

Colorado State University

CENTER FOR PUBLIC DELIBERATION

Report on the Public Meetings on STEM Education Initiative

Prepared by
Martín Carcasson, Ph.D.,
Director of the CSU Center for Public Deliberation

BACKGROUND

The CPD facilitated a series of seven public forums in six cities across northern Colorado (including Fort Collins, Loveland, Longmont, Greeley, Estes Park, and Sterling) in spring 2008 concerning the role of Science, Technology, Engineering, and Math (STEM) in the K-12 curriculum. The forums were one part of a larger ongoing national project. Colorado was named as one of six states to receive \$500,000 grants from the National Governors Association to establish STEM education centers. The Colorado governor's office and his P-20 council was also involved to gain input on potential changes to state education policy concerning STEM education. The state was divided into six regions, and Dr. Ellyn Dickmann of the CSU School of Education was responsible for the Northeast Region of Colorado.

Year one of the larger project was devoted to bringing people together, galvanizing the community, finding avenues of support, and identifying problems. As part of this process, therefore, Dr. Dickmann requested the CPD assist with the development of public forums to gain public feedback on STEM issues. CPD Director Martín Carcasson designed the forums, and facilitated them along with CPD associates. The Northeast region hosted six convening sessions across the northern Colorado area from March 31st – June 11th.

EXPLANATION OF PROCESS

The Northeast region hosted seven convening sessions across the northern Colorado area from March 31st – June 11th. The convening sessions were designed to bring together relevant audiences to learn about the STEM initiative and to provide feedback. A list of the cities and locations of the convening sessions, including the number of attendees at each, is listed below.

The basic framework for the convening sessions was to start with presentations by COMSTEC and representatives from the governor's office to provide an overview of the project and the goals for the convening sessions. Participants were then typically divided into groups of 10-20 for small-group discussions led by facilitators from the Colorado State University Center for Public Deliberation (www.cpd.colostate.edu). CPD facilitators are trained to be impartial, and simply direct and capture the discussions as they progressed.

The facilitators asked a series of discussion questions, and took notes on the discussion. Participants were also provided with surveys to complete individually. During the April 3 meeting in Fort Collins, however, facilitators were not used due to the manner in which the room was set up and the fact that the participants were eating lunch during the event. Participants were sitting in tables of 10, and questions were asked to the overall group over a microphone. Participants were asked to discuss the question at their tables, and then write answers on post it notes that were provided. Those answers were collected and placed on pieces of easel paper around the room. After all the questions were asked, participants were asked to complete a “gallery walk” to examine all the questions and answers, and to provide any additional answers that arose. All the written answers from the posts were included with the small group discussion notes.

The basic discussion questions asked were:

1. If ten years from now you were to look back and consider this current STEM initiative focused on increasing expectations and requirements a clear success, what would have happened? What steps are necessary to make that happen?
2. What are the primary barriers to realizing your vision for STEM, and how could they best be overcome?
3. One of the difficulties of making changes in education in Colorado is the decentralized state system which gives primary control to local school districts. Local control allows for flexibility, but major initiatives would need state support. What is the best way to negotiate the tension between state and local control?
4. How important is STEM education, in particular compared to other current educational initiatives that are also vying for additional resources, such as civic education, the arts, early childhood education, smaller class sizes, etc.? Are you willing to support increased emphasis on STEM education EVEN IF it required taking focus and resources away from other key initiatives?
5. Considering the discussions you’ve had today, what is the one thing you would like to tell the governor about state level policy development for STEM education?

Questions 1, 2, and 5 were asked at all of the sessions. Questions 3 and 4 were asked when there was time. The final convening meeting held in Fort Collins on June 11 was utilized to present and discuss preliminary data from the initial six sessions, rather than to bring in additional information.

The raw data is available to anyone interesting in examining them. Email any requests to cpd@colostate.edu. Three documents are available: the full notes from the convening session (42 pages), the transcribed answers to the open-ended questions from the survey (9 pages), and the collection of answers to the question #5 (4 pages).

Locations, Dates, and Attendance of Convening Sessions

Overall numbers: 6 public meetings, 229 attendees, 22 breakout groups, 56 surveys completed

Loveland, March 31
Thompson Valley High School
2 breakout rooms, total of 22 attendees.

