools and those working outside of the educational institutions. Many times, groups shared similar ideas for enhancing youth education in the STEM fields, or even in education generally, but it was not apparent if the groups within communities understood they shared similar notions for successful instruction. Moreover, even in small communities, where one might assume communication would be simpler between schools and communities, communication was not clearly consistent.

D. Develop, Utilize, and Maintain Organizational Outreach Programs

Focus group participants suggested bringing students to workplace locations and to events featuring STEM learning and STEM fields. One community member told focus group participants how powerful such an experience was for her/him:

I took algebra in junior high, and my teacher was a guy who worked at Idaho Power. He brought in a problem that they were working on. I'm sure it was way toned down for us, but he showed it to us. We got to work through it. He took us out to the site and showed us where they were putting this up. It was right in your face at that age... It blows your mind when you're that age. It really does.

A number of different programs sponsored by state universities or by private businesses were noted by focus groups throughout the state for their innovative and powerful efforts in teaching STEM and raising youth interest. Such programs included: Invention Convention, Idaho National Laboratory (INL), Mars-Rover Challenge, and Lego-ly Challenge.

Invention Convention example: For over a decade now, I think the elementary school has been doing the Invention Convention and they build contraptions, and all the way from first grade they learn about like the Mouse Trap game. Every kid has to go home and work with their family and come up with an invention...

Idaho National Laboratory (INL) example: INL offers programs, too, to high school students... summer mentoring, too, where you can go up there and work at INL. They really encourage kids, and they still do that. It's a good way for some of them to get their feet wet and find out if this is where their heart lies.

Mars Rover example: I did Mars Rover for five years. I loved it. Every group I had, I had a blast. But, it is so time-consuming and draining. I had my child two years ago. It was like, + can't do both. Something's got to give." We've been lucky this year to have a parent who took it on.

The Mars Rover example was mentioned several times and teachers, especially, spoke enthusiastically about it as an effective tool in engaging students. The quotation by the focus group teacher above also was supportive, though the teacher explained it took significant time to prepare and implement which presented problems given her/his own family demands. This teacher's outreach to a parent for support is an example of teacher resourcefulness and parental engagement.

E. Consider Effective Peer Tutoring

One final area for pedagogical strategies commonly discussed by focus group participants was the use of fellow students and older students (including college students) to assist by tutoring or demonstrating different learning exercises in STEM subjects. Given the degree to which peers can negatively and positively influence one another in academic motivation and achievement, this approach can effectively enhance learning. Yet, some focus group participants felt this was a dubious form of instruction. Notably, parents who felt their children were advanced learners in their classes thought this served to slow down their child's learning while supporting an environment in which teaching focused on the slow learners. In this view, peer tutoring supported a general trend of teaching to the lowest performers. A larger number of participants, though, saw more benefits than costs to the strategy of peer tutoring. One of the most valued benefits was the mutually beneficial interaction that could occur between two students. In this view, participants agreed that slower learners got the advantage of having help to better understand concepts and formulae. Peer tutors also benefitted by deepening their understanding of the subject at-hand through their explanation and demonstration. Further, students who were struggling in STEM could gain inspiration by having a peer as an example of success and by having someone willing to take the time to share their expertise. Finally, peer tutors could gain by developing an understanding of how different people think and of different learning styles. Below, we provide a sample of the different ways focus group participants described peer tutoring and its possibilities:

Example 1: I have a suggestion, why don't we have high school kids, we were going to have college kids come. Last year I had all my kids do it but I grouped them in fours. We could have high school kids come and help them with their experiments.

Example 2: Something that I thought of would be kind of a cool idea is if you have a peer school. For instance, certain people they get good grades - actually make those students the teachers for the kids down below them so that they're actually teaching them which means that they're increasing their grasp of the knowledge while passing it on. It's kind of like perpetual motion education.

Example 3: Bring a tutor in. A lot of them kids will listen to a younger kid, but, when you've got 55-year-old guy that can't correlate with the jittery teenage kid, it just doesn't work. The younger kid can also maybe get it into an aspect where that kid can understand it. They're the same age. They can understand it where you've got a gap with the older person. I feel a tutor in a high school would help a bunch.

Focus group participants suggested a broad strategy of improving Idahoans' understanding of and appreciation for higher education in general and STEM in particular. Many community members argued the State needed to challenge the cultural values which debase STEM and academic achievement. Participants argued schools and families needed to reinforce student interest in STEM by rewarding them in the same way they were rewarded when they had athletic success. For example, one rural community member said:

It also depends on acknowledging accomplishments like in those areas that you're talking about, which could be geeky areas, but, what if those kids gained scholarships and trips and prizes for being those geeks, then it wouldn't be so ridiculous.

In addition to students, focus group members argued others also needed to be educated. For example, one community member said:

There's so many levels that need to be educated about STEM whether that be our parents, our students, our businesses. All stakeholders need some education and some encouragement on that. Working with policy makers, I think that is a critical piece because it comes from the bottom up but it also comes from the top down. Raising that awareness and helping people make informed decisions is key.

Some focus group participants pointed to the lack of support for education by communities, evident by the difficulty they faced in trying to pass school bonds. Another community member shared her/his experience in successfully passing a school bond but noted:

Sixty-three percent of the people in [this community] were in favor of it, but it didn't pass by the super-majority because about 10% were convinced that they didn't want to raise their property taxes by one Big Mac a month. When you've got people in a community that have yet to be educated to the needs and you find that an easy no is simply digested than the complexity of the needs of education, you've got a mighty tall hill to climb. That's where we're at. . It's not that we don't know that we need to prepare our kids for the 21st century because we recognize that. But to get others to recognize that, to know that it is what we need to do.

Educating the public was seen as an important solution given the national and state-wide fiscal challenges. Focus group participants voiced concern about the continual cuts to education, arguing that the state should invest in education. For example, another community member said:

We have to stop arguing about education in terms of what can we cut. We have to be looking at how can we put more money into education. How do we convince the general populace and especially our legislatures that this is a valuable investment in, not just our kids' future, but in our future too? Who's going to take care of us?

In summary, focus group participants suggested a range of creative solutions and were well informed of the budgetary constraints communities and the state faced. Participants noted untapped STEM knowledge and learning opportunities within their communities and revealed a willingness to support teachers and students. They also advocated for a broader public program for fostering interest, appreciation and support for STEM education.

REPORT SUMMARY

This phase of the research project engaged Idaho communities in a statewide discussion through a methodology designed to listen to and understand the perspectives and experiences of parents, teachers and community members in consideration of the broader goal to improve STEM education in Idaho. The focus group process initiated an ethnographic step into each selected community providing insights into the overall state and community context and the local thoughts, perceptions, meanings and attitudes (see Hunter 2009). We developed focus group questions to access areas commonly reported in the literature on STEM education as well as general local and state-wide issues. The questions elicited both anticipated and unanticipated topics and ideas which were systematically coded and analyzed over the course of this phase. While the methodology did not involve the same depth as a comprehensive ethnography, and it did not access a population base as large as a survey, it reached a balance of breadth, through 39 focus groups in 12 communities, and depth in focus group discussions with each group and research field notes from each community.

