**Evaluation of Reducing Achievement Gaps in Science, Technology, Engineering and Mathematics (STEM): Promising International Research, Policies and Practice**

**M. David Miller, University of Florida**

A workshop was conducted on May 22-23, 2017 to “develop strategies for building an international community of stakeholders committed to engaging in collaborative efforts that can inform policies, research, and practices to reduce science and mathematics achievement disparities across the global landscape” (<http://achievestem.hsoc.gatech.edu/>). The workshop brought together participants from the Americas, Africa, Europe and Oceania to explore the challenges and opportunities to reduce achievement gaps in STEM. The workshop was organized into three working groups with 16-17 participants, including two co-conveners to lead each group and a student note-taker, to produce recommendations for promising strategies and methods to address the global issues of achievement gaps in STEM education. Each group was diverse in their backgrounds and roles. The groups included science and mathematics teachers and administrators at the secondary and post-secondary level, undergraduate, graduate and post doc students, faculty, entrepreneurs, representatives from professional organizations, private foundation staff and others.

The workshop included preparation by participants before the workshop, active participation in the workshop and the development of a white paper by each group post workshop. This evaluation of the workshop includes an assessment of the pre-workshop activities, an assessment of the workshop, and interviews of participants post-workshop.

The pre-workshop activities were focused on establishing communication within each group about their expectations and relevant background and programs that the participants brought to the workshop. The evaluation was formative at this point and assisted in organizing this stage through an online open-ended survey about expectations and experiences. The workshop evaluation consisted of the evaluator’s observation of the workshop and a brief survey at the conclusion of the workshop. The post-workshop evaluation was based on interviews of the participants about their views of the workshop and the ongoing efforts.

**Pre-Workshop Survey (Formative Evaluation)**

To assist in the planning of the workshop, a brief 4-item online survey was sent to each of the participants in the three groups to provide planning data for the group co-conveners (2 co-conveners were appointed for each group). The four questions asked about:

* The expectations of participants for the workshop
* The identification of any sites and/or practices of excellence or promising programs to enhance equity in STEM education.
* Strategies for increasing and enhancing equity in STEM education, including strategies that address finances, preparation, implementation, and other issues.
* Identification of any research gaps.

With two reminders and encouragement from the project Principal Investigator and the Co-Conveners, the number of participants varied from 12 in group 1 to 15 in groups 2 and 3. As can be seen in the table below, response rates to the organizing survey were very high in all groups ranging from .71-.94.

|  |  |  |  |
| --- | --- | --- | --- |
| Group | Number in Group | Respondents | Response Rate |
| 1 | 17 | 12 | .71 |
| 2 | 17 | 15 | .88 |
| 3 | 16 | 15 | .94 |
| Total | 50 | 42 | .84 |

The responses to the first question about expectations were consistent with the initial plans for the workshop (note that participants may have been reading the website which described the purpose of the workshop). Many of the responses focused on sharing knowledge and experiences on reducing the achievement gaps in STEM education. Several emphasized international perspectives. The participants also emphasized the importance of pursuing solutions and strategies to the current issues that are adversely affecting underrepresented groups in STEM disciplines. The diversity of the participants was also evident in the diversity of the context in which expectations were discussed: K-12 schools, undergraduate, and graduate education.

The remaining three questions generated a wide range of very specific answers that would be useful for planning and guiding conversations in the workshop. Question 2 generated a list of programs that were making positive strides already and that might be extended in the workshop. The diversity of the programs included legislative programs and policies as well as institutional specific programs. Within the wide range of programs being represented by the participants, question 3 generated a similarly wide range of strategies. The strategies included educational programs within the schools, hiring and retention of teachers, parent involvement, the importance of financial resources, and the development of policies. The research gaps (Question 4) were as broad as the strategies in question 3 including financial, social and psychological barriers to African Americans in engineering. As an example of the breadth of the comments, one comment called for “research on the social, behavioral, economic, environmental and institutional mechanisms and factors which determine, influence, and transform minority students’ interest, motivation, learning and success in STEM”.