Sterling, April 28
Northeastern Junior
College Ballroom
2 breakouts, total of 26 attendees

Fort Collins, April 3
Held during 21st Century Framework
Conference
Hilton Hotel
11 breakouts, total of 100 attendees

Longmont, April 30
Radisson Hotel
2 breakouts, total of 19 attendees

Greeley, April 16
Northridge High School
2 breakouts, total of 16 attendees

Estes Park, May 6
Estes Park High School
3 breakouts, total of 46 attendees

A follow up meeting was also held in Fort Collins on June 11 at the Community Foundation to present initial data from the sessions. 15 attendees

OVERVIEW OF AUDIENCES AND DATA FROM MULTIPLE CHOICE SURVEY QUESTIONS

Participants in all of the meetings except for the Fort Collins meeting had the option of completing two page surveys which included a mix of demographic and STEM questions, some in multiple choice format and some that were open-ended. Figures 1-7 present information from the surveys that were completed to provide a sense of the audiences that participated in the STEM community discussions in northern Colorado.

Participants identified a range of connections to the issue of STEM education, as shown on Figure 1. Educators and education administrators at various levels were the most prevalent, but a number of business leaders and employees also attended.

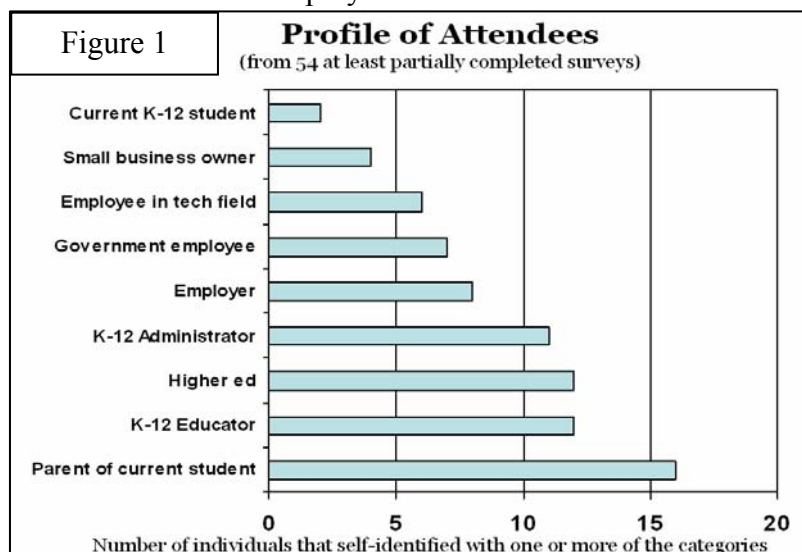


Figure 1 above does not include information from the Fort Collins meeting, because no surveys were completed at the meeting. The Fort Collins meeting was held in conjunction with the 21st Century Framework Conference, as 100 participants in the morning conference agreed to focus on STEM issues over lunch. The audience during this event was extraordinary, and included 32 key business leaders in the local community, 19 individuals connected to higher education, including both Colorado State University and Front Range Community College, and 28 K-12 administrators, including several principals, school board members, and the superintendent of schools. The Fort Collins city manager and members of the city council attended as well.

The participants completing the surveys also represented a range of ages, predominately from 24-64 (figure 2). Less than 10% of the participants were younger than 24 or older than 65. 53% of those completing the survey were female, 47% male. 95% were Caucasian, 4% Hispanic, 1% Multi-ethnic.

