

**Alabama Governor's Summit
on
Mathematics and Science Education**

March 6 and 7, 2006

**Ross Bridge Resort
Birmingham, Alabama**

Evaluation Report

Alabama Governor's Summit on Mathematics and Science Education

Evaluation Report
Submitted by Arlene Elrod
April 18, 2006

Context

In 2003 and 2004, the U.S. Secretary of Education convened national summits to bring attention to the perilous condition of mathematics and science education in our nation. In direct response to these summits, a call was issued for state-level summits focusing on science, technology, engineering and mathematics (STEM) education concerns and addressing necessary actions to develop improved systems for delivering educational opportunities to all students from pre kindergarten through college. With the support from the U.S. Department of Education, NASA, the National Alliance of State Science and Mathematics Coalitions (NASSMC) and key business/industry partners the Alabama Governor's Summit was convened on March 6-7, 2006 at the Ross Bridge Resort in Birmingham, Alabama. There were 156 participants from business/industry, education, government and community organizations.

The meeting was convened by the Alabama Mathematics, Science, and Technology Education Coalition (AMSTEC). AMSTEC was incorporated in 1998 with a mission to improve mathematics, science and technology education in the state of Alabama through the facilitation of communication among education, business, and public policy organizations. The Coalition promotes student learning by supporting effective teaching focused on student interaction and critical thinking, curriculum improvement focused on national standards, appropriate technology and other learning resources, technology enhanced pre-service and in-service professional development, governmental and public policy reform and school and school district accountability.

The Summit Goals were:

- Identify the width and breadth of Alabama's needs and challenges in improving STEM education for all students.
- Identify Alabama's needs for improving STEM education specifically to enhance workforce competitiveness.
- Identify strategies for engaging the entire stakeholder community in support of meeting those identified needs and challenges (like improving STEM education for all students.)
- The sharing of best practices from around the state identified in the forum activities.

The two day program included plenary sessions and roundtable discussions. Speakers included: Dr. Gail Cassell - Vice President of Scientific Affairs, Eli Lilly and Company, Governor Bob Riley - State of Alabama, Dr. William Schmidt - Co-Director, The Education Policy Center and the US China Center for Research, Dr. Ken Wesson - Educational Consultant, Neuroscience, Jim McMurtray - NASSMC Executive Director, Dr. Carol Garrison - President, The University of Alabama at Birmingham, Dr. Joseph Morton - State Superintendent of Education, State of Alabama.

Evaluation Plan

This report is an analysis of the evaluation data for the Alabama Governor’s Summit. Following is a table that shows the questions that Summit planners believed were important to monitor and the strategies that were used to collect the information. A short description of the evaluation strategies is included.

Collection Method	Analysis of Summit Round Table Discussions	Post event survey on surveymonkey.com	Random Post Summit interviews
Questions to be answered			
1. Did the Summit have an impact on the participant’s knowledge and beliefs about STEM education?	X	X	X
2. What are some ways STEM education in Alabama can be improved?	X	X	X
3. What should AMSTEC’s role be in improving STEM education?	X	X	X
4. What do participants perceive as their role in the improvement of STEM education?	X	X	X
5. Was strategic collaboration initiated among participants?	X	X	X

- A **pre-summit survey** was distributed to the majority of participants prior to the beginning of the event. This allowed pre – post data to determine if there was a change in participant’s thinking due to their experiences at the Summit.
- A **post-summit survey** was available on SurveyMonkey.com. Seventy-six participants completed the survey: Five teachers, 13 district central office personnel, 17 university educators, 6 corporate representatives, 7 government representatives, and 28 who classified themselves as other. The majority of the “others” identified themselves as some type of regional or state educators.
- **Phone interviews** were conducted with approximately 10% of the institute participants beginning one week after the Alabama Governor’s Summit. All Summit Planning Committee Members and presenters were removed from the list. Every person was coded according to the sector they represented (i.e. district, corporate, university, state department). The list was sorted by sector and every 10th person on the participant list was contacted. Proposed interview questions are attached.
- **Round Table Discussions** were monitored and comments were scripted for analysis.

Findings

The findings from this report are intended to be used as formative assessment for future events that AMSTEC may hold. The findings show general trends and needs of the participants that attended the Alabama Governor's Summit.

