

An Idea for Generating Diversity Conversations: Physics Jeopardy and the Future Faces of Physics Kit

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Abstract. Is there a way to engage typical physics undergraduates in a conversation about under-represented groups in physics that doesn't result in rolled-eyes or fingers-in-the-ears? The Society of Physics Students (SPS) has begun an experiment using a jeopardy-like game at physics meetings in an attempt to generate conversations about diversity. The physics jeopardy game is part of a "Future Faces of Physics" kit that includes a variety of materials that are of interest to those wanting to address under-represented audiences in physics, such as video clips exhibiting common physics words in sign language, tactile representations of the lunar surface for blind students, guidelines regarding lab procedures for the wheel-chair bound, and the book, *Einstein on Race and Racism* with a challenge letter directed at SPS chapters from the authors. While attempts to assess the impact of the game are modest, we report anecdotally some of the qualitative features seen in the discussions when the game is played. We also strive to indulge in a few physics jeopardy game moments to give a sense of how the game works. If you are hosting a meeting, large or small, and would like to receive this kit for use at your meeting, notify Kendra Rand, SPS Program Coordinator at krand@aip.org.

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INTRODUCTION

Together, Hispanic-Americans and African-Americans make up over 25% of the U.S. population [1], but they earn only 7% of physics bachelor's degrees [2]. High school physics classes are nearly 50% female [3], but females earn less than 25% of physics bachelor's degrees [4]. Students from the nation's poorest families have a much lower rate of college attendance and graduation [5], and first generation college attendees are less likely to earn degrees in any field of science [6].

The Society of Physics Students (SPS) and its governing council of 36 undergraduate students and faculty have been addressing the issue of diversity in physics intently for several years. The intention is to create a more welcoming and supportive climate for students from groups that are under-represented in physics, but discerning how to proceed has been difficult and sometimes contentious.

The SPS National Council adopted "Future Faces of Physics" as the theme for the 2007-2008 academic year. With this theme, the council aimed to raise visibility and focus on issues of student diversity in physics. In the fall of 2007 the Council's Committee on Under-represented Groups in Physics convened,

and their efforts resulted in a new SPS logo (see Figure 1) and a unique Future Faces of Physics kit that went to 13 regional physics meetings and six national physics meetings during the first half of 2008. A highlight of the kit is Future Faces of Physics Jeopardy, which was played at many of these meetings.



FIGURE 1. The new SPS logo created for the Future Faces of Physics theme.

THE FUTURE FACES OF PHYSICS KIT

The Future Faces of Physics kit consists of a collection of items that represent groups that are

under-represented in physics, ranging from people who are blind or visually impaired to African-Americans and women. In addition, the kit includes a Future Faces of Physics Jeopardy set, which consists of buzzers, a score board, instructions, and a game board—everything needed to host a game.

Kit Contents

We chose items for the kit that represent under-represented groups in physics and that an average physics student would be likely to pick up and play with. Relevant reports or background information is included where appropriate.

In addition to Future Faces of Physics Jeopardy, highlights of the kit include a tactile “picture” of the moon used to teach blind students, video clips featuring the sign language signs for a number of physics terms, “diversity beans” (jelly beans whose colors and flavors aren’t always paired as expected), and the book *Einstein on Race and Racism* by Fred Jerome and Rodger Taylor.

Included with the kit is a letter suggesting how the kit can be used to generate conversation. For example, at regional meetings the contents could be on display during a poster session, used as centerpieces on lunch or dinner tables, or featured during a special session on diversity.

See Table 1 for a complete list of kit contents, the vendors we used, and average prices. Note that many items are available from a variety of vendors at different prices. For links to vendors or to download Future Faces of Physics Jeopardy, visit www.spsnational.org.

Future Faces of Physics Jeopardy

The SPS Council’s Committee on Under-represented Groups in Physics wanted to include an interactive activity in the kit that SPS chapters would find easy to use, engaging, and fun. In particular, they wanted to stay away from activities that they thought were “touchy-feely” or “too much like a residence life program”. They wanted an activity that would appeal to a group of *physics* students and that was not necessarily focused on relationship building. The result is Future Faces of Physics Jeopardy.

Many physics professors on the SPS National Council have used a Jeopardy-like quiz game to help students review physics content, and they endorse it as a fun way to engage students. In addition, the Mathematical Association of America successfully hosts math jeopardy for students at their national meetings—and has high turnouts and levels of enthusiasm.

TABLE 1. Future Faces of Physics kit contents, excluding SPS-specific materials.