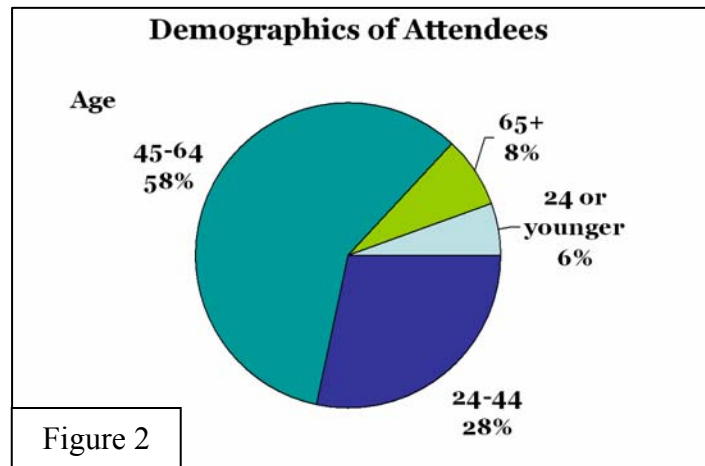


Figure 2

Participants represented a varied mix in terms of their prior knowledge with STEM. Interestingly, despite the fact that essentially a third of the audience that completed the survey was unfamiliar with STEM (figure 3), more than three-fourths believed STEM education was/would be a “significant benefit” to the community, and 98% believed it would either a “significant benefit” or “average benefit.” Only 2% (1 respondent) reported negative views towards STEM (figure 4). This data points to two issues. First, that support for STEM is clearly high in these communities, and the overall perspective of STEM is positive. On the other hand, the data also shows that almost everyone that attended the meetings were essentially “pro-STEM.” How representative the participants in the meetings were of the overall population is a difficult question to answer. Indeed, whether or not there is an “anti-STEM” contingent would be an interesting question to pursue. Perhaps few individuals would represent themselves as “anti-STEM,” but would be wary of supporting an increased focus on STEM ahead of other educational areas of study.