The results of the survey were shared with the all of the participants within each group. In later interviews, participants talked about the usefulness of seeing this information from their group prior to the workshop. However, a few interviewees also asked why the results for all three groups were not shared with everyone instead of only sending the information generated within a group to that group only. The full responses are contained in the Appendix at the end of this report.

**Workshop Survey (Process Evaluation)**

At the end of the workshop, a brief survey was administered to all of the participants. Thirty two participants completed the survey (32/50 for a response rate of 64.0%). The survey included 12 closed-ended responses with five opportunities to elaborate and provide open-ended responses about the workshop. The results below are for all of the participants across the three groups.

First, in a series of five questions, the participants were asked to rate the different components of the workshop. The majority, ranging from 51.6% for the breakout groups to 64.5% for the country presentations, felt that all of the components were excellent except for the reporting back from the breakout groups (43.3%). More than 80% felt that everything was excellent or good. The initial large group activities were rated higher than the breakout group activities but all components had high ratings. The workshop components graph, showing the number of participants with each rating of each component, shows the high ratings for each of the components with a slight rise in the fair ratings for the breakout group activities.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Excellent | Good | Fair | Poor |
| Opening Plenary | 61.3% | 38.7% |  |  |
| Panel 1: Country Presentations | 64.5% | 29.0% | 6.5% |  |
| Panel 2: Multicultural Presentations | 56.7% | 36.7% | 6.7% |  |
| Breakout Group Meetings | 51.6% | 32.3% | 16.1% |  |
| Breakout Group Report Backs | 43.3% | 43.7% | 6.7% | 3.3% |

Cells are left blank when there was no response (0%)

The open-ended comments for the ratings of the workshop components were used by six of the participants. Five of the participants commented that the breakout groups needed greater focus with two suggesting a prepared protocol with specific questions. This issue became a focus of the interviews and is discussed below in the interview section.

The sixth question asked if the specified goals of the workshop were the focus of the group discussions. More than two thirds (72.2%) felt that the group discussions were well focused on the specified goals of the workshop. However, 27.8% felt that the groups were not focused enough on the goals. The open-ended comments focused on two issues about the group discussions. First, 15 participants had some comment about the “struggle to focus the group” and the diversity of people which sometimes created “some incoherency”. Most of these comments felt that it was focused on the right issues but that it “meandered a bit”. As one participant put it, we were “trying to focus on too many things”. The second concern that was identified by two of the participants that the small number of international scholars made it so that the international component was not clearly part of the discussion. Again, this is elaborated on in the interviews and the results below.

Questions 7 through 10 asked how satisfied the participants with different parts of the group discussions. The participants were asked to rate how satisfied they were with different aspects of the group discussions. The data for these ratings are presented below in the table and the graph. As can be seen more than three quarters of the participants were very satisfied or satisfied with all aspects of the discussion. Participants were particularly satisfied with their interactions with each other (78.1% very satisfied). The item with the lowest rating showed a few (N=3) were dissatisfied with the final results of the discussion.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Very Satisfied | Satisfied | Neutral | Dissatisfied | Very Dissatisfied |
| Scope of Information | 28.1% | 50.0% | 21.9% |  |  |
| Usefulness of Information | 37.5% | 46.9% | 15.6% |  |  |
| Interactions of participants | 78.1% | 18.8% | 3.1% |  |  |
| Results of the Discussion | 40.6% | 34.4% | 15.6% | 9.4% |  |

Cells with zero respondents were left blank.

Eight participants commented on the group discussions. Half were positive comments (“well organized”, “very good group”). The remaining comments were again about focus and the broad range of topics included in the discussion. This broad range made it difficult to focus on the goals of the workshop.

