

GOODMAN RESEARCH GROUP, INC.
Program Evaluation • Consultation • Market Research

The Music Instinct
Formative Evaluation
(Educational materials)

PREPARED BY

Rucha Londhe, Ph.D.
Miriam Kochman
Nivedita Ranade
Irene F. Goodman, Ed.D.

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INTRODUCTION

Goodman Research Group, Inc., (GRG), Cambridge, MA, is conducting the formative evaluation of *The Music Instinct* project. The NSF-funded project aims to bring to PBS viewers the strong evidence of the connections between music and science, as well as to facilitate a deeper understanding of both fields. The *Music Instinct* project, presented by WNET/Thirteen, in collaboration with Mannes Productions, includes a two-hour television program, a website, and ancillary educational materials.

The purpose of the formative evaluation is to obtain timely information to support and guide the producers as they make decisions regarding the design, content, and format of the program, website, and ancillary materials. In 2008, GRG conducted formative evaluation activities during the pre-production phase of the project that focused on public knowledge of and receptivity to the music and science content of the television program. During the same year, GRG also conducted a viewer study with representatives of the target audience (PBS viewers, science enthusiasts, and non-science music aficionados) to assess the overall appeal of the show and the extent to which it provided the audience with new information.

In February 2009, GRG conducted a Website survey with the same sample that participated in the viewer study. These respondents had already viewed the *Music Instinct* 'rough cut' and had completed the Viewer Survey in 2008. The purpose of the Website Survey was to assess the level of interest in the *Music Instinct* website and to learn about the website topic preferences of the target audience.

Recently, GRG conducted a formative evaluation of the formal educational materials, complementary to the *Music Instinct* program, created by the LAB@Thirteen, WNET/Thirteen's Educational and Community Outreach Department. These materials are a part of an extensive community-based education initiative that also includes partnership with nine other PBS stations on educational outreach efforts, creation of informal educational materials, and attendance at national conferences.

The formal educational materials include five lesson plans that encourage middle school students' understanding about the powerful connections between music and science and bring the topic to life in school classrooms. The final lesson plans, which will adhere to national learning standards, will contain comprehensive instructions for classroom implementation, utilizations of the Music Instinct online features, streamable and downloadable segments of the broadcast program, printable student handouts, and suggestions for cross-curricular extensions. According to LAB@Thirteen, the primary goals of the educational materials are:

1. fostering meaningful, inquiry-based science learning experiences based on program content for underserved, middle-school aged students, and
2. promoting deeper understanding of the relationships between music and science, and encouraging further student exploration of both.

The current report presents the data gathered during the formative evaluation of these educational materials.

METHODS

At the beginning of this evaluation study, in April 2009, GRG's lead evaluation researcher for this project attended the *Music Instinct* Advisory Board meeting, at which the outreach and evaluation plans were presented and finalized. Early in May, LAB@Thirteen sent GRG rough drafts of two of the five activities, which GRG used for the formative evaluation. The first activity, *Good Vibrations*, focuses on connections between vibrations and creation of musical sounds. The second activity, *Can You Feel What I'm Saying*, demonstrates that sound travels through different substances and that human voice can create specific vibrations.

For the purpose of this research activity, GRG collected evaluation data from middle school science and music teachers. Through its participant database and by using snowball sampling, GRG recruited 14 middle school teachers to participate in the study. Out of the 13 who completed the study, 11 had a master's degree and currently teach fifth through twelfth grades. These math, science, and music teachers came from states across the country: Arizona, Florida, Maine, Massachusetts, Michigan, Missouri, Montana, Nebraska, New Jersey, Oregon, and South Carolina. Number of years of teaching experience ranged from three to 35 years. Eight of the 13 teachers were women.

GRG sent the teachers copies of the two activities and instructed them to write notes directly on the lesson plans as they evaluated the activities. Accompanying the lesson plans were questions to guide the teachers' assessment of the activities. These questions were:

- Is the activity age-appropriate?
- Are the instructions adequate and clear?
- Can the materials be easily obtained?
- How engaging is the activity likely to be for the students?
- In your opinion, what is the educational value of the activity?

After evaluating the activities, the teachers completed a brief survey on their impressions of the various aspects such as the appropriateness of the activities, the likelihood of student engagement, and the overall quality. After the teachers returned the activities with their notes and the survey, they received a stipend (in the form of a \$65 online gift certificate).

RESULTS

Overall, the teachers gave high ratings to the two activities. The teachers appreciated the underlying premise of the activities – a fusion of science and music concepts in experiential activities for students.

- Eleven teachers rated the two activities as either “*excellent*” or “*very good*”. The teachers agreed that the hands-on nature of the activities would make them very engaging for the students.
- Eleven teachers rated the *Good Vibrations* activity as potentially “*extremely engaging*” or “*very engaging*” for the students.
- Ten teachers gave similar ratings for the *Can You Feel What I’m Saying* activity.