This report has analyzed responses and identified the following themes that emerged as salient in Idaho:

- The meanings participants associated with STEM education.
- The various reasons focus group participants feel STEM education is important.
- The national and local cultural characteristics participants indicated are associated with STEM education as well as some general cultural characteristics that emerged from the focus group data which will directly impact efforts to enhance STEM education.
- Participants' perspectives regarding the influence of parents, teachers, and peers on student academic success.
- Pedagogical and curricular issues discussed in focus groups.
- Participant perspectives on resources necessary for successful STEM education.
- Participant suggestions for increasing youth interest and success in STEM.

Most unique to this project is its examination of socio-cultural contexts – national and local – and how they shape attitudes and perceptions regarding STEM education and fields. The focus groups reveal a local context in which autonomy was highly valued and where science was often viewed as a challenge to this autonomy. It also revealed a particular view of scientific knowledge, one on par with other beliefs that they could selectively choose to adopt depending upon whether it is deemed reliable and consistent with their own religious, political, and economic perspectives. At the same time, focus group findings show that Idahoans, in general, see STEM education as critical to the health of the state's and nation's future. They also have much to say about the various factors that impact student success in STEM education and that act as barriers to STEM interest and achievement. We encountered a wide range of people interested in enhancing education in Idaho with a variety of ideas for how to go about change. The strategies participants proposed for developing STEM education and making it relevant to young people today are illustrated throughout this report and are to be investigated further as the next phase of this project, the statewide survey, is conducted and analyzed.

IMPLICATIONS OF PHASE 1 FINDINGS

The objective of this phase of the project was to understand the socio-cultural processes of Idaho communities and how such processes shape students' STEM higher educational pursuits and potential career choices. We offer the following implications of focus group findings relative to key themes:

1. STEM MEANING AND DEFINITIONS

Focus group participants' definitions of STEM education reflect their life experiences and career trajectories. As such, personal understanding of STEM will remain at current levels unless a strategic plan for communicating a consistent meaning and value of STEM education is developed and implemented.

2. REASONS FOR STEM'S IMPORTANCE

Community focus groups shared the view that STEM education and STEM fields are important to the future of Idaho and Idaho's youth. In addition, they articulate support for initiatives to enhance STEM education. Participants felt that these fields will be critical in solving our nation's problems and in making Idaho competitive within a global economic system. Many of the participants felt that STEM education is necessary for creating a more informed citizenry.

- a. Results from focus groups suggest that policy makers should consider the importance of STEM in building a workforce skilled in these fields and for gaining greater public literacy, in general, in these fields. The latter enhancement, according to focus group participants, would enable residents and citizens to make more informed assessments of contemporary problems locally and nationally.

3. COMMUNITY CULTURAL CONTEXT

While national cultural trends impact Idahoans' attitudes and responses to STEM education, innovations that respect the unique local cultural considerations of Idaho communities will be most effective. Several culturally focused implications are noted:

- a. Given Idaho's strong sense of local autonomy, STEM innovations should be designed in ways that resonate with local interests and draw from local experience and opportunities to establish relevance. These innovations should be developed in discussion and collaboration with the community.
- b. Given the "culture of science" that emerged from focus group findings, more understanding is necessary about how Idahoans understand science, particular scientific content such as stem cell research, global climate change, and evolution, and how it intersects with their worldviews.
- c. Framing of communications concerning scientific knowledge and implementing STEM educational initiatives must consider the local Idaho culture. An important component of this communication should focus on the scientific process rather than simply scientific facts.

4. PARENTAL ENGAGEMENT

The role of the family in supporting student academic success in STEM is central. Parents clearly want their children to be successful in schools and future careers. Given the low levels of educational attainment across the state, parents may be constrained by their own educational experiences in assisting their children academically, particularly in STEM subjects. Focus group participants indicate this is a factor as is work constraints and other forms of cultural capital. Several implications are noted:

- a. The already existing family-school partnerships in communities should be enhanced through additional creative family-school innovations given the important role parents play in shaping STEM and academic attitudes and values. Such partnerships should be developed and publicized through effective communication in the community.
- b. Accessible educational outreach programs should be developed to improve parents' knowledge of educational opportunities and expectations particularly with academic requirements for higher education success in STEM.
- c. Such partnerships and outreach programs should consider parents' work schedules and travel requirements due to the rural geography in some districts.

5. TEACHERS

It is generally recognized that teachers should have content knowledge that they are teaching. Focus group members perceive teachers to have such knowledge and do not see a lack of teachers' training or expertise in STEM as a significant problem. They also, in general, do not perceive teacher performance to be of insufficient quality. Instead, the following is suggested:

- a. Provide better pay for teachers to improve recruitment and retention of educators.
- b. Enhance communication in communities and the state to highlight and support teachers' efforts.
- c. Embrace smaller class sizes and greater instructional flexibility to allow teachers opportunities to tailor education to meet individual students' learning styles.
- d. Provide teachers with professional development so they can create engaged online learning environments.
- e. Communicate with teachers in multiple ways regarding the State Board of Education plan to integrate online learning in Idaho high schools. This communication should emphasize the relationship of teachers and online learning and how it will be funded and supported.

6. STUDENT CHARACTERISTICS AND EXTERNAL INFLUENCES

Student individual characteristics are shaped by role models and mentors. Therefore, communities can improve student motivation and interest by:

- a. Tapping into local STEM professionals and community members to stimulate students' interest in STEM fields and careers.
- b. Identifying purposeful learning communities composed of academically-inclined peers and role models to motivate student learning in STEM fields

7. CURRICULUM AND PEDAGOGY

Curriculum, or the scope and sequence of student educational experiences, is sensitive to the ever-changing social and political climate. The following are suggestions based on focus group data:

- a. Experiential learning opportunities should be emphasized in the local community and industries to engage students.
- b. Online courses may be one way to expand offerings in STEM fields, particularly in smaller schools that do not have enough teachers to offer a wide variety of such courses. These steps could assist in implementing online courses: Identify appropriate subjects for online teaching and learning, support professional development for teachers to effectively use this technology, and provide schools with resources to maintain equipment and technical support.
- c. Pilot newer technological instructional tools, assess effectiveness, and support instructional needs.
- d. Policy makers must be aware that initiatives to build STEM education in districts throughout the state will meet resistance if communities perceive a zero-sum situation, in which liberal arts areas (music, theater, art, English, etc.) are jeopardized during such endeavors. Educational programs that embrace integrative techniques for student learning across multi-disciplinary subjects are more likely to lead to public support and to support STEM academic improvement

8. RESOURCES

Effective education in STEM subjects requires competent and well trained teachers, student access to appropriate and well maintained classroom materials and laboratory equipment, and a breadth of STEM class offerings and opportunities for experiential and engaged learning. To better understand and respond to each community's resources, the following are recommended:

- a. Systematically collect data on within-district expenditures and reconsider State funding formula to adequately support STEM opportunities in all schools.
- b. Provide adequate state support for teacher professional development, recruitment, and retention.
- c. Provide adequate classroom resources (laboratory equipment, books, computer equipment and technical support, etc.) to support STEM education and innovation.
- d. Ensure technology support exists for online delivery of courses; this should include appropriate network bandwidth capacity, teacher professional development, and technological support staff.
- e. Access local community resources and integrate into learning experiences (e.g., STEM mentors and professionals).