Question 11 asked about satisfaction with the opportunities to network. This question had a very positive response with 80.6% being very satisfied and 16.1% being satisfied. The six comments were also very positive suggesting that “networking and strategic connections were the best part of the event” and that there were “so many energetic and resourceful people”.

The last question was about the likelihood that the participants would continue to work on the project (the white papers) after the workshop. 83.9% were extremely likely to continue to participate and 16.1% were less sure but likely to continue to participate. Nobody reported not being likely to continue to work on the project. Comments were mainly about how this was an opportunity for them and that it was an important goal to pursue.

In summary, the workshop survey showed that the participants were very positive about the workshop. The highest ratings were the opportunities that it provided for scholars and experts in different areas to interact on important issues (e.g., strategies, policies and programs) on the achievement gap. While almost all of the ratings and comments were positive about the workshop, two issues emerged that could be used in future workshops. First, several felt that the diversity of the groups led to some lack of focus in the breakout groups. Several suggestions for this issue included making the goals of the groups clearer and having specific questions that could be used to guide discussions. One participant also suggested dividing into groups based on specific common concerns. However, a larger number of comments were positive about the benefits of having a very diverse group and what was gained by the diversity of perspectives. The second concern was that the number of international participants was particularly small when broken into the breakout groups. These small numbers led to a lack of emphasis on international perspectives in the breakout discussions.

**Post Workshop Participant Interviews**

After the workshop, select individuals were contacted and phone interviews were conducted. Twelve individuals were selected to be representative of the workshop participants. The selected individuals included 4 from each group. The interviewees were selected to represent different types of universities/colleges including HBCUs, national organizations, and businesses. The interviewees were also representative of the international participants. After two contacts for each of the selected individuals, all twelve individuals were interviewed. The interviews ranged from 15-30 minutes and were guided by the following questions:

1. What do you think will be the outcome of this workshop? That is what will be its impact of this on achievement gaps?
2. What do you think are the strengths of this meeting in terms of process? For example, was it run well? Was there broad participation in the feedback sessions?
3. How could the workshop have been more effective?
4. What is the impact of the meeting on you?
5. Did you perceive the climate as being comfortable for the participants? Did this lead to a high level of input and participation from all participants?
6. Were there any problems with the meeting? That is, if a similar meeting were conducted in the future, what would strengthen the meeting and the final outcomes?
7. What did you think was the balance between the international and national components of the workshop? Should there have been more or less emphasis on the international component or do you think it was about right?
8. Other Comments about anything that was not previously asked

The themes from the responses are discussed below for each question.

1. What do you think will be the outcome of this workshop? That is what will be the impact of this workshop on achievement gaps?

The participants in the workshop were very positive about the workshop and its potential to have positive effects. One participant described the workshop as a “profound conversation” about achievement gaps. Another participant thought the workshop helped to “establish a strong foundation to move forward with strategies and programs”. However, the participants recognized that the issues being faced were a monumental problem internationally and that a single meeting would certainly not be able to solve the problem. Instead it was described as an “excellent beginning’, ‘moving in a good direction” and a “good starting point”. As seen in the interviews, the problems and issues with achievement gaps were seen as very broad and several participants pointed to the international perspective being “eye opening” or that it was good to know that similar problems and strategies exist in other countries.

It was clear that the participants recognized the broad issues that needed to be examined from the primary to the secondary to the tertiary level of schooling. One of the primary strengths of the workshop that was a recurring theme in the interviews was the diversity of perspectives that were brought to the workshop. One interviewee characterized the group discussions as “outside of the box” which was a “valuable” starting point. The diversity of perspectives were also recognized as necessary to continued collaborations and cross-disciplinary work that needed to occur to address the achievement gap issues since the issues are complex and best understood and addressed with a diversity of input and knowledge.

