<National Institutes of Health Science and Education Partnership Award Recipient (SEPA program)>

Evaluation Findings

Prepared by

data 2 insight

finding wisdom in information

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Executive Summary

August 7, 2013
Prepared by data2insight LLC

In 2012, the Biomedical Association partnered with data2insight LLC to conduct formative and summative evaluation of the National Institutes of Health Science and Education Partnership Award Recipient (SEPA program). The principal objective of the evaluation was to determine the SEPA program's impact on 1) student learning; 2) student attitudes and beliefs about animal and human research; and 3) public attitudes about and understanding of clinical trials. The evaluation also focused on collecting teacher and curriculum expert input on finalization and dissemination of the SEPA program curricula, and on how the curricula have enhanced secondary translational bioethics education. The evaluation was developed to inform Biomedical Association program leaders' decisions and actions for the purpose of achieving the SEPA program's aims, which are to:

1. Provide teacher professional development and curricular resources for middle and high school life science educators that target the science and ethics of translational research.
2. Provide learning experiences for students that will increase their understanding of translational research and ethics.
3. Disseminate the resources and materials developed through the SEPA program.

Data2insight data scientist and principal, Veronica Smith, met with Biomedical Association program staff, attended the Year 4 SEPA program advisory committee meeting, and the May 2012 SciEd Conference. The Year 5 evaluation plan framework was a result of the conversations held at these meetings. The evaluation plan (Appendix A) was designed to answer the following questions:

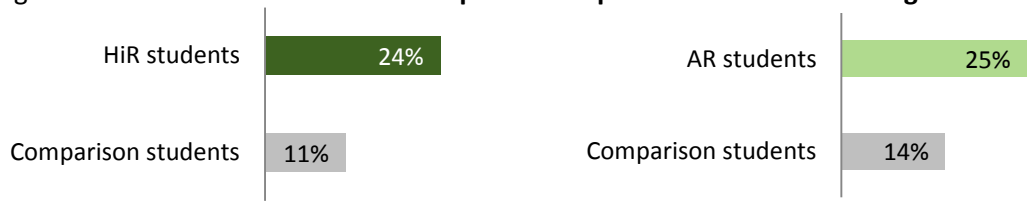
1. What have students learned from one animal research lesson?
2. What have students learned from the RARE clinical trial lesson?
3. How have select SEPA program units influenced student attitudes and beliefs about animal and human research, and clinical trials?
4. What are feasible and effective ways that Biomedical Association can disseminate and promote use of the SEPA program curricula in the next 1 to 2 years?
5. How did the 'Biomedical Research—Science and Ethics' professional development workshops and teacher instructional materials enhance secondary school translational bioethics education?

Key Findings

- ***Increased 10-12th grade student understanding of translational research and ethics:*** *Biomedical Association curricula student posttest improvement was two times greater than comparison peer groups*

  Ninth to 12th grade students who completed select Humans in Research (HiR) lessons (N=64) experienced an average gain of 24% on the humans in research subject posttest compared to pretest scores, which is more than two times the 11% improvement of peers in high school science classrooms who did not complete those lessons ($p < 0.005$). Similarly, students who completed Animal Research (AR) lessons (N=59) improved their posttest performance on animal research questions by 25% compared to a 14% improvement by high school science classroom peers ($p < 0.005$).

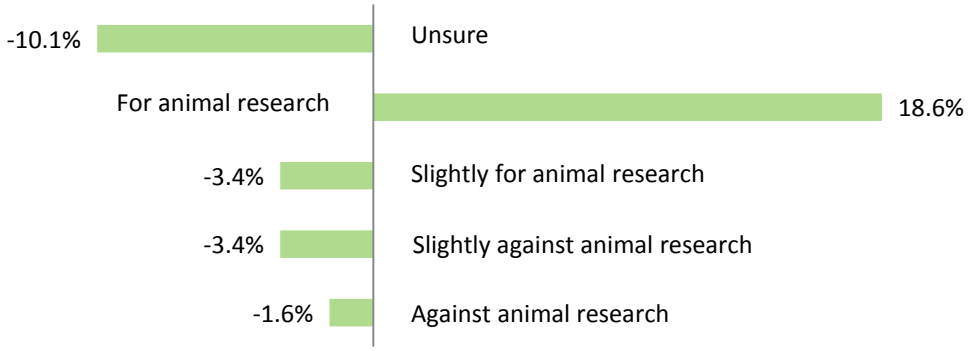
  Figure 1: **Human and animal research posttest improvement rate of 9-12th grade science students**