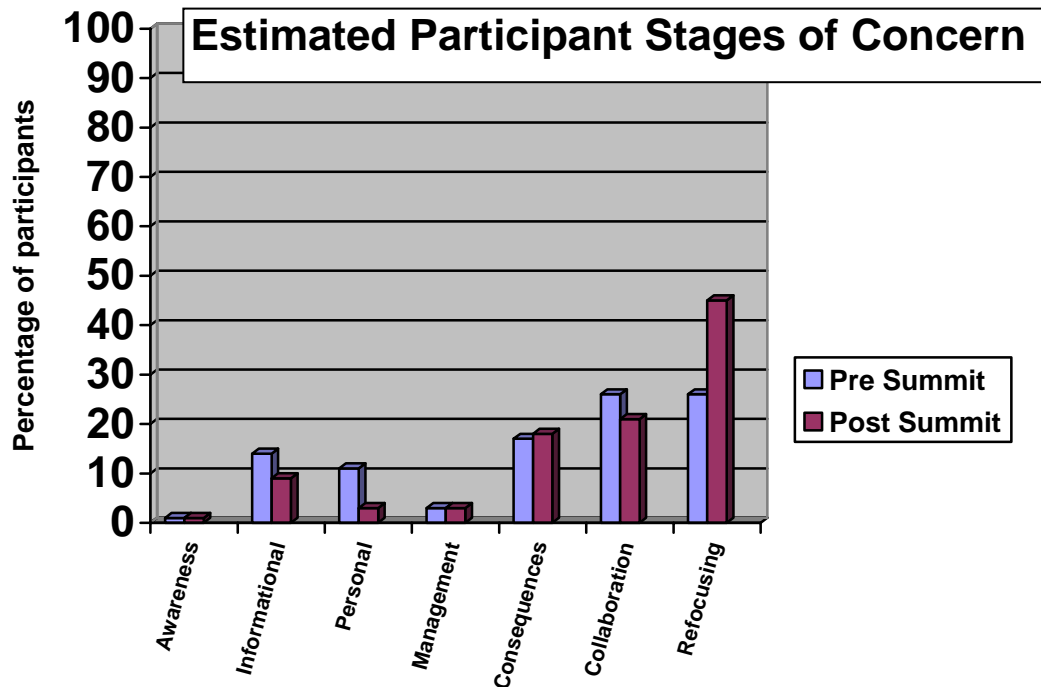
Did the Summit have an impact on the participant's knowledge and beliefs about STEM education?

Evidence of learning is available through an analysis of the participant's Stages of Concern prior to attending the Alabama Governor's Summit and their Stages of Concern after completing the Alabama Governor's Summit.

In the Pre- and Post- survey instrument, participants were asked to choose a statement that most closely describes their position in regard to STEM education. These statements are the evaluators attempt to determine the quasi developmental path that unfolds during the change process as described by Gene Hall and Shirley Hord in *Implementing Change: Patterns, Principles and Potholes* (2001). Through Hall and Hord's research of the Concerns Based Adoption Model (CBAM), seven stages of concern have been identified and are indicators for how individuals are moving through the change process. Following are the stages of concern as identified by Hall and Hord and the survey choices corresponding to the stages provided by the evaluator.

- Awareness – I have heard of STEM education but do not know anything about it.
- Informational - I have a general understanding of the goals of STEM education.
- Personal - I have an understanding of the goals of STEM education but I don't know how I can help.
- Management - I want to help with STEM education but time and/or money is an issue.
- Consequences- I believe that I will be able to help with STEM education in my local school district.
- Collaboration - I believe that I can facilitate collaboration between my local school district and others interested in STEM education.
- Refocusing - I believe that I have ideas that can improve the effectiveness of the SCCMS plan for STEM education.

The chart below shows the differences in responses from the pre- to post-survey.



A shift in concerns is clearly visible. A smaller percentage of participants had self (informational and personal) and task (management) concerns after the summit. Concerns about the impact of STEM education reform on students within the participant’s immediate sphere of influence (Consequence Concerns) increased by only 1%, while participant’s feelings about their ability to effectively collaborate with others to make a difference decreased by 4%. Refocusing concerns showed the greatest change from pre to post summit survey. Refocusing concerns moved from 26% to 45%. The changes observed in this data, indicate that the summit participants changed the way they were feeling about STEM education as a result of the summit activities.

The high percentage of consequence, collaboration and refocusing that was present in the pre and post summit surveys is not normal for people who are at the beginning stages of an innovation. This could indicate that participants were already knowledgeable about STEM issues before the summit. The worrisome statistic in this data set is the tailing up of the refocusing concerns in the post summit survey. According to Hall and Hord this could indicate that a large percentage of participants have strongly held beliefs about what ought to be done differently with STEM education. It is possible that many have initiatives of their own that they believe will “fix” the STEM education problem in Alabama. It is not possible to tell from this data whether the solutions that these participants have are consistent with the knowledge and beliefs of AMSTEC.

When participants expressed their views in of the state of STEM education in Alabama, three major categories were evident. The largest percentage of respondents (51%) indicated their belief that STEM education in Alabama is improving. Responses included words like: heading in the right direction, a good start, emerging, much improved. Twenty-one percent of the responses indicated the participant's apprehension about Alabama's STEM education. This apprehension was evident from their choice of words like: on the back burner, lacking, not a priority and in a crisis. The last significant category was the lack of equity in the state. Ten percent of participants shared a belief that some regions in Alabama were receiving services to which others did not have access. This seemed unfair to them.

When asked how their opinion had changed as a result of the Summit, 31% indicated they were enlightened in some way as a result of their participation. Some mentioned learning about programs of which they were not previously aware, while other were happy to learn of industry's interest in STEM education in Alabama. A few stated that they were unaware that Alabama had already made positive strides in STEM education. The quote below is representative of participants who felt the content of the summit was informative.