While all of the 12 participants who were interviewed recognized the overall positive effects of the workshop, several issues that were recurring themes throughout the interviews were brought up. First, the workshop was clearly just a starting point and there was a great deal of work that needed to be done. Thus, several interviewees emphasized that the impact of the workshop was really dependent on the next steps and how the efforts were facilitated beyond the meeting. The challenge of how to address the achievement gaps would continue to be important to address and the true measure of impact should be the next steps that were taken even though this was an important initiative in the larger efforts. Second, the international component of the meeting was seen as useful and meaningful to understanding and addressing the issues of the achievement gaps. While it was informative to hear about and from other countries, some of the participants questioned whether there was enough of a focus on the international component of the workshop, particularly in the discussions in the breakout groups. This issue is further elaborated below. Third, the discussions were viewed as valuable but there was a recognition that more people and more stakeholders needed to become involved to begin to effectively address the issues. For example, one participant felt that most of the discussion was “academic” or “scholarly” but that more school based practitioners would have been a good addition, focusing particularly on primary and secondary education.

In summary, the participants felt that the workshop was an excellent start or part of addressing this important problem of what can be done about understanding and addressing achievement gaps in the US and internationally. The planned diversity of the participants and the expertise that was brought to bear on the problem were recognized as an important contributing factor in this effort. However, the participants recognized that most of the work on this issue was still ahead of them and that the workshop could only begin what should be a long term process of addressing the achievement gaps. One participant commented that they did not think there was an action plan when done and that should have been part of the workshop. The international component was also recognized as being important and informative. On the other hand, some questioned whether this should have been more strongly emphasized in the breakout groups (see question 7 below). Several participants also questioned whether the breakout groups were as focused as could have been on developing or recommending strategies and solutions (this issue was also discussed below).

1. What do you think are the strengths of this meeting in terms of process? For example, was it run well? Was there broad participation in the feedback sessions?

As with the workshop outcomes, the process was considered very positively. The participants felt that the format and each of the components of the workshop were very well done. This was consistent with the survey results above. Some reported that the pre-survey and the contact from the PI and the co-conveners prior to the workshop allowed for good preparation. On the other hand a few individuals (N=2) commented that more could have been done before the workshop so that the groups were framing the issues for discussion before they arrived. This would have also allowed more time for participants to learn more about the other participants in their group.

The plenary talks and the large group presentations were seen as excellent – informative and well presented. The large group sessions helped to frame the later discussions with the data presented and the examples from different countries. There were no concerns about the large group presentations except one suggestion that the presentations could have ended with specific questions to guide the discussions in the breakout groups.

Once the group discussions began, the co-conveners did an excellent job of including everyone in the discussion. The discussions were seen as lively and informed by a wealth of expertise from the group participants. While the overall assessment of the process was that everything was well done, several suggestions were made about how to improve the group discussions. Again, many felt that the discussions could have been more focused. Specific methods for accomplishing this included having specific questions that were to be discussed, and having three groups that varied in topic and allowing participants to select which group/topic to participate in. A few also suggested that a method of focusing more on the international context would have benefited including having more international participants or having the co-conveners emphasize the international context in the discussions.

The large group discussions and report backs from the breakout sessions were also viewed positively. The only concern voiced was one person wondered if there was enough time in the end for everyone to contribute to the discussion.

In summary, the process of the workshop was seen very positively. The most positive comments were about the large group presentations. The breakout groups were also seen positively but there were some questions about whether they could have been more focused and include more on the international context.

1. How could the workshop have been more effective?

All comments about making the workshop more effective were given within the context of improving what was considered a very effective workshop. Within this framework of positive comments about the workshop, there were several suggestions for making it more effective. The areas for improving the workshop were a) more focus in the breakout group discussions, b) more emphasis on international context in breakout group discussions, c) more information and involvement pre and post workshop, and d) more time.