9. IDAHO RESIDENTS' SUGGESTIONS TO IMPROVE STUDENT STEM EDUCATION ACHIEVEMENT

Focus group participants provided a number of suggestions which they think will improve student STEM educational achievement. These included pedagogical innovations, teacher-focused solutions, and educational outreach to state residents regarding the value of STEM. Given the range of suggestions, we suggest the following:

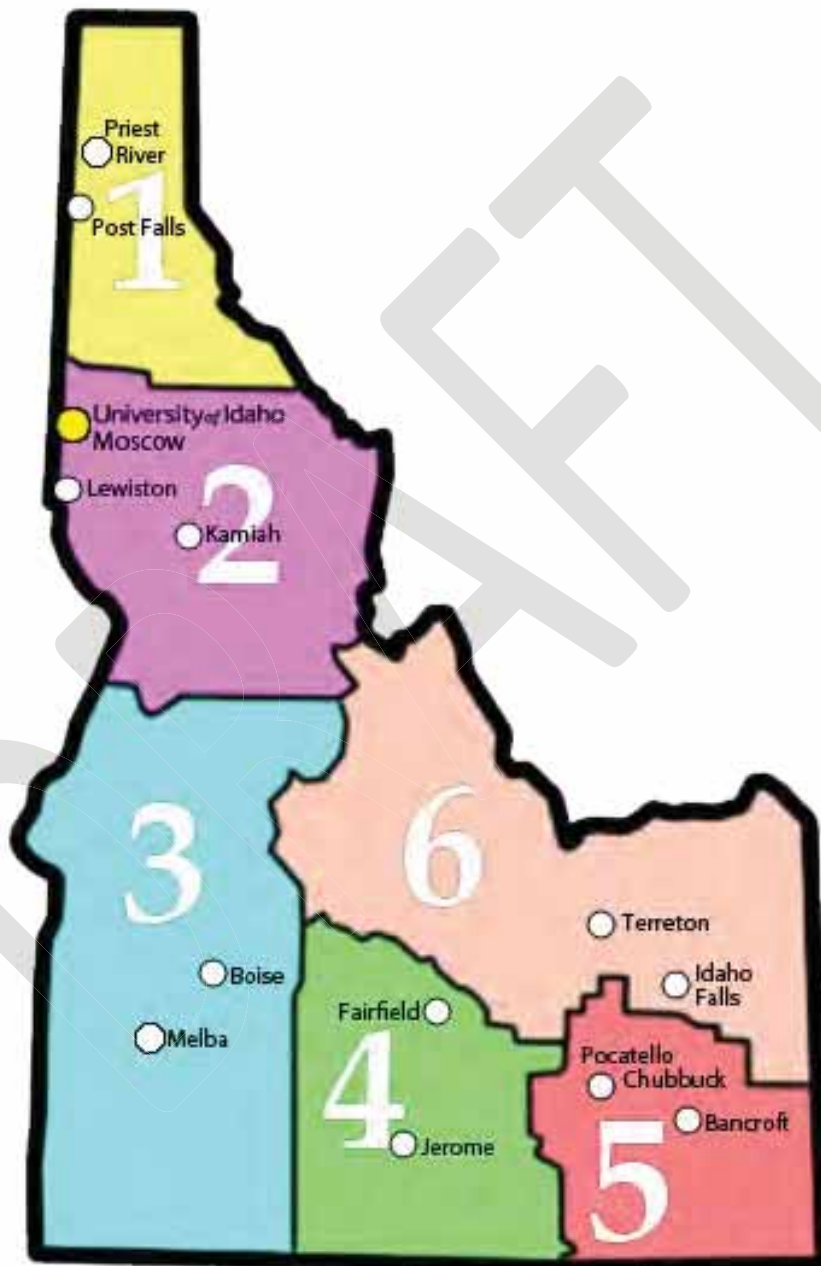
- a. Develop collaborative, community based innovations that are informed by local community members and responsive to needs, opportunities, and challenges in each focus group site.
- b. Maintain dialogue with parents, teachers, and community members in each of the 12 focus group sites to build STEM educational capacity and networking.

- c. Communicate STEM educational value and importance of STEM knowledge, including the scientific method, across different groups of community members and establish flows of information to continuously enhance members' STEM literacy.

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APPENDIX

I. DESCRIPTIONS OF THE TWELVE IDAHO COMMUNITIES IN THE PROJECT



**Idaho Community Profile: Bancroft,
Caribou County**



North Gem District 149

Number of Schools in District:

One school serving Preschool – 12th grade

Students in District, 2009-10⁶: 205 students

Percent Student Low Income, 2010-11⁷: 59.69%

ISAT Scores, 2010⁸: 77% 10th grade proficient and above in Math

61.6% 10th grade proficient and above in Science

Population Size (Bancroft city limits) ⁹	422 residents
Median Age	37.6 years
Employment	54%
Percent with Bachelor Degree or Higher	4.2%
Owner Occupied Housing	92%
Main Industry ¹⁰	
Construction	14.4%
Entertainment, Accommodation and Food Services	13.7%
Retail	13.1%

COMMUNITY DESCRIPTION

Bancroft is a small town sitting in a wide valley at the base of the Fish Creek Mountain Range in an area that saw early pioneer travel through southern Idaho¹¹. The town consists of six square blocks of houses, with an almost completely abandoned Main street. The two new buildings are the North Gem School that serves all grade levels and a large Church of Jesus Christ of Latter Day Saints building across the street from the school. There is no place in Bancroft to purchase groceries or gasoline, and residents must travel 16 miles to the county seat in Soda Springs, the largest town providing basic services for its residents. Area residents are 65-70% Church of

⁶ Student enrollment for each district was obtained from the same source: State of Idaho Department of Education.

⁷ Low income figures for each districts were obtained from the same source: State of Idaho. Department of Education. Eligible Participants, School Year 2010-2011.

⁸ ISAT scores for each district were obtained from the same source: State of Idaho. Department of Education. No Child Left Behind State Report of District Scores and Demographics. Idaho Standards Achievement Test (ISAT) Spring 2010.

⁹ Population size for each community was obtained from the same source: U.S. Census Bureau. 2005-2009 ACS 5-Year Estimates.

¹⁰ Industry information for each community was obtained from the same source: Idaho Department of Labor. Labor Market Information.