My opinion is now shaped by the information shared by the experts speaking at the Summit. I learned so much! It exceeded my expectations. I now know that working together we can make systemic changes that will improve and enhance STEM education in Alabama. Prior to my involvement in this event, my awareness of STEM was minimal and my opinions of the school system was based on information that may not have been supported by research or accurate.

Other participant's opinions of the value of the summit included 26% who responded that as a result of the Summit and their interactions with other participants, they felt more hopeful about the possibility for making positive steps in STEM education in Alabama. The feeling of hope was followed by 14% of participants who felt that the Summit had generated a momentum for change. Some of these comments included the need for leadership and a plan of action to keep the thrust for STEM moving forward.

Twenty-four percent of the respondents said their opinion about the current state of STEM education in Alabama had not changed as a result of the Summit. Many respondents qualified these statements by indicating they were more hopeful or felt it was useful for building momentum. The following quote is representative of individuals in this group.

The Summit did not really alter my opinion. There were many good ideas presented, however there was no clear plan that was outlined by the governor.

What are some ways STEM education in Alabama can be improved?

Sixty-seven participants responded to this question in the post summit survey. This was an open ended response item which elicited varied answers. The complete responses are available in Appendix A of this report. The evaluator recommends that if an oversight council is created for STEM education in Alabama, this data be reviewed.

Some patterns to the responses were noticed. Forty-six percent of the responses were related to curriculum improvement. The most popular curriculum related response (10 responses) was to improve the Alabama State standards, some responses specifically stated that the Course of Study should be changed to be more coherent and age appropriate. The second most often given response (9 responses) was the importance of expanding AMSTI. Other curriculum related answers included the need for

research based curriculum elementary through high school, coordination with the Alabama Reading Initiative and distributing program equitably.

Another cluster of answers involved the recruitment and development of support outside of the education system. The recruitment would include educating the public (11 responses). Marketing campaigns (3 responses) and better communications (4 responses) were mentioned as means for acquiring the support of all stakeholders. Developing industry, government and other stakeholder partners to be champions for STEM education was an important step mentioned by 13 participants. The overall percentage of participants interested in developing stakeholder support was 46%.

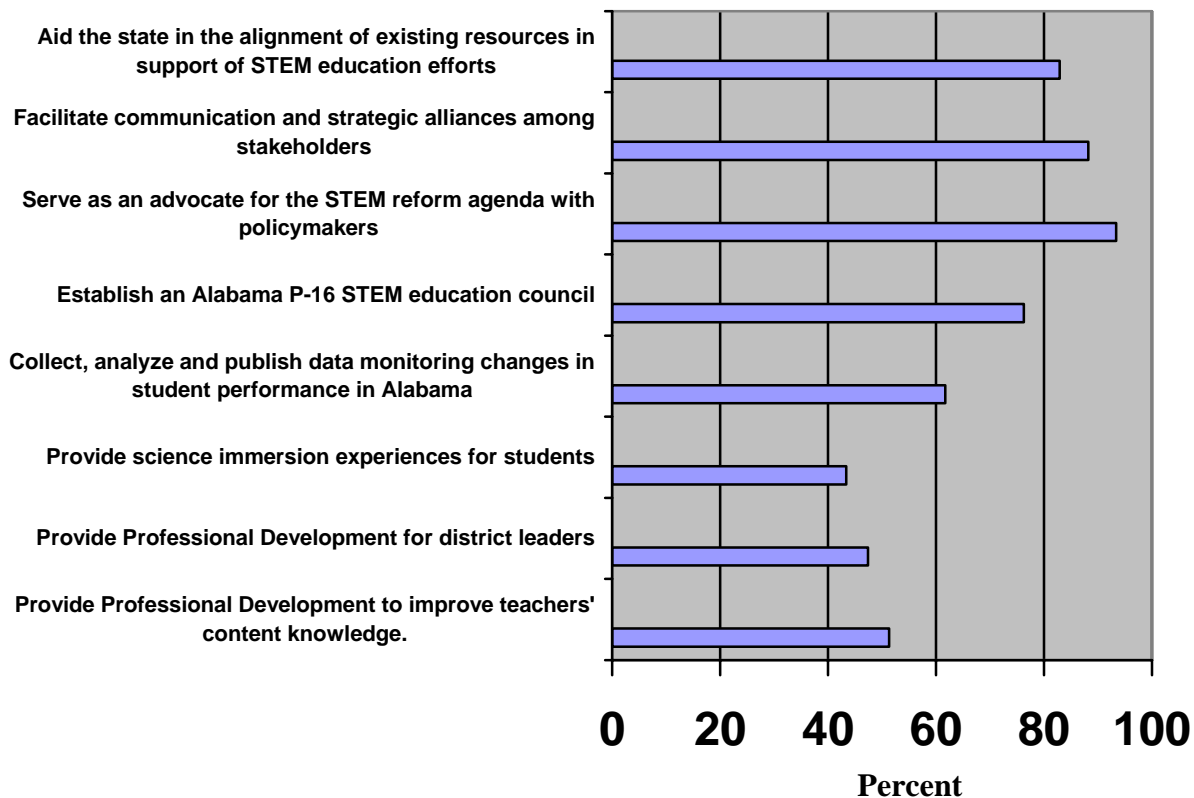
Many responses (51%) related to teachers and students. Twelve individuals think the teacher preparation programs in Alabama should be improved and ten believe that more professional development should be provided for teachers and principals. Twelve participants believe a reward or incentive system should be created to recruit and retain teachers of math and science and to interest students in math and science teaching or other related careers.