- ***Change in student attitudes and beliefs about animal and human research, and clinical trials****: SEPA program students were more likely to support animal research and less likely to volunteer for clinical trials after completing SEPA program lessons*

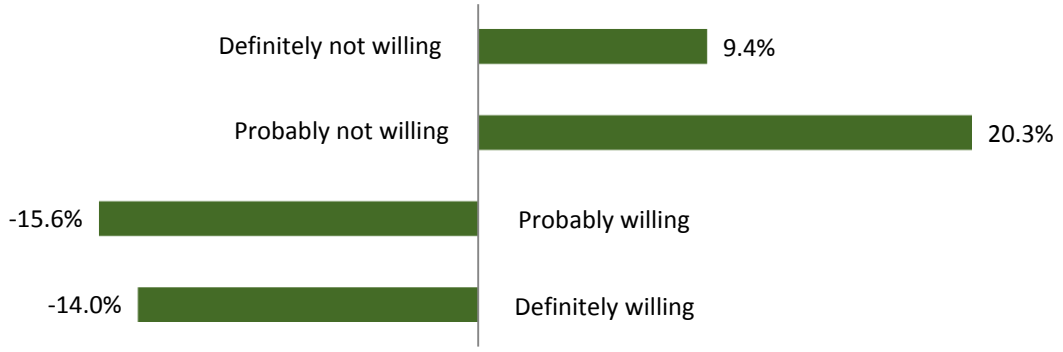
  SEPA program AR curriculum students' responses to a test question about their support for animal research before and after completing AR lessons showed significantly more increase in support after instruction compared to their peers who did receive AR instruction ($p < 0.05$). Prior to instruction, 41% of AR students were for animal research, while after instruction, 56% were for animal research (↑15%). In comparison, science students who did not receive AR instruction increased their support for animal research by a little over 6%. This finding is consistent with Biomedical Association's theory of change: Individuals who learn more about animal research will be more supportive of animal research.

  Figure 2: **Change in 9-12th grade student support for animal research (N=59)**



SEPA program students who completed HiR lessons, however, were less likely to volunteer for a clinical trial after instruction than they were before instruction ($p < 0.005$). This finding is inconsistent with SEPA program's theory of change, which posits that if individuals know more about the importance of clinical trials to public health, they will be more likely to participate in clinical trials. This result also differs from the change in attitudes seen in public viewers of the film, *RARE,* about clinical trials: they were significantly more likely to volunteer for a clinical trial after viewing the film ($p=0.0001$). A suspected contributor to the decreased willingness of 9-12th grade students to volunteer for clinical trials was student age (14 to 19 years). Future evaluation or research is recommended to better understand student concerns about clinical trials so they can be addressed in HiR curriculum and Biomedical Association professional development training.

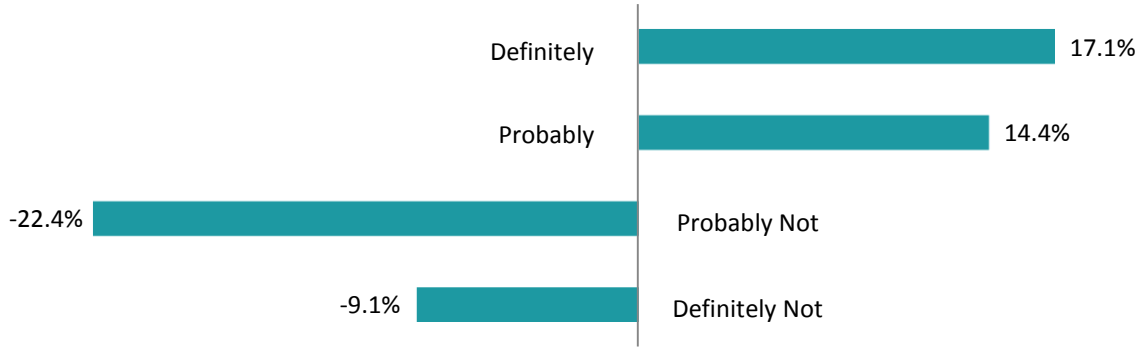
Figure 3: **Change in 9-12th grade student willingness to volunteer for a clinical trial as a healthy volunteer**