The qualitative and quantitative analyses of the data gathered from the teachers revolved around a number of themes, presented in the following sections. These included highlights, potential difficulties, and suggestions for changes. For more information on the quantitative data, please refer to the annotated survey in the appendix.

APPROPRIATENESS OF THE ACTIVITIES

According to the teachers, both of the activities were appropriate for middle school students. The science and music concepts illustrated in the activities could be grasped and understood by children of that age. The teachers indicated that the activities were most suited for 6th through 8th grade students – the potential target audience specified by LAB@Thirteen. The only exception to this is the extension challenge for the *Good Vibrations* activity. According to the teachers, this activity is more appropriate for high school students due to the inclusion of advanced mathematical concepts such as constants and an elaborate set of instructions.

The teachers indicated that the two activities were appropriate for both science and music classes. The teachers also agreed that the activities would be most effective if they were co-taught by science and music teachers. In the words of a teacher,

“Great ways to cross curriculum and engage other subjects. Maybe even invite the science teacher to help teach the lesson if possible or have the science teacher teach along with the lesson in science class (same lesson/ subject matter different class)”

BACKGROUND INFORMATION

The teachers felt that the two activities have the potential to teach the concept of connection between music and science. The activities are good examples of an interdisciplinary curriculum. However, an overarching theme that was evident among the teachers’ comments was that they would like to see an *explicit* emphasis on the inter-connections between the three fields, in addition to a more in-depth discussion of the science, math and music concepts used in the activities. For example, one teacher suggested that once students had learned that vibrations set up sound waves and that different lengths of strings produce different waves with different frequencies to give different pitches, then the students should be encouraged to use that information to understand how different instruments produce different sounds. The teachers reported that if such

in-depth discussion was not included, the activity would be more recreational than educational.

It was also critical to the teachers that a description of vocabulary words such as ‘octave,’ ‘vibrations,’ or ‘fret’ be included. The teachers further elaborated that instead of just providing some possible questions for discussion, it would be beneficial for them if the lesson plans provided them with pre-written discussion material in a question-answer format and a precise direction in which the conceptual discussion should progress.

MATERIALS

The teachers appreciated the fact that the materials required for the activities were simple and could be easily made available. However, these materials were not necessarily a part of a classroom and would need to be specially assembled. Also, the number of materials required is high and the activities are to be carried out individually. Because of these reasons, the teachers were concerned that the total cost of the materials would rise. They also worried about not having access to certain musical instruments, such as a guitar or a piano, which are a required part of the activities.

The teachers raised the question of the reusability of the material. They would prefer materials that can be recycled and reused with successive classes. This could, potentially, also help in reducing their preparation time.

A need for more information about the materials was a common theme across all activities. The teachers indicated that they would benefit from more specific details about the materials. For example, “size and gauge of nails” and “particular number of the rubber bands” for part I of *Good Vibrations* activity or “size/ type of tuning fork” for part I of *Can You Feel What I’m Saying* activity.

The teachers appreciated having possible alternatives for the materials. However, they wanted to know the optimum requirement for the activity. In the words of a teacher:

“Because the materials used will make a difference in quality of experiment, it would be good to list specific items as “best” and then give suitable substitutes. Then, refer only to the specified items. Using all 3 choices makes it a bit cumbersome and confusing.”

SAFETY ISSUES

Another major theme that was consistent across the teachers’ feedback was the need to explicitly state and emphasize the safety issues involved in both the activities. Specific examples of safety concerns cited by the teachers included:

“Having students nail a board inside a classroom would be very noisy and likely result in injury and/or damage to classroom furniture.”

“Some [teachers] might wonder if there are any potential safety issues with placing tuning fork against bone behind ear lobe and you may want to mention this in the description.”

“[Part 2 of Good Vibrations activity] might be difficult with child scissors and it might be dangerous with scissors sharp enough to cut holes in a straw.”

The teachers suggested that reviewing safety rules, setting explicit limits for the activity, using less hazardous materials (e.g. hole punchers instead of scissors), and having adequate adult supervision would minimize the risk of injury.

PREPARATION

The teachers agreed that both the activities will be most effective if they are co-taught by science and music teachers because they include both science and math concepts. However, if a science or a math teacher chooses to individually conduct the activities, s/he might need extra preparation time in terms of gaining background knowledge and connections between science and music.

In terms of advance preparation, it was also suggested that teachers should practice the activities themselves before conducting them with their students – and that this should be specified in the instructions. This practice session would help them anticipate any potential issues when the students are engaged in the activities. Also, the models made by the teachers could be used as prototypes by the students when they conduct the activities.

FORMAT

Because of the length and the complexity of the activities, the teachers suggested that the format could be changed from individual activity to group activities. If the format could not be changed, an alternative suggestion was to involve more adult helpers (parent volunteers) during the activity. Having more adults involved would also help eliminate some of the safety concerns mentioned previously.