Participants who were interviewed mirrored the concerns noted from survey responses. There was a desire to see teachers recruited and educated in pre-service programs with a system for supporting and retaining them after they are assigned to a classroom. The curriculum should align with good instruction and significant, appropriate content. And there is a need for marketing, coordinating programs and services, and lobbying for STEM at the state level.

What should AMSTEC's role be in improving STEM education?

Participants were asked on the post summit survey to help define AMSTEC's role in STEM education in Alabama. They were asked to select as many as were appropriate from a list of possible roles. They were also given space to write other roles they saw for AMSTEC. The chart below shows the responses that participants selected. The three top choices indicate that participants would like AMSTEC to take on the roles of promoting STEM education with policymakers, facilitating communication among stakeholders and assisting in the alignment of existing resources.

Participant's View of AMSTEC'S Role



Other roles that were mentioned included: advertising and marketing STEM to the public (including students), making opportunities for STEM equitable for all parts of the state, providing funding, educating key leaders in government, facilitating the creation of state standards, and leveraging other organizations/institutions to provide assistance for the STEM reform movement. One participant mentioned the need for AMSTEC to coordinate a coalition of universities to provide professional development and programs for the state.

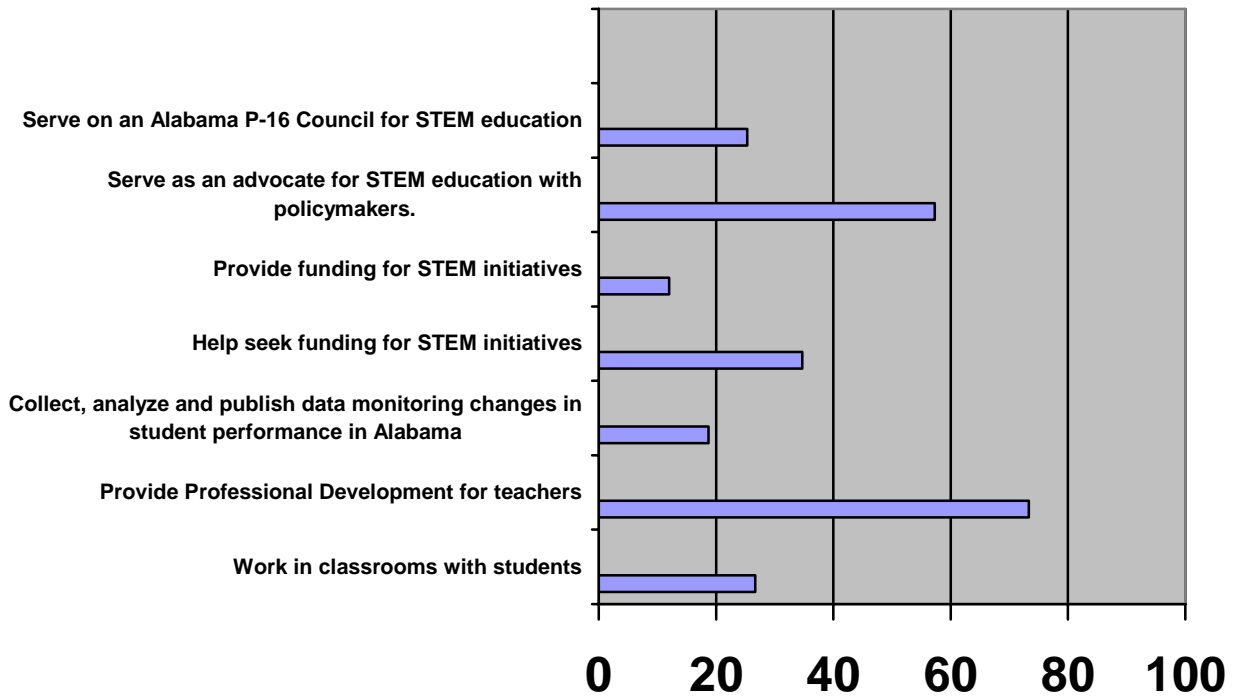
The participants who were interviewed shared many of the same ideas. As with the survey respondents, the majority of the interviewees felt that AMSTEC should serve as the coordinator/ broker/ planner/ liaison for STEM education in Alabama. There was a strong feeling about the need to align the programs and people in Alabama to make have a bigger impact on science and math learning and teaching. There was a strong feeling among those interviewed that AMSTEC should continue to host events similar to the Governor's Summit to maintain and increase the momentum for STEM reform. Other suggestions for continuing the interest that was generated in Birmingham were to hold video conferences, regular emails and/or produce a newsletter.