- ***Change in public understanding, attitudes, and beliefs about clinical trials:*** *Over 31% of* RARE *viewers were more likely to volunteer for a clinical trial as a healthy control after watching the film at the Pacific Science Center. According to one viewer, the film was powerful and put a human face on NIH research.*

Over half (54%) of 70 *RARE* viewers commented that HPS patients and their stories touched them. Many viewers were struck by the strength and perseverance of the patients featured in the film and mentioned enjoying the intimate look into their lives. Furthermore, there was an impressive amount of change in viewers' willingness to participate in a clinical trial as a healthy volunteer. Before viewing the film, just over 38% of viewers felt they would probably not volunteer for a clinical trial; less than 16% (↓22%) felt this way after viewing the film.

Figure 4: **Change in *RARE* viewers' willingness to volunteer for a clinical trial as a healthy volunteer (N=70)**



- ***Dissemination of resources:*** *Biomedical Association teachers want SEPA program curricula available on NTSA, NATB, and WSTA websites*

  Respondents to the teacher survey (N=110) suggested several potential ways to promote and distribute SEPA program curricula to other teachers and classrooms. The Internet was mentioned most frequently as a resource for disseminating SEPA program curricula, and the most recurrent specific recommendation given (52%) was to create a link through educational websites, such as NSTA, NATB, and WSTA.

- ***Enhanced secondary school translational bioethics education****: Biomedical Association professional development training and instructional materials increased teachers' ability to teach bioethics and the scientific method.*

  Most teacher survey respondents (71%) indicated that professional development workshops and instructional materials on translational bioethics **increased their ability to teach bioethics and the scientific method in their classrooms**, as well as **help students use these skills to solve problems**. Other respondents stated that the training and materials **helped them correct erroneous student beliefs, increased student engagement**, and that the **resources were easy to adapt to the learning needs of all students.**

Conclusions & Recommendations

- ***Increased 10-12th grade student understanding of translational research and ethics:*** *Biomedical Association curricula student posttest improvement was two times greater than comparison peer groups*

  The large effect size of posttest improvement by AR and HiR students is consistent with the Year 1-2 research findings showing SEPA program instruction and curriculum having a large effect on student ability to craft strong justifications when analyzing a controversial bioethical case study. These findings constitute strong evidence that SEPA program professional development and curricular resources result in student learning.

  However, the low percentages of students achieving proficiency on the AR and HiR sections of the posttest indicates that there is a need to 1) better align instruction and curricula with learning objectives; 2) improve implementation fidelity by teachers; and/or 3) further develop instruments to more accurately measure student knowledge and understanding.

  Recommended next steps: Further development of the curriculum and teacher professional development is recommended in order to ensure that students educated using SEPA program curricula will achieve proficiency on clearly defined learning objectives. Observation of teachers in their classroom settings is the most important next step to determine how the curricula and training are being applied in the field. Recommendations from the Paragon Education Network curricula review will be useful in refining learning objective definitions and aligning those with Common Core and/or Next Generation Science Standards.

- ***Change in student attitudes and beliefs about animal and human research, and clinical trials****: SEPA program students were more likely to support animal research and less likely to volunteer for clinical trials after completing SEPA program lessons*

  In order to better understand the impact of SEPA program teacher training, instruction and curricular resources on student attitudes and beliefs about animal and human research, it will be important to collect qualitative data from students and teachers who have taught or learned from SEPA program lessons. Furthermore, in order to determine if there is a positive correlation between student attitudes and beliefs and increased understanding of animal and human research, a larger cohort of students (N=200+) would be needed.

  Recommended next steps: Student and teacher interviews and/or focus groups asking questions about their thoughts and feelings after completing select lessons (e.g., RARE film lesson) and/or an entire course will be important to understanding why students were more likely to support animal research and less likely to volunteer for clinical trials. This qualitative data is essential to being able to refine and improve SEPA program curricula.

  Given Biomedical Association's mission to promote understanding of research and its ethical conduct, it is important to develop a more comprehensive survey instrument that measures attitudes and beliefs about animal and human research. This instrument would allow Biomedical Association to better measure changes in attitudes and beliefs of participants in any Biomedical Association program.