¹¹ Untraveled Road, Bancroft, Idaho <http://www.untraveledroad.com/USA/Idaho/Caribou/Bancroft.htm>;

Official Website of the State of Idaho. Caribou County

<http://www.idaho.gov/aboutidaho/county/caribou.html>, accessed July 20, 2011.

Jesus Christ of Latter Day Saints members¹². The town is surrounded by farmland and approximately half of the county workforce is employed in the production of fertilizer, phosphorous and weed killer¹³, although within city limits, the construction industry is highest employment sector¹⁴. The participants in the STEM education focus groups seemed to have long-term, close personal and community ties, and discussed the focus groups questions from a local, personal perspective.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN NORTH GEM/BANCROFT: Jamie Holyoak, North Gem School District superintendent, and Ralph Peterson, North Gem high school teacher

DRAFT

¹² The Association of Religious Data Archives. Accessed July 20, 2011:

<http://www.thearda.com/DemographicMap/displayGMap.asp>

¹³ Idaho Department of Labor. Labor Market Information. Publications: Work Force Trend Profiles.

Accessed July 20, 2011: <http://labor.idaho.gov/publications/lmi/pubs/CaribouProfile.pdf>

¹⁴ U.S. Census Bureau. 2005-2009 American Community Survey 5-Year Estimates. Data by Geography. <http://www.census.gov/acs/www/>

Idaho Community Profile: Boise, Ada County



Boise Independent District 001

Number of Schools in District:

- 5 High Schools
- 8 Jr. High Schools
- 33 Elementary Schools

Students in District, 2009-10: 25,205 students

Percent Student Low Income, 2010-11: 43.17%

ISAT Scores, 2010: 78.2% 10th grade proficient and above in Math
73.4% 10th grade proficient and above in Science

Population Size	202,703 residents
Median Age	33 years
Employment	71.4%
Percent with Bachelor Degree or Higher	36.2%
Owner Occupied Housing	62.1%
Main Industry	
Educational, Healthcare and Social Services	19.6%
Professional and Scientific	12.3%
Retail	12.2%

COMMUNITY DESCRIPTION

The largest city in Idaho, Boise is the state capital and the Ada county seat. Historically, the city was located as a U.S. Army fort on the Oregon Trail. Currently, the city is situated on I-84 which connects Portland Oregon with Salt Lake City, and is the major hub of government, commerce and education in Idaho¹⁵. Micron Technology Incorporated, the sponsor for the UI STEM Education Research Project, is located in Boise. The high tech industry and investment in technology is a growing commercial sector in the city¹⁶. In addition to the commercial and government sectors, Boise is home to several higher education institutions, including Boise State University, University of Idaho and Idaho State University satellite campuses. Just over 36% (36.2%) of residents 25 years or older have earned a Bachelor's degree or higher, a percentage exceeding both state and national averages (23.7% and 27.5% respectively)¹⁷. The STEM focus group participants approached the education related questions from a common perspective of community building and problem solving, and did not seem to have to struggle with limited resources as did many of our smaller communities.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN BOISE: Brian Luckey (UI Extension Office), Catherine Chertudi (City of Boise), Michelle Bradley

¹⁵ City of Boise.org. Accessed July 20, 2011:
<http://www.cityofboise.org/CityGovernment/VisitingBoise/AboutBoise/>

¹⁶ City of Boise.org. Accessed July 20, 2011:
<http://economicdevelopment.cityofboise.org/Workforce/BoiseCompanies/index.aspx>

¹⁷ U.S. Census Bureau. 2005-2009 American Community Survey 5-Year Estimates. Data by Geography. Accessed July 20, 2011: <http://www.census.gov/acs/www/>

(Boise Schools Parent Coordinator); Boise Metro Chamber of Commerce – Non-Profit Organization Listings, Boise Community Support Center, Idaho Parents Unlimited, Green Works Idaho, and Idaho Center for Assistive Technology.

REFUGEE AND LATINO PARENT RECRUITMENT could not have happened without the following individuals' and organizations' active involvement (in alphabetical order): Sam Byrd (Centro De Comunidad Y Justicia), Ann Farris (Boise Schools), Margie Gonzalez (Idaho Commission on Hispanic Affairs), Juan Saldana (Idaho Commission on Hispanic Affairs), Maria Mabbutt (Owner, Power of Translation), Richard Mabbutt (Director, Intermountain Fair Housing Council), Rabiou Manzo, (Resettlement Program Specialist, International Rescue Committee), Marcia Munden (Volunteer and Youth Coordinator, Catholic Charities) Ruby Mendez, and the staff at Boise State University's TRiO office.

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Idaho Community Profile: Fairfield, Camas County



Camas County District 121

Number of Schools in District:

1 High School G9-12

1 Elementary School GK-8

Students in District, 2009-10: 160 students

Percent Student Low Income, 2010-11: 55.32%

ISAT Scores, 2010: 92.3% 10th grade proficient and above in Math

92.3% 10th grade proficient and above in Science

Population Size (Fairfield city limits)	431 residents
Median Age	42.3 years
Employment	76.4%
Percent with Bachelor Degree or Higher	15.9%
Owner Occupied Housing	78%
Main Industry	
Educational, Healthcare and Social Services	21.8%
Construction	17.2%
Agriculture, Forestry and Mining	14.2%

COMMUNITY DESCRIPTION

Located 60 miles east of Mountain Home, Fairfield is the smallest town to participate in the STEM Education research. Fairfield is the county seat for Camas County and is the only incorporated town in the county¹⁸. The town is located on a high elevation plateau surrounded by mountain ranges¹⁹. Historically, the area was a summer camping location for the Bannock Indians²⁰. Currently, the surrounding region is used for hay, dry land wheat and barley farming, and cattle and sheep ranching. Residents are able to access a small convenience store, a small café/bar, a library, a community health center and a senior center²¹. As with the other small towns in the study, the Fairfield participants were well acquainted with each other, and the focus group comments were liberally sprinkled with personal and localized comments.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN FAIRFIELD: Cindy Kinder (UI Extension Office), Shari Simon (Caboose Tourist Information), Fairfield Chamber Business Listing

¹⁸ National Association of Counties. Accessed July 20, 2011:

<http://www.naco.org/Counties/Pages/FindACounty.aspx>

¹⁹ Camas County School District. Scenes from the Camas Prairie. Accessed July 20, 2011:

<http://www.camascountyschools.org/CamasPrarie.html>

²⁰ Fairfield, Camas County Idaho. Welcome to Fairfield. Accessed July 20, 2011:

<http://www.fairfieldidaho.net/community/history/>

²¹ Fairfield, Camas County Idaho. Chamber of Commerce. Accessed July 20, 2011:

<http://www.fairfieldidaho.net/community/business-directory/businesses/>

Idaho Community Profile: Idaho Falls, Bonneville County



Idaho Falls District 091

Number of Schools in District:

- 3 High Schools
- 3 Jr. High Schools
- 12 Elementary Schools

Students in District, 2009-10: 10,492 students

Percent Student Low Income, 2010-11: 42.88%

ISAT Scores, 2010: 75.7% 10th grade proficient and above in Math
61.6% 10th grade proficient and above in Science