What do participants perceive as their role in the improvement of STEM education?

Participants were asked to select from a series of possible roles for themselves. The following chart shows the distribution of the participant choices. Participants were asked to select as many choices as applied to them.

Some participants were willing to leave their name. A table on Attachment B shows a list of the individuals who were willing to assume each role.

Percentage of Participants Willing to Take Specific Roles



Sixty-five participants responded to the question: What will you do in the next year to promote STEM education? The answers were varied. Although the answers were varied, 54% of the responses included the word “continue”, suggesting that participants felt they were already doing good work. Examples of this answer follows:

I will continue to provide professional development for teachers in our district, strengthening their content knowledge and emphasizing the methods of AMSTI. I will continue to advocate that ample time be allocated to teach mathematics and science and that technology be appropriately incorporated within the lessons.

Continue in attempts to bring AMSTI to our region of the state and in lobbying for support for recruiting and retaining highly qualified math and science teachers for our state.

Roles that participants will take on in the next year include: provide professional development, be advocates, work with AMSTEC, look for funding, plan for improvement at various levels, offer programs of interest to students, align resources and become better informed.

Participants who were interviewed echoed the sentiments of the survey respondents that they were already playing a role in the improvement of science and math education in Alabama. They all anticipated continuing their efforts. Fifty percent of those interviewed felt they would be willing to take on a bigger role if there was an organized effort to make a difference in the state.

Was strategic collaboration initiated among participants?

On the post summit survey participants were asked: Were you satisfied with your opportunities to network with colleagues from across the State? The overwhelming majority (87%) said yes, they were satisfied.

Satisfaction was expressed about the opportunities for a statewide discussion with multiple stakeholders and for networking with others who share the same passion and in some cases the same job. Many reported making new and important contacts while others mentioned renewing acquaintances with colleagues they don't often see. Several people mentioned the seating arrangements facilitated networking with various stakeholders from diverse regions of the state.

While the seating arrangement was applauded by many, it was also the cause for other's unhappiness. The most often given reasons for being dissatisfied with the opportunities to network were: not enough time and displeasure with being in the same group for both days.

We could have done with more time to process all the information we were fed. Great speakers...but not enough time to digest their messages...and I've heard most of them before. Reflective dialog helps process new learning..

Although the speakers were tremendous, there was not enough time to network. The seating arrangement was fine to begin with, but there should have been opportunity to make changes. Our table experienced one person who was not open to discussion. She represented high ed. According to her, the institution was perfect, not needing to change to accomodate K-12, or anyone else.

Other interesting comments were:

I wish there had been an introduction of the entire attendees and more time to talk directly to speakers.

AMSTEC was held during the week that high schools across Alabama were giving the graduation test. This prohibited classroom teachers from attending. Classroom teachers form the largest talent pool for ideas to improve STEM education. They were effectively excluded from this meeting.

Participants felt that the collective wisdom of the group at the Summit would serve to promote STEM education in Alabama and gave a sense of "we're in this together". One individual expressed this as "strength in numbers" and another described the value of having a "unified voice". Networking provided a forum for understanding the issues at multiple levels of education in the state. Connections were made that will make communication in the future easier.

Fifty percent of those interviewed indicated that collaboration may have been initiated but if nothing happens to continue the collaboration it will subside. Continued regular communication with the participants was mentioned as critical by four of those who were interviewed. Approximately one-third of

the participants who were interviewed were less positive about the Summit's initiation of collaboration to support STEM education. They were "hopeful" that collaboration had been initiated.

Conclusion and Recommendations:

When asked on the post summit survey if they would be interested in attending other AMSTEC sponsored events, 100% of the attendees answered – yes. The majority of attendees described themselves as already being members of AMSTEC or willing to become a member of AMSTEC. See Attachment C for a list of participants who are members already or who are willing to become members. Only 4 people indicated they would not be interested in becoming a member of AMSTEC.

There appear to be several critical activities that need to be considered as AMSTEC moves forward to promote STEM education in Alabama.

- The participants were overwhelming positive about the possibilities for making a difference. Many are willing to take on new roles if needed. This group needs to be sustained through regular communication. Some communication should be sent within two months of the event. This will serve notice to the participants that this was not just another meeting and their work has not fallen between the cracks.
- Additional "meetings" would be welcomed by the participants. Collaboration could be fostered by providing a participant list to all in attendance.
- There is not a common vision for science reform. Some process needs to be implemented to begin development of a common vision. Currently, individuals seem more interested in promoting what they are doing rather than listening for how a plan can be strategically implemented to change Alabama STEM education. Even though they all heard the same speakers they believe it is the other person who needs to change. This is inferred from the responses received and was particularly evident in the interviews.
- A strategic plan needs to be developed for Alabama. Many participants were looking to AMSTEC to manage this planning process and include all stakeholder issues. The plan should be public knowledge and buy in should be solicited based on the common vision that has been developed.