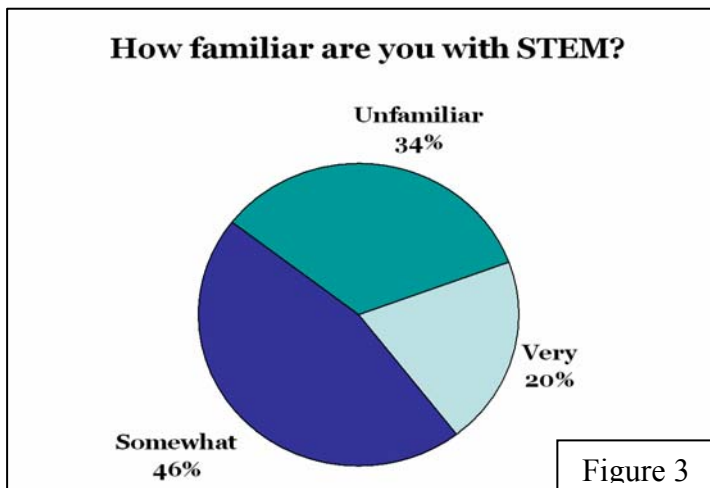


Figure 3

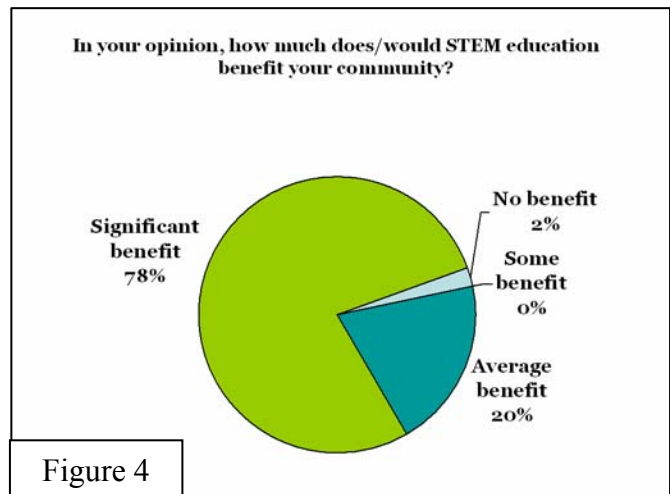


Figure 4

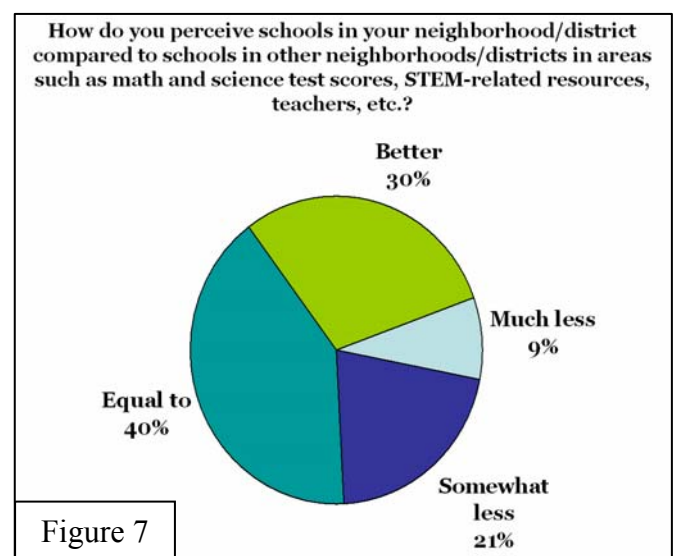
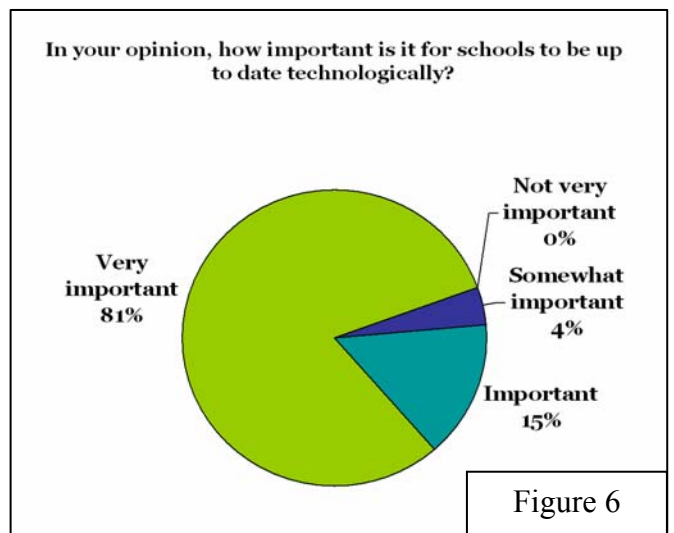
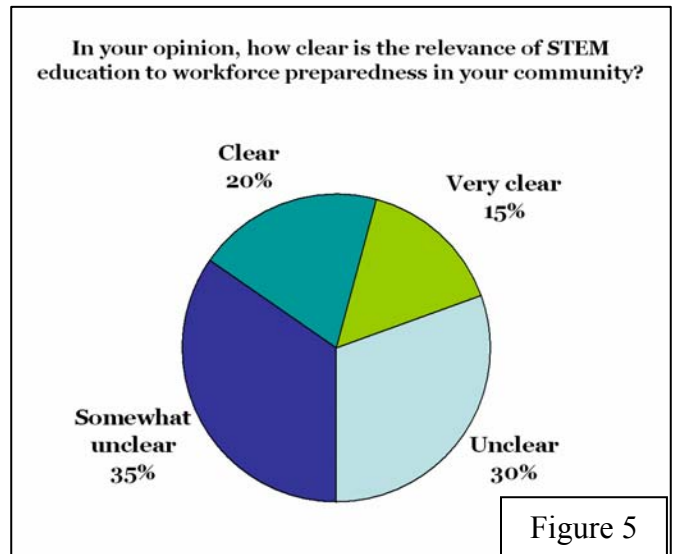
Perhaps due in part to the manner in which the publicity for these meetings was performed—focused particularly on STEM educators, business leaders, and related industries and groups—it seems clear that the conversations were primarily among those already holding an affinity for STEM. The information is nonetheless valuable, as it explores how a variety of people connected to the issue respond to a number of issues, but is also limited because it primarily represents a conversation among supporters. If we had attracted a broader audience that included, for example, educators or community members dedicated to civic education, art, music, etc., the information may have included a different slant.

Despite the fact that a high majority of individuals completing the surveys identified STEM as having a positive impact on their community, the connection between STEM and workforce preparedness was much more varied (figure 5). Only 35% of the respondents felt the connection was “clear” or “very clear,” and a majority felt it was either “somewhat unclear” (35%) or “unclear” (30%).

This data supports one of the themes that will be discussed later concerning the need for greater awareness about STEM education and its benefits at multiple levels.

One of the key issues with STEM education is the role of technology and the degree to which schools are able to expose students to the tools of current technology. Survey participants strongly supported the idea that schools should be “up to date” technologically, with 96% agreeing it was very important or important (figure 6).

The last multi-choice survey question asked participants about the perceived quality of their local schools compared to other schools in STEM education. A majority (70%) felt that their schools were better or equal to others (figure 7). 9% of the respondents felt that their schools had “much less.”



KEY THEMES DRAWN FROM THE SMALL GROUP DISCUSSIONS.