A theme that was seen in most questions of the interviews was the request for more focus in the breakout groups. One participant suggested that each group could have been more focused by having specific questions to answer or even to ask them to return with “three big points”. Another participant suggested that each breakout group could have been assigned different topics and the groups would be created with the appropriate expertise to work on the topics. However, it is important to note that an equivalent number of interviewees felt that it was not as focused as possible but that it was due to the clear advantage of having a very broad and diverse range of expertise in the breakout groups. This was an issue that continually was discussed with some participants almost taking both positions simultaneously “it would have helped to have greater focus…on the other hand, I understand that the exploratory nature…” was facilitated by the breadth of the expertise in the breakout groups.

The issue of how much emphasis was placed on the international context was questioned again. A few felt that the workshop would have been more effective with a greater emphasis on international issues and strategies in the breakout sessions.

Several thought that the workshop would have been more effective by including more information and interaction on the front or back end. One participant felt that sharing web links between participants were useful as the discussion occurred but that this could have been done before the workshop so that everyone was more prepared. The same participant also felt that contact between the participants in a group prior to the workshop would have facilitated the later discussion. Several participants also asked about ongoing connections. Will we see the results of the white papers? Is there any effort to continue the relationships established in this workshop and to continue to build collaborations?

Finally several thought that increasing the amount of time devoted to this topic with this format would have been beneficial. A few suggested that another day could have allowed the breakout groups to build an action plan. Time was spent with divergent expertise but additional time would have allowed the breakout groups to converge on solutions and action plans. Others asked about whether there would be any follow-up from the workshop? Several of the participants were unsure about how work would continue on the papers beyond the days of the workshop.

1. What is the impact of the meeting on you?

Although most of the questions in the interview asked about the workshop and its overall effect on the development of strategies, policies and programs to address the achievement gaps internationally, this question asked how the workshop individually impacted the participants. The participants felt that the workshop had three broad effects on them. First, many reported that the workshop helped to energize or inspire them. Thus, people engaged in this work found it helpful to engage in discussions with a broad range of experts concerned and passionate about the same problems. Several participants felt that meeting with those who share a common concern about the issue was inspiring and energizing. Several had also spoken about how “honored” they were to be included in the workshop.

Second, the workshop provided a learning experience, particularly with regard to the international differences and examples. Several talked about how they now were thinking broader about these issues, especially with a broader understanding of the issues in an international context, in their jobs. As one participant said, participation in the workshop “brought an international perspective to my work””. One of the international participants similarly said that they often “look to the US and the UK” for strategies and answers but that this workshop went well beyond the usual contexts. The same participant felt that Australia was doing interesting things that she had not been aware of.

Some also felt that the workshop had “validated” the work that they were currently engaged in and that it was helpful to hear about what was happening in other countries.

1. Did you perceive the climate as being comfortable for the participants? Did this lead to a high level of input and participation from all participants?

The climate of the workshop was perceived as open and affirming. All interviewees were positive about the climate and spoke about the workshop bringing together people with a diversity of views on how to address a common issue within a climate of mutual trust. As one participant said, everyone was engaged; discussions were lively and focused, there was enthusiasm and passion; and everyone cared deeply about the issues. This was a topic that everyone felt was “close to the heart”. Participants used terminology to describe the climate such as inclusive, healthy, inviting and collegial. One participant described the workshop as “perfect…conducive to everyone feeling engaged”.

Participants were also clear that the co-conveners and the organizers of the workshop had done an excellent job. Their leadership continuously kept the climate open which facilitated the discussions. The leaders also kept everyone involved – participants commented on how comfortable they felt in expressing their views in a group of “experts”. Interviewees commented on how well the discussions were led by the co-conveners and the value of input from Dr. Pearson.

1. Were there any problems with the meeting? That is, if a similar meeting were conducted in the future, what would strengthen the meeting and the final outcomes?

This question resulted in overlapping information from prior questions. The two issues that had been raised earlier in this report were discussed again by the interviewees: (1) focus in the breakout groups and (2) the emphasis of the international context in the breakout groups. Three additional comments were made. First, more time would help to develop a plan to build and implement action plans. Second, it would have benefited the discussion by involving more K-12 teachers and other practitioners in the workshop. Third, while the networking opportunities were excellent, it would have been better to have had more time in networking. However, the overall impression was that this workshop was an excellent starting point.