Following are participant responses outlining ways to improve STEM education in Alabama

1.	1) Broadly expand AMSTI at at least twice the current expenditure rate. 2) Coordinate with ARI (not serve two masters) 3) Do away with bachelor of ed degree and require content majors for bachelors followed by masters in education per several Carnegie Inst. reports. 4) Provide significant prof. develop. for current in-service teachers. 5) Re-write science COS to MEET national standards and do away with current middle school arrangement. 6) AMSTI high school program needs major revision towards use of exemplary, NSF-research based materials using hands-on inquiry-based materials; most high school materials or bad.
2.	More resources Educate parents on the importance of science
3.	Hire expensive consultants from SC... or Align existing resources
4.	1) Make legislators aware of the Governor's Summit and form a council to oversee the implementation of recommendations. 2) Encourage teacher preparations programs to change. 3) Assessment and evaluation will be monumental in promoting the cause.
5.	Coordinate the requirements students need to build a good base of math and science knowledge in the lower grades which will prepare them for the higher math and science classes they need in high school and college. Tutorial help for students who were not encouraged to take the prep classes but later show a desire to work toward degrees that require math and science backgrounds.
6.	Encourage industry to be more outspoken in their need for a STEM educated workforce. Continue to stress hands-on, inquiry-based educational methods, and make sure that newly trained teachers have exposure to these methods. Encourage (provide extra incentives) more pre-service teachers to go into STEM fields. Simplify educational standards.
7.	Reward the efforts of teachers and students. Scholarships, stipends, etc
8.	Business and industry needs to champion the change. Educators can't effectively make the case with the public or event with other educators.
9.	More extensive communications
10.	Provide additional funding for math/science related projects. Revise the current NCLB/Highly Qualified definition for middle grades teachers to a more reasonable number of courses. Also, permit a more flexible certification process to allow professionals into the teaching force in math/science. Provide bonuses, scholarships, etc. for future teachers of math/science in order to attract more candidates.
11.	AMSTI is a great program but must be brought down to the local level to be as effective as it needs to be. The distribution of the kits seems a monumental task...one which will only increase as more schools as added to the program. The reality of everyday life at the school level is that teachers need more immediate access to the supplies.
12.	Follow the advice of the speakers -- fix the courses of study a la Dr. Schmidt (even AMSTI doesn't address this, according to some users); consider early brain development as well as school performance; align resources rather than trying to focus on one particular program or approach to the exclusion of others.
13.	MAKE SURE RURAL SYSTEMS RECEIVE ADEQUATE SUPPORT IN ALL AREAS.ALSO, LOBBY FOR FINANCIAL SUPPORT FOR INCENTIVE PAY TO BRING MORE QUALIFIED TEACHERS (MATH AND SCIENCE) TO RURAL SCHOOLS.COLLEGES OF MATH AND SCIENCE NEED TO SEND (AS PART OF GRAD REQUIREMENTS) TO THESE AREAS FOR PRESERVICE,ETC. SCHOLSRSHIPS NEED TO BE OFFERED FOR STUDENTS TO SERVE IN RURAL COUNTIES FOR A CERTAIN PERIOD OF TIME.
14.	Pur as much emphasis on mathematics and science as on reading. Require schools in school improvement become AMSTI schools.
15.	I still consider the "root cause" to be an outdated State constitution that perpetuates a regressive tax system and favors special interest groups - particularly those with large land interests such as ALFA, AL Forestry Assn., U.S. Steel, Alabama Power, and certain banks. The home rule and earmarking provisions also severely inhibit educational reform. The "rule" of AEA must be broken. It has been said by a veteran

observer of Alabama politics that Jerry Newby, the head of ALFA, decides how much money Alabama can raise through taxes and that Paul Hubbard, the head of AEA, decides how that money is spent. This stranglehold on our citizens must be broken if we are to truly realize our potential. "Education" has been and continues to be the "motherhood and apple pie" mantra of elected officials and candidates - but, that continues to be translated into battles over teacher salaries and benefits while educational curricula and the general fund suffer and our physical and human infrastructure continue to deteriorate. In a more practical and more readily achievable sense, we need to effect more and broader partnerships with business and industry to promote STEM-related initiatives. This could - and should - involve much more than financial assistance. I'm talking involvement not "lip-service" and nominal contributions.