INSTRUCTIONS AND PROCEDURES

Appropriate wording

The teachers addressed the use of certain words, indicating that they should be changed in order to be sensitive and consistent with standard practice. For example, the teachers suggested changing the word ‘children’ to ‘students’ and using the word ‘hearing impaired’ instead of ‘deaf.’

The teachers recommended that the objectives of each activity should be checked for logical progression of goals. Also, some objectives may be more apt as sub-objectives of an overall, broader objective rather than stand-alone objectives by themselves.

Sequence of the instructions

The teachers recommended checking the logical flow of instructions for the two activities. For example, one teacher felt that procedure numbers 4 and 5 in Part II of the *Good Vibrations* activity would work better if they were switched. It would be more instructive for students if they are allowed to experiment with different straw lengths in order to come to the conclusion that shorter straws produce higher sounds and longer straws produce lower sounds, rather than providing that conclusion for them. Another example is reversing the order of Part I and Part II of the *Good Vibrations* activity. According to the teachers, Part II is a simpler activity and the reversal would help in terms of successive concept development.

Simplifying and enhancing instructions

The teachers appreciated the pictorial representation for building the wooden board to produce musical sounds through vibrations, as shown in part I of the *Good Vibrations* activity. They felt that the diagram simplified the instructions. However, it was suggested that the pictorial representations be placed before the instructions so that the final prototype is visible before the students actually begin constructing it (especially in case of the Extension Challenge in the *Good Vibrations* activity).

Additionally, some teachers found the long list of instructions to be cumbersome and confusing. They indicated that depicting the instructions in a successive pictorial form (often seen in ‘do-it-yourself’ manuals or wiki ‘How to’) would help them understand the instructions better.

Another valuable suggestion from the teachers was to have the pictorial representations drawn to scale in order to make the diagrams more accurate. An alternative to pictures and diagrams was providing a video that depicted an adult creating the instruments while using the instructions in the lesson plan.

ENHANCEMENT OF THE ACTIVITIES

Teachers had several suggestions for enhancing the activities to make them more inclusive and relevant. The activities could be made more multi-culturally sensitive by talking about stringed instruments from around the world. In the words of one teacher:

“It would be good to make reference to instruments such as koto (Japan) and zither (Vietnam), to illustrate the multi-cultural component. The DVD made reference to the “western notion” of pleasing sounds...it’s good for students to learn the connections/ variations with others instruments in the world.”

Another way in which the activities could be enhanced would be to relate the activity to the students’ everyday lives. For example, in reference to the *Can You Feel What I’m Saying* activity, one teacher suggested, “students should be asked

to write down a list or make a KWL [What I Know, What I Want to Know and what I Learned] chart of places where students can “feel” music; e.g. a concert, from a car with loud radio, etc.”

LENGTH OF THE ACTIVITIES

With respect to the number of class periods required for the *Good Vibrations* (Part I-III and the Extended Challenge) activity, teachers were of the opinion that it would take from two to ten class periods, with each class period ranging from 45-60 minutes. On the other hand, in order to complete the *Can You Feel What I'm Saying* (Parts I-III), they felt that it would take approximately one to five class periods, with each class period ranging from 45-60 minutes.

The extensive length of time required to complete these activities was one of the concerns among the teachers. A second concern was that they would have to invest more time and energy in preparing for these activities. It might be beneficial to explicitly mention that each part of *Good Vibrations* or *Can You Feel What I'm Saying* activity can be used as a stand-alone activity. Teachers can choose which part they want to conduct with their students. Also, depending upon the time they have at hand, the teachers can decide the extent to which they want to engage in the conceptual discussion.

POST ACTIVITY FOLLOW-UP

The teachers indicated that the activities lacked any post-lesson extended learning objectives. They suggested that adding worksheets or assessment tools within the lesson plan, and providing post-activities review materials, would help the students retain the scientific concepts learned during the activities. Also, because the activities are heavily focused on experiential learning, the teachers suggested that the students should be asked to record their observations and hypotheses. To allow the students to experience the various processes in a scientific inquiry, they could be asked to maintain a response journal during and after the activity. This would also add to the “hands-on” nature of the activities.

CONCLUDING STATEMENT

Overall, the teachers had a positive impression of the two hands-on activities, *Good Vibrations* and *Can You Feel What I'm Saying*. They found the activities both age- and subject matter- appropriate. They believe that the activities have a high potential to engage the students. In order to enhance the effectiveness of the activities, the teachers requested the following: some additional background information in science and music concepts conveyed through the activities, specific details about materials used, graphical representation of the instructions, explicit mention of safety issues, flexibility with the format, and suggestions for follow-up activities.

Goodman Research Group, Inc.

Main Office

955 Massachusetts Avenue, Suite 201
Cambridge, Massachusetts 02139

Tel: (617) 491-7033

Fax: (617) 864-2399

info@grginc.com

www.grginc.com

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