After hearing an overview of the STEM initiative from various officials, participants were split into small group breakouts lead by a facilitator from the CSU Center for Public Deliberation. Depending on the time constraints, 3-5 discussion questions were asked, and notetakers captured the discussion. During the Fort Collins meeting, each table discussed the question on their own (without a facilitator), and then wrote answers on post-it notes that were then collected, compiled and displayed on the wall. The compiled notes from all the various breakout groups were then analyzed for key recurring themes, which is presented here in part 3.

3A. Most prevalent themes from the group conversations in response to a question asking:

“If ten years from now, you were to look back and consider this current STEM initiative a clear success, what would have happened? What steps are necessary to make that happen?”

The numbers in parenthesis represent the number of different instances in which the theme arose across the discussions.

- **Increased collaboration between schools and business/industry (56)**

Participants discussed the need to have schools and businesses work together for many reasons, including to expose students to career options and the importance of STEM subjects, to provide more practical connections to education, to help schools understand the needs of industry, to connect students to mentors and internships, to tap into business leaders and retirees as “non-traditional” teachers and classroom volunteers.

- **Increased awareness by community, parents, and students concerning the importance of STEM (41)**

Participants discussed the need for much greater understanding of STEM subjects and their importance. Overall, participants believed that STEM education has much to offer, but few are aware of its strengths. In particular, participants discussed the need to educate parents about STEM so they would encourage their children toward STEM courses, to educate the community about STEM so more resources could be made available, and to educate and motivate students to connect to STEM. Participants also argued that greater awareness will be necessary for STEM to take a significant step forward.

- **Increased innovation in classroom (37)**

Participants discussed the need for getting beyond the classroom with STEM education, having students work on “real world,” “experiential learning,” and “hands on” projects that teach creativity and entrepreneurship skills, and expose students to STEM subjects through field trips and guest speakers.

- **Increased cooperation between levels of education (26)**

Participants supported the notion of a more seamless P-20 system in Colorado, in particular the need for better coordination, collaboration, and integration of resources between K-12, community colleges, and four-year colleges. Some participants discussed that the current environment creates competition between schools and levels rather than cooperation, thus a significant change would be needed.

- **Increased graduation rate, college attendance and preparedness (22)**

Participants envisioned a number of benefits if STEM education improved in Colorado, including increased enrollment in postsecondary education, reduction in remediation, more competitiveness, and a greater ability for Colorado to “grow its own” talent for key industries.

- **Increased integration between subjects (20)**

Several participants reacted against the notion of compartmentalized education or “silos” and discussed the need to integrate STEM subjects with other important subjects such as literacy, art, and music. Participants, for example, mentioned “teaching science through art,” “teaching English in science,” “using music to teach math,” etc. Participants saw integration as a solution to expanding STEM education without having to take away from other subjects.

- **Better STEM teachers (more funding, training, and hiring flexibility) (16)**

Participants discussed the importance and difficulty of attracting and retaining high quality STEM teachers. Additional funding for STEM salaries and training was a recurring theme throughout the discussions. Participants also discussed the need for more flexibility with teacher credential requirements, as high requirements can place K-12 schools out of the market, and can keep out non-traditional teachers who could be great assets to schools.

- **Better distribution of STEM students (male/female balance, more minorities) (11)**

Participants discussed concern with the imbalance of interest in STEM and envisioned that success would include more women and minorities engaging in STEM courses and careers.

- **Increased funding (for technology, STEM teachers, innovation) (6)**

Participants imagined that success would also mean additional resources for STEM initiatives. Whereas funding was a minor theme for this initial question, it was clearly a theme throughout the discussions in general.

3B. Most prevalent themes from the group conversations in response to question asking:

“What are the primary barriers to realizing your vision for STEM, and how could they best be overcome?”