- 16.** most are listed above.
- 17.** Help teachers realize that science is a process not just content. Improve the way science is presented to students so that it is not just memorization. Teachers need more PD.
- 18.** Give all students the same opportunities. Professional development for teachers along with proper compensation. spread the successes to all areas of the state.
- 19.** Any of the items listed in #5 would be helpful.
- 20.** AMSTI
- 21.** Work with the legislature to provide more funding for students entering math and science education fields. Work with legislature to provide more teachers. Math and science classrooms in high schools and middle schools are often packed with students (far above the "suggested guidelines). We have a number of math classes with 37+ students, which includes 15+ special ed students, in one class. With these numbers and time constraints, it is very difficult to teach hands-on math and science.
- 22.** Create more hands-on science & engineering programs at all K-12 levels. "Feeder" programs that get students excited about STEM are needed at the elementary, middle, and high school levels. Although Engineering wasn't specifically addressed at the Summit, is it a critical educational component in the future success of AMSTEC. We have to get our congressional delegates on-board as advocates - champions of STEM initiatives and programs.
- 23.** AMSTI SISTER
- 24.** An Alabama P-16 STEM education council should be formed immediately. Align the Course of Study and the science curriculum. (AMSTI and other projects have tried very hard, but it is difficult, because the Course of Study-Science has many fragmented sections.) After it is aligned, don't change it merely on a whim. If the state is going to use science modules (kits) as the curriculum, those kits can't be moved around every few years unless there is a compelling reason to do so. Demand science education for students just as vigorously as we demand reading education. Concentrate on the Nature of Science as well as the concepts. Professional development for administrators.
- 25.** If there was one theme that I heard over and over at the Conference -- it was that you need mandatory math courses for all high school students -- algebra, geometry, trigonometry and calculus -- mandatory. I did not hear mandatory requirements for the sciences articulated as clearly but I would think that biology and chemistry should also be required. I would also recommend that you catalogue the various hands on learning activities for students and foster and promote these activities. Our kids have limited opportunities to make things work, to integrate textbooks with real world applications. We need to create an environment and a portfolio of activities that improve the technical and analytical skills of our students.
- 26.** 1. Better communication between K-12, higher ed, and industry is critical. It is virtually impossible to make positive systemic changes in our education system without the main players communicating regularly. 2. The concept of teacher incentives (mentioned at the summit) should be investigated further, since teacher content training is key to making any changes in what is being taught to the children. 3. I would like to see the creation of a Science and Math Governor's School summer program for exceptional high school students. This type of program, which occurs in various states, gives a competitive edge to our best and brightest students and might help to encourage them to pursue STEM careers, which ultimately contributes to the future economic growth potential of the state.
- 27.** delope the political will in the state to make education a priority
- 28.** Keep communication open

29.	Re-evaluate current curriculum offerings and lean toward a more hands-on approach to teaching science. Better prepare future teachers in effective ways to teach science.
30.	The following are some suggestions for improvement of STEM education in Alabama: 1. Continue to provide training for teachers with both the AMSTI kits and content development 2. Include more connections with informal learning centers and organizations 3. Consider departmentalizing in the younger grades (i.e. 3rd grade and up)
31.	Assure that curriculum is research-based, with ongoing formative assessment - focused, coherent, and rigorous. Assure that teachers are properly prepared to deliver instructional material - may require modifications in delivery for pre-service teachers. Must include ongoing professional development.
32.	Expand funding. Coordinate current programs. Develop a pilot programs for a state-wide curriculum to match the state standards.
33.	Understand the research and implement those tools and materials that will meet our needs.
34.	Take the distance learning concept and really explore it as a catalyst for equalizing opportunity. For example, at UAB we have the technology to provide content to many local high schools. I would love to create a class that could be broadcast to several local schools in the area (where I also would visit occasionally). The only limit to the above is resources to provide the high schools with the distance learning hardware (about \$8-\$12k per school)
35.	Provide scholarships for undergraduate students preparing to be science and math teachers. Make graduate programs for middle and high school science and math teachers more relevant and accessible.
36.	use as much hands-on with teachers and students to make it relevant - not just theory; empahzise math and science in teacher preparation
37.	All the above listed in item #5.
38.	Take a look at the courses of study and see in what areas they can be improved or enhanced.
39.	1. Increase the professional development opportunities for teachers. 2. Provide an opportunity for student representatives to share input regarding evaluation of past math and science experiences and suggestions about what would be most relevant to them in their planning for future endeavors. 3. Opportunities for parents to be immersed in science, math, and technology experiences through workshops offered via AMSTI and other organizations at minimal fee. These workshops can be provided monthly.
40.	Demand nes teachers be qualified from the first day they enter the classroom.
41.	Market the successful STEM initiatives being implemented in Alabama to 1. attract potential math and science teachers, and 2. make business leaders aware of the change that coming.
42.	Begin with programs in the middle and high schools such as AMSTI. We have one school that has been selected but we had one other school that was not selected that wanted to be included.
43.	* Fund hands-on science/math. * Fund teachers with a good science/math background and an understanding of the importance of science/math to the future of our children. * Have a means of accountability. * Work toward increasing the involvement of the business community and institutes of higher learning in our quest for educational improvements in K-12 science/math/technology. * Work toward informing the public of the importance of improving STEM education.
44.	Have AMSTEC serve as a clearinghouse of programs around the state. Bring those representatives together to explore ways to help and strengthen each other. Convince the State Department that it is ok for other programs to exist along side AMSTI. Provide different opportunities for all stakeholders to particpate, according to their available time and money. Make the case for the need of reform to parents and communities at large. Many do not realize we are in crisis. Perhaps a Summit targeting parents and local government officials?? Marketing blitz?? Get several ad agencies / marketing firms (from different regions) to collaborate on a marketing program (pro bono, of course).
45.	1) Get STEM standards in the Alabama Course of Study 2) Identify successful STEM efforts in other states that have become integrated into K-12 education