Population Size	54,403 residents
Median Age	32.3 years
Employment	66.5%
Percent with Bachelor Degree or Higher	27.5%
Owner Occupied Housing	67.2%
Main Industry	
Educational, Healthcare and Social Services	21.9%
Professional and Scientific	16.1%
Retail	14.2%

COMMUNITY DESCRIPTION

The second largest city in the state, Idaho Falls is the county seat for Bonneville County. An early site for a bridge over the Snake River, it was key to settler, miner and goods transportation between Idaho and Montana in the 19th century²². Today Idaho Falls is internationally known as the home of the Idaho National Laboratory (INL). Many Idaho Falls participants were highly educated and several associated with INL. Idaho Falls is also the commercial center for Southern Idaho and Western Wyoming. The city has been named one of the 2010 Best Places to Raise Kids by Business Week, one of the 2010 Best Small Places for Business and Careers by Forbes.com, and one of 100 Best Adventure Towns by the National Geographic Society²³. The STEM education focus group discussions reflected community interest in education. Several spoke in detail of their desires for their children’s educational achievement.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN IDAHO FALLS: Margaret Wimborne, communications specialist, Idaho Falls District 91

²² Idaho Falls Convention and Visitors Bureau. Accessed July 20, 2011: http://www.visitidahofalls.com/index.cfm?pg=dis_faq#history

²³ Bloomberg Business Week. Best Places To Raise Your Kids 2010. http://images.businessweek.com/ss/09/11/1117_best_places_to_raise_kids/13.htm; Forbes.com. Best Small Places for Businesses and Careers. http://www.forbes.com/lists/2010/5/business-places-10_Idaho-Falls-ID_IDIda.html; National Geographic Adventure. <http://adventure.nationalgeographic.com/weekend-getaways/best-adventure-towns-list/2/>; Idaho Falls Chamber of Commerce. <http://www.idahofallschamber.com/>, accessed July 20, 2011.

Idaho Community Profile: Jerome, Jerome County

Jerome Joint District 261

Number of Schools in District:

- 2 High Schools
- 1 Middle School
- 1 Elementary School

Students in District, 2009-10: 3,613 students

Percent Student Low Income, 2010-11: 68.93%

ISAT Scores, 2010: 73.4% 10th grade proficient and above in Math
55.1% 10th grade proficient and above in Science



Population Size (Jerome city limits)	8,905 residents
Median Age	30.3 years
Employment	64.4%
Percent with Bachelor Degree or Higher	9.3%
Owner Occupied Housing	61.8%
Main Industry	
Agriculture, forestry and Mining	15.6%
Manufacturing	15.5%
Educational, Healthcare and Social Services	14.5%

COMMUNITY DESCRIPTION

At approximately 8,000 people, Jerome is a moderately sized community in the UI STEM Education Research project. The city is the county seat of Jerome and its history is intimately connected to Twin Falls, a community of 34,000 about 8 miles away. Both cities were developed as planned communities by the North Side Twin Falls Canal Company, in 1904 and 1907, as a result of the Federal Carey Act, designed to promote large irrigation system development²⁴. The Twin Falls Canal Company is still in business today and is involved in Idaho State water rights issues. Farming and agriculture are leaders in the economic base of Jerome. The dairy industry and associated businesses are the primary agribusiness in the area. Hispanics comprise 27.6% of the total population in Jerome, much larger than the total Idaho state Hispanic population of 10%²⁵.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN JEROME: Lyle Hansen, University of Idaho Extension Office in Jerome and Father Ron Wekerle of St. Jerome Parish.

²⁴ Southern Idaho Economic Development Organization. Twin Falls Profile. Accessed July 20, 2011: <http://www.southernidaho.org/aboutsi/Twin%20Falls%20Community%20Profile%20Rev%2001222007.pdf>

²⁵ U.S. Census Bureau. 2005-2009 American Community Survey 5-Year Estimates. Data by Geography. <http://www.census.gov/acs/www/>

Idaho Community Profile: Kamiah, Lewis County



Kamiah Joint School District 304

Number of Schools in District:

- 1 High School
- 1 Middle School
- 1 Elementary School

Students in District, 2009-10: 541 students

Percent Student Low Income, 2010-11: 67.74%

ISAT Scores, 2010: 76.9% 10th grade proficient and above in Math
71.8% 10th grade proficient and above in Science

Population Size (Kamiah city limits)	1,294 residents
Median Age	47 years
Employment	48.2%
Percent with Bachelor Degree or Higher	11.3%
Owner Occupied Housing	56.6%
Main Industry	
Entertainment, Accommodation and Food Services	25.3%
Educational, Healthcare and Social Services	18.6%
Construction	12.2%

COMMUNITY DESCRIPTION

With a population of 1,294 residents, Kamiah was one of the smaller communities included in this project. Because of its location next to the Clearwater River and on the edge of the vast Clearwater National Forest, the community has an extensive history with the timber industry and natural resources management. In fact, during focus group discussions, residents noted that Kamiah is not just a rural community, it is a “frontier town.” Lewiston (the closest urban settlement, pop. 31,559) is nearly an hour-and-a-half away and such things as cell phone service are not easily accessible in areas served by the school district. Compared to Idaho’s median age of 34, Kamiah’s residents are older with a median age of 47, and an employment rate nearly 20 percent lower than the state’s. Located within the Nez Perce Indian Reservation, Kamiah is unique among the project’s sampled communities since it comprises a relatively large tribal population of around 8 percent²⁶.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN KAMIAH: Mary Ulrich (UI Extension Office), Valdasue Steele (UI Nez Perce Extension Office); Kristina Wilkins (Kamiah resident); Kamiah Chamber of Commerce Business Directory

²⁶ U.S. Census Bureau 2000. Accessed on July 20, 2011, <http://censtats.census.gov/data/ID/1601642400.pdf> U.S. Census Bureau ACS Fact Sheet 2005-2009 estimates record American Indian population comprising 4.3%. Accessed on July 20, 2011, http://factfinder.census.gov/servlet/ACSSAFFacts?_event=Search&geo_id=16000US1655450&_geoContext=01000US%7C04000US16%7C16000US1655450&_street=&_county=Kamiah&_cityTown=Kamiah&_state=04000US16&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=160&_submenuId=factsheet_1&ds_name=ACS_2009_5YR_SAFF&_ci_nbr=null&qr_name=null®=null%3Anull&_keyword=&_industry=

**Idaho Community Profile: Lewiston,
Nez Perce County**

Lewiston Independent District 340

Number of Schools in District:

- 2 High Schools
- 2 Middle Schools
- 7 Elementary Schools

Students in District, 2009-10: 4,963 students

Percent Student Low Income, 2010-11: 41.23%

ISAT Scores, 2010: 79.1% 10th grade proficient and above in Math
67.8% 10th grade proficient and above in Science