- **Funding (47)**
Lack of resources was the most often cited barrier to progress in this area. In particular, funding for technology, innovative programs, and high quality teachers were repeatedly mentioned.
- **Lack of parental or community support and student interest (34)**
The lack of “buy in” or “urgency” from the community was a concern. Participants felt that students were not interested, and parents did not encourage their children in these areas.
- **Lack of STEM teachers (33)**
The need for resources to support greater incentives to attract and retain teachers in STEM subjects and to keep teachers up to date with technology was a clear concern, as well as the need to be creative and flexible in dealing with this problem. Encouraging teachers to be innovative in order to motivate and excite students was also important.
- **Bureaucracy/politics/unfunded mandates/rhetoric without action (28)**
Several participants expressed concern over the long-term viability of any program due to the political and fiscal environment in Colorado. Participants mentioned concerns with TABOR, and with the use of “unfunded mandates” from both the federal and state governments.
- **Lack of basic skills (17)**
Participants expressed concern that many students have low writing and math skills, and that increasing expectations on higher level classes without first establishing a strong base would be setting students up for failure.
- **CSAP and the overall focus on testing and assessment (15)**
Participants had concerns with the current focus on testing, particularly because of the time and resources used, the shift in resources toward particular subjects (testing driving curriculum), and the stress they can cause.
- **Lack of high expectations from parents and community (12)**
Connected to the lack of awareness of the importance of STEM, participants identified low expectations as a key barrier. Participants mentioned the lack of will and overall valuing of education, and the preference for too many students to take easier paths.
- **Different student capabilities and the reluctance to deal with those differences (10)**
Participants discussed the difficulty of dealing with students of different skill and motivation levels, and the tension of addressing those differences when working to increase expectations.

3C. During the discussion, other key tensions or “tough choices” emerged that should be taken into careful consideration.

- **Negotiating the tension between standardization v. flexibility (22)**
One of the most often discussed tensions was between standardization and flexibility. The subject came up often, in particular in the discussion of state versus local control. Participants clearly saw the advantages and disadvantages of different perspectives on this issue, and the need to find the right balance and other mechanisms that help transcend this dichotomy.
- **Timing of STEM (early or high school) (20)**
Participants disagreed concerning the best time to engage students with STEM subjects. Many participants mentioned the need to start students early in order to develop an interest and connection, while others believe STEM should not become a focus until high school.
- **Issues with tracking and dealing with students of different abilities (14)**
Participants struggled with the traditional tension of deciding at what point students should be encouraged toward higher education or more vocational and career-oriented paths. Participants recognized that the earlier the decision is made, the more likely the student will be able to gear their studies in a productive path, but such decisions are difficult to make early, and student preferences and societal needs change as they develop. This tension was also evident within discussion of STEM, as a STEM focus could both lead to higher education or directly to employment in STEM related industries. A related concern was evident between focusing on high achievers and focusing on the achievement gap, with comments supporting both views (the need to focus on closing the gap, and the need to focus more on high achievers rather than those falling behind).
- **Technology (needs to be up to date, but quickly obsolete) (11)**
Participants agreed strongly on the need for schools to be “up to date” technologically, but also understood the costs involved and the likelihood that the technology students use will likely be obsolete by the time they graduate.

3D. Primary Themes from State/Local control question

If time allowed, participants were asked a question specifically addressing the tension between state and local control. The question was typically worded as follows: “One of the difficulties of making changes in education in Colorado is the decentralized state system which gives primary control to local school districts. Local control allows for flexibility, but major initiatives would need state support. What is the best way to negotiate the tension between state and local control?”

Overall, attendees showed a nuanced understanding of the tension between state and local control. **Key themes from these discussions included:**

- Support for state goals, standards & oversight, but districts must be allowed flexibility in implementation and curriculum. This point was consistently expressed by many participants.
- The need for better coordination and communication between state and local in general
- The need for multiple options and pathways to success
- The use of incentives and enticements, not mandates

Commonly expressed advantages of increased state control

- No need for local districts to reinvent the wheel
- Progress on STEM requires standardization, sharing of resources
- Smaller districts do not have the resources to innovate
- Initiative will require incentives and resources from the state level to succeed

Commonly expressed disadvantages of increased state control

- May get embroiled in politics
- Different areas of state have different strengths and needs, and the state too often focuses primarily on the needs of the Front Range
- Increased focused on collaboration with business and/or higher education would inherently advantage some districts and disadvantage others
- Local districts understand their students better
- Fear of unfunded mandates
- State stifles creativity

3E. STEM compared to other initiatives

If time allowed, participants were also asked the following question: How important is STEM education, in particular compared to other current educational initiatives that are also vying for additional resources, such as civic education, the arts, early childhood education, smaller class sizes, etc.? Are you willing to support increased emphasis on STEM education EVEN IF it required taking focus and resources away from other key initiatives?

Primary themes from these discussions include:

- Need to be both/and, not either/or - integrate, don't compartmentalize.
- Remain balanced in elementary, and then develop tracks in high school
- Help students find their niches.
- Need to educate the whole child. STEM should not take away from other areas.