<u>46.</u>	Work to align all stakeholders: business, education, government. Translate working plans and recommendations into action.
<u>47.</u>	1. Strengthen partnerships with four year colleges and junior colleges and K-12. We need to motivate students to pursue careers in STEM. Not infrequently, one individual with a passion for the sciences or math can inspire a young student. 2. Educate local chambers of commerce and "captains of industry" of the challenge before us and have them aggressively seek out opportunities to partner with their local school systems. 3. Statewide summer camps for middle and high schoolers to introduce them to STEM topics with highly motivated and motivating teachers.
<u>48.</u>	Incentive pay to lure better teachers.
<u>49.</u>	More money for teachers and students at all levels, public relations efforts to inform citizens of STEM efforts to build support, lobbying lawmakers for support of STEM efforts
<u>50.</u>	Outcomes-based incentives to teachers that challenge them to improve the performance of their students. More rigorous and consistent standards for S&T education. Moving state government to embrace recommendation 1 of the NAS report.
<u>51.</u>	Expanding ASMTI to all districts.
<u>52.</u>	collaboration with current efforts improve communication among key stakeholders
<u>53.</u>	Restructure college education curriculum - elementary ed majors often do not have a clue about teaching math and science. Change certification policy so that those who want to come into education from business/industry do not have insurmountable battles to overcome. Also, alternate and emergency certification should not be so difficult.
<u>54.</u>	We need to improve the quality of content area courses being taught to elementary teacher candidates in our colleges and universities. Many elementary teachers are not comfortable teaching math and/or science because they are not prepared very well to do so in their teacher training. Elementary students need to have good backgrounds in math and science if we expect them to perform well later on.
<u>55.</u>	See comments above.
<u>56.</u>	For teachers: Work collaboratively with those individuals and groups who provide professional development for teachers and administrators (eg. Regional Inservice Centers, SDE, etc.). For K-12 students: Include some deans from colleges of engineering and colleges of arts and sciences in the process so that they can provide information regarding what students need to know when they are in the initial stages of planning their 6-8 courses.
<u>57.</u>	By forming some form of well advertised repository for educators to seek counsel from and get the needed support and materials in their classrooms to hold and stimulate interest among students in the fields of math and science. The same old, same old just isn't getting it done!!
<u>58.</u>	--Attract and retain quality math and science teachers. --Provide incentives like free college tuition for advanced degrees, and grants for attendance of national conventions to help teachers continually improve their craft. --To attract teachers, give tax breaks like exemption from state taxes as long as they teach in field
<u>59.</u>	We could improve our efforts at collaboration to utilize all the resources we have in the state to impact K-16 STEM education. We need to capitalize on David Bronner's offer to help improve the general perception toward STEM education by the average AL taxpayer and voter. We need to be sure students in AL's many disadvantaged schools and districts are receiving the benefits of AL's STEM reform efforts. We need to be sure what's being delivered in our STEM reform efforts is being implemented in the classroom "with integrity", i.e., routinely and effectively, so the students are indeed receiving the benefit, and that the reformed practices are "sticking" for the long term.
<u>60.</u>	-develop relationships between K-12 educators and STEM faculty, as well as connections among STEM and math/science educators on college campuses -develop programs for K-12 students on college campuses to spark and maintain their interest in math and science
<u>61.</u>	Ways to improve STEM education in Alabama area: Make citizens aware of the crisis we are facing if we do not change our attitude about the value of science and math in the schools. Fund AMSTI for every student

in the state Choose experts to develop our Alabama Course of Study for all grade levels. Develop a plan to coordinate statewide programs

Attachment A

62. Communicate the need for improvement to every school system and higher education institution, encourage and assist the SDE in developing a state curriculum that does not "insignificant" courses be taken in K-12 schools, recognize the academic limitations of students and develop their strengths...whether this be in art, music, sewing, carpentry, auto mechanics, etc. Let us help students become productive citizens in their ability level. Counselors should be more involved in programs that help "struggling" students achieve and less in trying to direct their choice of classes, professional, vocation, etc. Efforts should be to directed at programs that help students achieve in school rather than what and where to go after school.

63. Provide funding, support, and time for professional development for all science and math teachers. A coalition of AL universities with AMSTEC guidance could develop specific PD strategies and programs to serve each area of the state.

64. I am working with AMSTI, which I believe is a leading effort in Alabama at this time.

65. IMAGE and AWARENESS - push, push, push

66. The best way to improve STEM education is to improve the content knowledge of the teachers. This will involve improving pre-service education, focussing professional development on content, improving salaries to recruit and retain better teachers, and changing the perception of society as to the importance of STEM education.

67. Continue collaboration between stakeholder groups: identifying needs and challenges, developing goals and action steps, and identifying the appropriate leadership to "blast this rocket forward!"