Population Size	31,559 residents
Median Age	40 years
Employment	62.6%
Percent with Bachelor Degree or Higher	18.7%
Owner Occupied Housing	64.8%
Main Industry	
Educational, Healthcare and Social Services	23.6%
Manufacturing	13.5%
Retail	12.4%

COMMUNITY DESCRIPTION

Situated at the confluence of the Snake and Clearwater Rivers, Lewiston is the most inland seaport for the west coast of the United States. The historic Lewis and Clark Expedition visited the area. It is also the historical and current home of the Nez Perce Tribe. Tribal headquarters are located 14 miles from Lewiston in Lapwai, Idaho. Clearwater Paper is located in Lewiston and is the county's largest employer, manufacturing lumber and paper products. As the county seat for rural Nez Perce County, retail and other services are important economic contributors. The area is surrounded by farmland. Lewiston is home to Lewis-Clark State College. Several non-traditional students from LCSC participated in the STEM education focus groups and provided invaluable information about educational issues for this particular subset of Idaho students.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN LEWISTON: Jeanette E. Gara (Lewis Clark State College), Community Action Partnership of Lewiston, Kathleen Tiffit (University of Idaho Extension)

Idaho Community Profile: Melba, Canyon County



Melba Joint District 136

Number of Schools in District:

1 Jr/Sr High School

1 Elementary School

Students in District, 2009-10: 713 students

Percent Student Low Income, 2010-11: 51.65%

ISAT Scores, 2010: 71.9% 10th grade proficient and above in Math

73.7% 10th grade proficient and above in Science

Population Size (Melba city limits)	554 residents
Median Age	31.8 years
Employment	65.3%
Percent with Bachelor Degree or Higher	12.5%
Owner Occupied Housing	72.9%
Main Industry	
Agriculture, Forestry and Mining	20.9%
Educational, Healthcare and Social Services	17.2%
Retail	12.4%

COMMUNITY DESCRIPTION

Melba is a small farming community outside of Nampa, Idaho. The town's website describes itself as "Even though Melba is on the road to nowhere, it is where a lot of people want to be – at the end of the road." Surrounded by agricultural lands, the area is known as the "Seed Heart of America" and specializes in vegetable and grass seed crops. The town was formed in the early 1900's to support the growing agricultural industry in an area without nearby access to city services²⁷. Currently, many Melba area citizens must commute to Nampa, Boise, and Kuna for employment, a commute of 15-30 miles. The need to commute from the area may have contributed to the differences noted in the STEM education focus groups. Unlike the other very small towns studied, Melba parents did not seem to know each other or the specific issues faced by the local schools. Parent focus group discussion was generalized, without the personal interactions seen in other similar sized study areas.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN MELBA: Nancy Shelstad (UI Extension Office), Joe and Lisa Berrett, Susie Leavitt, Madge Wylie, Melba Business Directory

²⁷ City of Melba Idaho. History of Melba. Accessed July 20, 2011: <http://www.cityofmelba.org/index.html>

**Idaho Community Profile: Pocatello,
Bannock County**

Pocatello/Chubbuck District 025

Number of Schools in District:

- 3 High Schools
- 3 Middle Schools
- 13 Elementary Schools

Students in District, 2009-10: 12,122 students

Percent Student Low Income, 2010-11: 47.86%

ISAT Scores, 2010: 74.3% 10th grade proficient and above in Math
73.4% 10th grade proficient and above in Science



Population Size	54,253 residents
Median Age	28 years
Employment	68.9%
Percent with Bachelor Degree or Higher	30%
Owner Occupied Housing	66.7%
Main Industry	
Educational, Healthcare and Social Services	25.5%
Retail	13.4%
Entertainment, Accommodation and Food Services	10.1%

COMMUNITY DESCRIPTION

Known as the “Gateway to the Northwest”, Pocatello is a major transportation and retail core at the intersection of I-5 and I-86 in southeastern Idaho. Historically, Pocatello was located on the Oregon Trail and was home to early railroad transportation into Idaho during the Gold Rush. The Pocatello area remains an important transportation corridor today and houses several international companies and Idaho State University. An economically diverse area, Pocatello’s economic base is comprised of manufacturing, mining, transportation, agriculture, medical products, processing of agricultural products, high-tech and nuclear research, recreation and tourism, and government services. However, according to the Idaho Department of Labor, trade and service industries provide nearly half the jobs in Bannock County²⁸. This is consistent with the STEM education focus groups verbal description of their community as “working class.”

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN POCATELLO: Diana Guerrero and Luis Carillo (Idaho State University’s TRiO Office), Angela Davis (SEICAA - SouthEastern Idaho Community Action Agency), and Missy McElprang Cummins (University of Idaho Extension), and Anne Lopiccalo (Pocatello/Chubbuck School District 025)

²⁸ Idaho Department of Labor. Labor Market Information. Publications: Work Force Trend Profiles. Accessed July 20, 2011: <http://labor.idaho.gov/publications/lmi/pubs/BannockProfile.pdf>

**Idaho Community Profile: Post Falls,
Kootenai County**

Post Falls District 273

Number of Schools in District:

- 2 High Schools
- 2 Middle Schools
- 5 Elementary Schools

Students in District, 2009-10: 5582 students

Percent Student Low Income, 2010-11: 55.42%

ISAT Scores, 2010: 72.3% 10th grade proficient and above in Math
71.5% 10th grade proficient and above in Science



Population Size	25,208 residents
Median Age	32.6 years
Employment	70.8%
Percent with Bachelor Degree or Higher	15.9%
Owner Occupied Housing	68.1%
Main Industry	
Educational, Healthcare and Social Services	18.5%
Retail	12.4%
Construction	12.2%

COMMUNITY DESCRIPTION

Post Falls is a “connector” community between the Spokane Valley, WA and Coeur d’Alene, ID. The city sits on the I-90 corridor between the two larger communities and provides both services and a workforce to Spokane and Coeur d’Alene. Traditionally a timber/lumber town, Post Falls was developed to serve the first commercial sawmill built on the Spokane River in the 1870’s²⁹. The timber industry has declined significantly in northern Idaho, and Post Falls has actively recruited to increase its manufacturing sector. The many new manufacturing and commercial businesses, the recent housing boom and numerous recreational opportunities have contributed to rapid growth in the Post Falls area. Increasing and improving educational services to address the rapid growth has been a challenge for Post Falls³⁰. A 9.5 million dollar levy recently passed to fund a new professional-technical high school, the Kootenai Technical Education Campus³¹. The STEM Education focus groups reflected the mix of “old-time” residents, proud of their community roots and “newcomers” eager to contribute to the area.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN POST FALLS: Crystal Perez-Avila (Post Falls Head Start), Jerry Keane (Post Falls School District #273), and Sherry Wallis (Post Falls Food Bank)

²⁹ The Post Falls History Walk. Frederick Post: Founder of Post Falls. Accessed July 20, 2011: <http://postfallshistorywalk.webs.com/frederickpost.htm>