3F. The final question asked during the small group discussions was:

Considering the discussions you've had today, what is the one thing you would like to tell the governor about state level policy development for STEM education?

A total of 105 individual statements were collected concerning this question. All the raw data is available at the CPD website (www.cpd.colostate.edu) or send a request to cpd@colostate.edu. We encourage the governor and others in his office involved in this initiative to read through the full quotes for this question. Primary themes from these discussions included (parenthesis once again identify how often that theme was repeated among the 105 responses collected):

- Provide adequate funding for this initiative (23)
- Fix Tabor/Gallagher (8)
- Must focus on community awareness & educating parents concerning STEM (7)
- Need to support collaboration with business and employers (5)
- Encourage creativity/innovation (4)
- Keep politics out of it (4)
- Shift focus away from assessment/testing (4)
- Pursue best practices/don't reinvent the wheel (4)
- Go forward with STEM (4)

Part 4: Open Ended Survey Answers

The surveys completed by some of the participants also included three open ended questions, as well as space for participants to add any additional comments. This section provides a summary of the answers to these questions. The numbers in parenthesis represent the number of times the themes were repeated in separate surveys.

How important is STEM education as a school-related issue?

- “Very,” “critical,” “extremely important” or “very important” (25)
- Important along with other subjects (“equally important to...,” need well rounded) (6)
- Important specifically linked to the economy (4)
- Important due to global concerns (4)
- Important due to everyday use, preparation for life (2)
- Should be foundational to curriculum (2)

What could have the most positive impact on STEM education in your school/district?

- More funding (10)
- More awareness, understanding, and support of STEM in the community and by parents and students (10)
- More collaboration between businesses and schools (4)
- Students being more prepared for college (4)
- More alignment/cooperation among stakeholders (3)

What do you think is the most important thing parents and people in the community need to understand about schools in your city/district/region?

- Need for more funding (12)
- Need for more collaboration between schools, community, and businesses (6)
- More parental involvement and encouragement (5)
- Need for more awareness about the importance of STEM (4)

Please add any other comments or suggestions you have about STEM.

The answers to this question varied greatly, and we certainly encourage interested parties to read the full text of the answers for this question in particular. Two themes that were repeated often to this question were the need for adequate funding (8) and concerns over testing (4).

LESSONS LEARNED / SUGGESTIONS FOR OTHER REGIONS

If other regions use a similar survey to capture demographics, we would suggest splitting community colleges and four-year institutions in order to identify better who was in attendance at the convening sessions since collaboration between all the various levels is critical.

Ideally, the process would involve more students. Some students attended the Longmont convening session, and had some valuable contributions. We would encourage other regions to specifically invite students to attend, or perhaps have separate events focused on gathering student feedback on various proposals.

Facilitators discovered early in the process that participants tended to focus on their professional perspective during the breakout sessions, and as a result, we were not receiving feedback from individuals as parents. During later sessions, we specifically asked participants to answer questions both as professionals and as parents, in applicable, and the information we gathered was richer in some ways.

From the perspective of the facilitators from the Center for Public Deliberation, in retrospect more time should have been designated for questions like question #4 that had participants struggle with the tradeoffs between STEM and other initiatives. When discussed on its own, it is likely that individuals would be highly complimentary of STEM, but there are only so many hours in a school day and dollars in a budget, and any initiative to increase focus in one area will inherently take focus and resources away from others, unless, as some participants argued, subjects could be integrated better and be taught at the same time. Other projects the CPD has completed have focused on gathering community input on the broader purpose of public education, and while STEM, job readiness, and global competitiveness have been important topics in those discussions, they have only been some topics among many. The Conversation 2007 process sponsored by the Donnell-Kay Foundation, for example, uncovered a wide variety of public views on the purpose of education in the 21st Century, some of which can be connected to STEM, and others likely not. A focused discussion on improving STEM is certainly important and useful, particularly in bringing together all the various stakeholders and exploring ways to work together more effectively, and the information captured at the convening sessions should be helpful in that regard. However, considering the narrow focus of the conversation and the fact that the participants were primarily supporters of STEM, we would caution readers from assuming this report is representative of a broad “public voice” or an overall clear community endorsement of an increased focus on STEM education over other initiatives.