1. What did you think was the balance between the international and national components of the workshop? Should there have been more or less emphasis on the international component or do you think it was about right?

The amount of emphasis on the international context was clearly an issue that the interviewees wanted to discuss. The initial protocol did not include this question. However, the first two interviewees wanted to discuss this issue so it was added to gather input from the other interviews.

After conducting the 12 interviews, the participants were evenly divided on whether the international context was balanced in the workshop with issues in the US. That is, six of the interviewees felt that the international emphasis was “about right” or “well balanced”. Interestingly, all of the international participants who were interviewed (N=3) felt that the balance was about right. One of the international participants pointed out that international presentations at conferences (e.g., AERA) typically do not draw many US participants in the audience. Thus, this workshop was a much more useful time to share in the discussion between the US and international colleagues. Several US interviewees also felt that the international context was well represented and that the diversity of countries was “outstanding”. One interviewee felt it was interesting to think about whether the issues and strategies seen in other countries were transferable to the US.

On the other hand, half of the interviews had comments about the potential for a better balance. One participant questioned the need for more countries. In their view, the information presented was helpful but that it showed that they were having similar issues as in the US and questioned if adding more countries would have brought “unique problems that may not be as helpful” to the discussion.

The remaining comments raised several issues about the international context and how it could have been framed different at the workshop to be emphasized more strongly. First, three participants commented on the lack of representation from certain parts of the world (e.g. Asia), or simply that it would have been better to have heard from more countries. However, these same participants described the international context and its representation in the meeting as being “wonderful” and “fantastic” as far as it went. Second, four participants commented on the lack of focus on international contexts in the breakout group discussions. The same individuals commented on how wonderful the large group talks were with their international focus but they felt the international emphasis was not brought to the breakout groups. The reason for this were described by several participants as having too few international representatives in the breakout groups which resulted in the US dominating the conversation with the free flowing format of the discussions. The two possible solutions mentioned were either including more international representatives or having more specific directions in the breakout groups that would clearly include the international emphasis.

1. Other Comments about anything that was not previously asked

Few additional comments were made. Several took the opportunity to express their gratitude for being included in the workshop. Several talked about the “honor” and/or “privilege” they had to participate in the workshop. The remaining comments were querying about what the next steps were; how results of the workshop would be shared; or how to continue this effort. Participants expressed interest in forming research collaborations, or writing about the topic. Thus, the workshop seemed to inspire them to want to continue collaboration from this important starting point.

**Summary**

The different parts of the evaluation were consistent in that participants were very positive about the workshop and its potential to have an impact as a starting point in the discussion of strategies, policies and programs to address achievement gaps nationally and internationally. Some of the unique strengths were:

* The workshop was anchored in prior work of the experts who participated
* Strong plenary and large group talks about international issues and strategies
* The workshop included a strong (i.e., high expertise) and diverse blend of participants that included representation from a wide range of academic, government and private industries as well as international representation.
* The participants were passionate about the issue and the importance of the work to establish strategies, policies and methods to reduce achievement gaps

Although the participants are very positive about the workshop and its potential impact, there were some questions about the next step and the collaborations that could be built and maintained from this starting point.

The evaluation also led to several suggestions for improving the workshop if a similar workshop were conducted. These suggestions were notably within a context of the overall success of the workshop. However, the following suggestions for future workshops were:

* Expanding the international participation and the emphasis on the international differences in measuring and addressing these issues
* Some expressed a need for more focus in the breakout sessions that might include more direction about the eventual outcomes and purpose of the workshop
* More time would have benefited the workshop in several potential ways: more networking, and more time in breakout groups to develop action plans and strategies.

Appendix

Pre-Workshop Survey Results