³⁰ Bond Levies Respond to Growth”. The Spokesman Review.com. May 15, 2006. Accessed July 20, 2011: <http://www.spokesman.com/stories/2006/may/15/bond-levies-respond-to-growth/>

³¹ Kootenai Tech Center Clears Another Hurdle”. Coeur d’Alene KXLY.com. March 30, 2011. Accessed July 20, 2011: <http://coeurdalene.kxly.com/news/business/kootenai-tech-center-clears-another-hurdle/44079>

**Idaho Community Profile: Priest River,
Bonner County**



West Bonner County District 083

Number of Schools in District:

- 1 High School
- 1 Middle School
- 2 Elementary Schools

Students in District, 2009-10: 1402 students

Percent Student Low Income, 2010-11: 64.78%

ISAT Scores, 2010: 88.6% 10th grade proficient and above in Math
61.2% 10th grade proficient and above in Science

Population Size	1,581 residents
Median Age	41.6 years
Employment	57.2%
Percent with Bachelor Degree or Higher	8.6%
Owner Occupied Housing	79.7%
Main Industry	
Educational, Healthcare and Social Services	22.3%
Retail	14.6%
Construction	14.1%

COMMUNITY DESCRIPTION

The second largest town in the most northern county in the state, Priest River is a small logging community. Situated near the Idaho-Washington border, Priest River is located in a mountainous region of Idaho, with two large lakes and three rivers. In the early 1900's, Priest River was the most rapidly growing North Idaho town, primarily due to timber needs for the Great Northern Railroad development³². Recently, the timber industry has significantly declined in Idaho and the Priest River Sawmill lost 650 jobs in the last five years³³. During the period of STEM focus group research, the community was very concerned about the upcoming school levy, and spoke at length of their severely limited financial resources and multiple educational needs. The school levy successfully passed a few weeks after the focus groups were completed³⁴.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT PRIEST RIVER: Nancy Wright (UI Extension Office), Katie Crill (West Bonner Library District), Sally Nelson (4-H), Patrick Karr (Teacher West Bonner School District), Val Peterson-Jackson (Secretary, Priest River Elementary)

³² City of Priest River. Accessed July 20, 2011: <http://priestriver-id.gov/>

³³ Idaho Department of Labor. Labor Market Information. Publications: Work Force Trend Profiles. Accessed July 20, 2011: <http://labor.idaho.gov/publications/lmi/pubs/BonnerProfile.pdf>

³⁴ "School Levy Passes". The Priest River Times Online. May 25, 2011. Accessed July 20, 2011: http://www.priestrivertimes.com/breaking_news/article_8155b05a-86f1-11e0-bfd8-001cc4c002e0.html

**Idaho Community Profile: Terreton,
Jefferson County**



West Jefferson District 253

Number of Schools in District:

1 High School

1 Elementary/Middle School

Students in District, 2009-10: 613 students

Percent Student Low Income, 2010-11: 72.33%

ISAT Scores, 2010: 77.8% 10th grade proficient and above in Math

79.5% 10th grade proficient and above in Science

Population Size (Mud Lake city limits)	353 residents
Median Age	25.6years
Employment	66.5%
Percent with Bachelor Degree or Higher	17.3%
Owner Occupied Housing	98%
Main Industry	
Educational, Healthcare and Social Services	27.6%
Manufacturing	22.0%
Wholesale Trade	9.4%

COMMUNITY DESCRIPTION

Terreton is an unincorporated area near Mud Lake in Jefferson County. The two communities are very small and are situated side by side along Highway 33, about 35 miles northwest of Idaho Falls and 35 miles northeast of the Idaho National Laboratory. The area is surrounded by farmland, with large landowner farms. In the early 1900's Terreton/Mud Lake was organized by the Church of Jesus Christ of Latter Day Saints into a branch, a district too small to be a ward³⁵. Twenty-to-thirty percent of the population describe themselves as members of the Church of Jesus Christ of Latter Day Saints, with less than 1% of the population describing themselves as belonging to any other specific religious category³⁶. The area had the youngest median age of the STEM communities and in the state, at 25.6 years, about 8 years younger than the state median (34). It has the highest owner occupied housing rates in the state at 98%. The Hispanic population in all of Jefferson County was 10.1% in the 2010 U.S. Census (representing an 11.2% growth from 2000)³⁷. Yet in Mud Lake (the town situated nearby the North Gem schools), Hispanics comprised 27.4% in the 2000 U.S. Census of the population suggesting a higher level of ethnic diversity in the North Gem School District area than in the rest of Jefferson County³⁸.

³⁵ Andrew Jenson. 1941. *Encyclopedic History of the Church*. Salt Lake City: Deseret News Press, p. 554.

³⁶ The Association of Religion Data Archives. Accessed July 20, 2011.

<http://www.thearda.com/DemographicMap/displayIGMap.asp?ZipCode=83450>

³⁷ U.S. Census 2010. Accessed July 19, 2011 at, <http://quickfacts.census.gov/qfd/states/16/16051.html>

³⁸ U.S. Census Bureau. Accessed July 20, 2011 at, <http://censtats.census.gov/data/ID/1601655450.pdf>

The U.S. Census Bureau American Community Survey (ACS) Fact Sheet estimates for 2005-2009 report that Hispanic and Latino populations comprise 48.2% of the population, with Whites comprising 76.5% (Accessed on July 20, 2011,

The only other STEM Education Research community to have a significant non-white population was Jerome, whose Hispanic population is recorded at 27.6%. The focus groups in Terreton referenced different perspectives on how to expend educational resources given its diverse population.

INDIVIDUALS AND ORGANIZATIONS UTILIZED IN FOCUS GROUP RECRUITMENT IN THE WEST JEFFERSON SCHOOL DISTRICT AREA: Lorie Dye (UI Extension Office) and Marianna Taylor (West Jefferson High School Principal)

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http://factfinder.census.gov/servlet/ACSSAFFacts?_event=Search&geo_id=&geoContext=&street=&county=mud+lake&cityTown=mud+lake&state=04000US16&zip=&lang=en&sse=on&pctxt=fph&pgs|l=010). These numbers would suggest rapid growth of Hispanic and Latino populations in the North Gem School District region.