- ***Change in public understanding, attitudes and beliefs about clinical trials:*** *Over 31% of RARE viewers were more likely to volunteer for a clinical trial as a healthy control after watching the film at the Pacific Science Center. According to one viewer, the film put a human face on NIH research that was "powerful."*

  Recommended next steps: The *RARE* film is a powerful resource for educating the public about humans in research. Finding more venues to share the film is directly aligned with Biomedical Association's mission. More evaluation of the mid- and long-term impacts of film viewing is recommended to determine if films like RARE are a cost effective intervention for Biomedical Association to invest in going forward.

- ***Dissemination of resources:*** *Biomedical Association teachers want SEPA program curricula available on NTSA, NATB, and WSTA websites*

  Clearly teachers are using Biomedical Association curricula. In the teacher survey, teachers reported using Biomedical Association curricula to teach over 50,000 students over the past 5 years. The question that Biomedical Association needs to ask now is: *How does Biomedical Association reach 250,000+ students over the next 5 years?*

  Recommended next steps: Leveraging Biomedical Association relationships education and research institutions, teachers, school districts and textbook publishers are key to broad dissemination and continued improvement of SEPA program curricula. The focus of Biomedical Association on science and ethics is a niche in science education that has much potential. Exploring how the SEPA program curricula can be aligned with the Next Generation Science Standards will be key in leveraging the value of the SEPA program programs and materials.

- ***Enhanced secondary school translational bioethics education****: Biomedical Association professional development training and instructional materials increased teachers' ability to teach bioethics and the scientific method.*

  Biomedical Association's recognized leadership in the bioethics teaching community provides a solid foundation to develop original and high quality teacher programs and materials. SEPA program teacher professional development and instructional materials are a valuable addition to the Biomedical Association portfolio.

  Recommended next steps: It will be important to develop a funding source for ongoing professional development of teachers and curricula development using the SEPA program model. This will be essential to expanding the reach of SEPA program and to keeping it relevant over time.

Appendix A: Year 4-5 Evaluation Plan

Impact Evaluation

Outcome	Evaluation Questions	Data Sources	Timeline & Costs	Evaluation Tools	Targets	Data Analysis & Interpretation Plan
Increased 10-12th grade student understanding of translational research and ethics (Aim B)	What have students learned from selected animal and human research lessons?	Pretest-posttest (N=60) 30 min paper test admin	**Pre** Sep 2012 **Post** May-June 2013 5 participating teachers receiving $300 stipend (total cost & 1,500)	• Curriculum Assessment	• 80% of SEPA program students demonstrate at least a proficient level of understanding of Animal Use Action Plan (request from pretest-posttest classroom teachers) • >= 40% average learning gain on pretest-posttest	• Descriptive statistical analysis • Gender analysis • Ethnicity analysis • Learning gain analysis
Change in student attitudes and beliefs about animal and human research, and clinical trials	How have select SEPA program units influenced student attitudes and beliefs about animal and human research, and clinical trials?	Pretest-posttest	**Pre** Sep 2012 **Post** May-June 2013	• Custom survey prompts • Pilot clinical research knowledge questionnaire	• TBD	• Descriptive statistical analysis • Gender analysis • Ethnicity analysis • Visualize relationship between student attitudes/beliefs and knowledge
Dissemination of resources (Aim C)	What are feasible and effective ways that Biomedical Association can disseminate and promote use of the SEPA program curricula in the next 1-2 years?	Teacher survey 15 min online admin	Dec 2012-Jan 2013	Customized teacher questionnaire	n/a	• Triangulation of data • Qualitative analysis
		Curricula expert review & landscape scan	July-Dec 2012	TBD	n/a	

Outcome	Evaluation Questions	Data Sources	Timeline & Costs	Evaluation Tools	Targets	Data Analysis & Interpretation Plan
Enhanced secondary school translational bioethics education (Aim A)	How did the 'Biomedical Research—Science and Ethics' professional development workshops and teacher instructional materials enhance secondary school translational bioethics education?	Teacher survey Target: N=75(?)	Dec 2012-Jan 2013 Drawing for 3 X $50 amazon gift certificates from participant pool (total cost: $150)	Customized teacher questionnaire	n/a	• Descriptive statistical analysis • Qualitative analysis
Change in public understanding, attitudes and beliefs about clinical trials	How did the documentary film, *RARE*, inform and impact viewers?	Retrospective pretest-posttest survey	June 2012	Customized survey instrument	Increase viewer understanding of willingness to participate in clinical trials	• Descriptive statistical analysis • Statistical significance testing • Qualitative analysis