II. FOCUS GROUP QUESTIONS WITH ASSOCIATED RESEARCH QUESTIONS

Research Question	Focus Group Question
<p>What are participants' worldviews of STEM education?</p>	<p>1. Okay, let's start the discussion. I will be asking you several questions about technology, engineering, science and math education. What comes to your mind about each of these fields in STEM?</p> <p>Checklist as they come up (if they don't discuss each, use follow up question to stimulate discussion):</p> <p>___ Technology ___ Engineering ___ Science ___ Math</p> <p>*after discussion circulate handout on "What STEM ed" is and briefly review (provided in Appendix II.A.)</p>
<p>What social networks exist that shape attitudinal support of education in general and STEM education specifically in this particular community?</p>	<p>2. Do you ever talk with others about schools and education? Who do you talk with about these things and in what ways?</p> <p>Follow up questions:</p> <p>a. Does STEM education ever come up when you talk with folks about education?</p> <p>b. What do you think is the best balance between an emphasis in STEM education & other disciplines (English, Art, PE)?</p>
<p>What are the community perceptions of student abilities for STEM education (stereotypes/assumptions)?</p>	<p>3. What kinds of kids are good at STEM ed?</p> <p>Follow up questions:</p> <p>a. Why? What does it take? Do all kids have this? Why or why not?</p> <p>b. What percent of kids in your community, roughly, <u>could</u> succeed in STEM (or, have what it takes)?</p>
<p>What are the community influences (parents, friends, community activities/investments) on children's STEM interest, abilities, success?</p>	<p>4. If you were to guess, what percent of kids <u>will</u> pursue STEM classes in high school and degrees in college in your community?</p> <p>5. What will encourage some students to pursue STEM classes and not others?</p> <ul style="list-style-type: none"> • Follow up: Who? <ul style="list-style-type: none"> a. Are parents influential in generating interest or raising expectations in STEM education? How? b. What is the influence of their friends? c. Who else influences kids on this? • Follow up: What? <ul style="list-style-type: none"> a. What might they do to get interested? b. Are there any local activities or sites that might get

	<p>them interested or exposed? c. Does the community support a science fair, STEM focused scholarships, or something else? other forms of local support?</p>
<p>What does the community see as the value of STEM education, careers, fields?</p>	<p>6. Why do you think it is, or is not, important for youth in Idaho to pursue learning in engineering, technology, math and science? Follow up: a. Important for finding Jobs? What local jobs exist that require math/science expertise? What local professionals are here that need math/science skills? b. For being informed citizens? For helping others?</p>
<p>How are STEM careers, professionals, and programs perceived in the community?</p>	<p>7. There's discussion out there about a public distrust of science or scientists. How would you describe the level of trust for science or scientists in your community? Follow up: a. What types of people, or professions, come to mind when you think about scientists? b. What do you think this distrust, or level of trust, comes from?</p> <p>8. There's, also, discussion about conflicts between science and religion. Do you, or others in the community, feel that there is a conflict? In what ways? Follow up questions: a. Climate change, evolution, stem cell research, sex education.</p>
<p>What are the community's perceptions of the local education system that promotes or creates barriers to their children's STEM educational experience.</p>	<p>9. Let's talk more specifically about schools for a bit. What, if anything, is going on in your local schools that affects students' experience with the fields of science, technology, math and engineering? Follow up question: a. What specifically are some of the things happening in schools that are successful in supporting student STEM achievement? b. What specifically are some of the things happening in the schools that lead to poor success in STEM achievement? c. If you could change things in school, how would you balance STEM education and other disciplines or programs (English, Art, PE)? d. (For teachers only): What, if any, of this is connected to the local community and how?</p>

II.A. HANDOUT FOR PARTICIPANTS EXPLAINING STEM DEFINITIONS AND SUBJECTS

STEM Education is,

SCIENCE: general science, earth science, biology, physics, and chemistry.

Learning knowledge in these fields and applying scientific methods to generate new knowledge.

TECHNOLOGY: computer science, industrial education, electronics, machining, and woodworking.

Learning about tools and how to construct, design, and use tools to solve problems.

ENGINEERING: electrical engineering, mechanical, civil engineering, agricultural engineering and computer software engineering.

Learning to use math and science to solve problems and design projects in the physical world.

MATHEMATICS: basic math, algebra, calculus, geometry, trigonometry, and statistics.

Learning mathematical knowledge often applied in science, technology and engineering fields.

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III. TEAM CODING PROCESS

The focus group questions were developed from both our research design, intended to collect an ethnography of sorts of the local communities' perspectives on STEM education, and a literature review providing a foundation for the types of relevant information we may solicit with sufficient questions. Our focus group questions were also enhanced by three pilot focus groups conducted. Since the focus group questions shaped the responses and directed discussion toward particular topics, we started with the questions in developing our coding strategy. All focus groups were recorded and transcribed. We used NVivo 9 to code and analyze the focus group information, primarily working with focus group transcripts and demographic data on each participant.

Our coding process incorporated two initial strategies. First, we constructed a skeletal coding structure based on the focus group questions designed to collect information relevant to our research questions. We had a good sense of the types of information and topics the questions elicited because we had conducted twelve focus groups before we initiated coding. We also knew how we designed the questions to target particular areas for discussion. The initial coding skeleton was intended to account for a good amount of known information types from the focus groups. Pre-determined codes or themes will certainly affect the "read" of the data, but the formulation and employment of focus group questions necessarily shaped the discussion, so we were confident that using a coding structure that paralleled the questions would be the appropriate starting point. This skeletal structure was intended to evolve over time as coding proceeded. Second, we created a process whereby each coder could create her/his own codes as they analyzed focus group transcripts in recognition of the importance and utility of reading emerging themes and having the flexibility to account for them. Thus, each researcher had the freedom to develop codes as they saw fit, but these codes were kept separate from the rest of the project until the team could discuss these, see parallels with others, and decide whether to integrate the new coding into the skeletal structure or to leave it as a researcher code and, if the latter, whether others would use the code in their coding work.

Thus, the coding strategies matched the project design as the code selection was initially driven by the research questions and it incorporated a mechanism for recognizing and formulating codes or themes that emerged as we worked with the data.

This phase of the project was designed to be exploratory initially. Thus, we didn't address inter-coder reliability as the primary purpose was to capture the range of topics that emerged and to categorize or organize them into a framework that best represented them. Subsequent levels of analysis of the focus group data will tend more systematically to these issues as well as incorporate further use of demographic data.

The coding was conducted by six members of the research team, all trained in N-Vivo 9 and in qualitative research and analysis. Once developed, the skeletal code structure was distributed in hard copy along with one transcript, and the team met to discuss the structure's utility in relation to a representative focus group transcript. After the skeletal code structure was revised based on this discussion, four researchers began coding the first three transcripts to further test the code structure and to use the feature of creating new codes. The team met again at this stage to discuss the code structure and the codes developed by each researcher. After revisions, the team commenced coding additional transcripts. The process was repeated in four cycles following each group of transcripts added to the project until all transcripts were coded.

The analysis of the data required another level of coding drawing from existing codes to develop broader and more complex themes to which many codes are related. The team was asked to individually develop a list of overarching themes in preparation for an analysis meeting. The team met to review and discuss the topical areas that would best represent the data coded. An initial list of fifteen broad themes emerged in the meeting which, after further discussion, was then reorganized and consolidated into seven themes. Each team member was assigned one or more of the seven to develop over the course of the next week through secondary coding and narrative. The team worked intensively in a retreat format for five days developing and discussing these themes. In this process, two additional themes emerged during the week as significant and were addressed. During the retreat, the theme in developmental stages was circulated to the entire group for comment. The themes were similarly distributed for comment and revision during the drafting of the focus group report.

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