Item	Vendor	Cost
Poster: <i>Conquer Your Universe</i> poster	American Physical Society	Free, while supplies last
Book: <i>Einstein on Race and Racism</i>	Amazon.com	\$17.95
DVD: <i>Percy Julian: Forgotten Genius</i>	Amazon.com	\$19.95
Article: <i>Do we need Julian today?</i>	Public Broadcasting System	-
Magnet: <i>Girls Can</i>	Café Press	\$19.99 / 10
Article summary: <i>Beyond Bias and Barriers</i>	National Academies Press	Free download
Tactile picture of the moon	AAC Core Concepts	\$3
Photograph of the moon	USGS	-
Lesson: <i>Sense(s) of Scale—The Moon...Bigger than Life</i>	Southeast Regional Clearinghouse	Free download
Article: <i>Top 10 List for Making Earth & Space Science Materials Accessible</i>	Southeast Regional Clearinghouse	Free download
Magazine: <i>Winds of Change</i> , fall 2007 issue	American Indian Science and Engineering Society	\$3.50
CD of Physics signs	Dr. Harry Lang	-
Lesson excerpt: <i>The Doppler Effect</i>	Dr. Harry Lang	-
Diversity beans	iCelebrateDiversity.com	\$7.25 / 8 oz.
Eggspert buzzer system	Amazon.com	\$49.00
Handbook: <i>People With and Without Disabilities: Interacting and Communicating</i>	NASA Goddard	Free download

With help from the Committee and others, we created a set of Future Faces of Physics Jeopardy categories, each with five questions. The questions address physics content, the physics community (careers, demographics, etc.), the contributions of physicists to the field (including many physicists from under-represented groups), and physics in popular culture. Some representative questions are given below with their categories.

Know Your Stats

... Together these two minority groups make up over 25% of the U.S. population – but they earn only 9% of physics bachelor's degrees.

... Of 10, 30, and 50 about this percentage of physics bachelor's degree recipients become physics professors.

Past Faces of Physics

... The Nobel Prizes in Chemistry has been given to 3 women. This woman and her daughter each received one for work on radioactivity.

... This iconic physicist was engaged in many civil rights activities and co-chaired the American Crusade to End Lynching.

In the Classroom

... Of 10, 30, and 50, about this percentage of students take physics in high school.

... Of 20, 35, and 50, girls make up about this percentage of total enrollment in high school physics.

Rock and Roll Physics

... These three letters, in different permutations, are used to describe three quantities: resistance, conductance, and the hardness of rocks.

... Of a basketball, bowling ball, and car tire, this one rolls down a ramp fastest.

For the most part, the game is played according to official Jeopardy rules—a team earns points for buzzing in first and answering a question correctly and loses points for answering incorrectly. To see the rules of play, download a “Host Manual” from the SPS website, www.spsnational.org/news/2007/jeopardy/. The “game board” was made with Microsoft's PowerPoint software and is normally projected onto a screen for play.

Since the main goal of the Future Faces of Physics theme is to provoke discussions on diversity in physics, we suggest using the break between the first two rounds to initiate discussion. At national meetings where we hosted the game, we initiated the discussion by asking participants which questions surprised them. The following questions were often cited:

... This iconic physicist was engaged in many civil rights activities and co-chaired the American Crusade to End Lynching.

... Of 50, 100, and 300, about this many African-American females have earned PhDs in physics in the United States.

... Of the United States, Turkey, Japan, and Sweden this country awards the highest percent of physics bachelor's degrees to women.

Discussion often resulted around these questions and, in some cases, relevant data or background information was projected on-screen.

KIT USAGE

Regional Meetings

The Future Faces of Physics kit was sent to all SPS chapters that hosted a regional meeting for SPS members in the spring semester of 2008. These schools included:

- Angelo State University (TX)
- Bellevue Community College (WA)
- Emporia State University (KS)
- Louisiana Tech University
- Penn State
- University of California – Santa Cruz
- University of Central Florida
- University of Connecticut
- University of New Mexico – Albuquerque
- University of Maryland
- University of Rochester
- University of Wisconsin – River Falls
- Washington University (MO)

It is not clear the extent to which all of the kits were utilized, however written reports from several meetings explicitly mention components of the kit. The comments we received were largely positive and indicate that sending such a kit to meeting hosts is fun for them and is a great way to spread the Future Faces of Physics theme.

National Meetings

The SPS National Office has hosted Future Faces of Physics Jeopardy games at national meetings during the first half of 2008, including:

- American Association of Physics Teachers Winter Meeting (Baltimore, MD)
- Joint Meeting of the National Society of Black Physicists & National Society of Hispanic Physicists (Washington, DC)
- American Physical Society March Meeting (New Orleans, LA)

- American Physical Society April Meeting (St. Louis, MO)
- Council on Undergraduate Research (Saint Joseph, MN)
- American Association of Physics Teachers Summer Meeting (Edmonton, AL, Canada)

In most cases the participants were undergraduate physics majors and a few physics faculty members. At the APS April meeting we also led a modified round of Future Faces of Physics Jeopardy for high school physics students. The participants at the Council on Undergraduate Research meeting were all faculty.

Informal feedback from participants and audience members at these national meeting was very positive. The students enjoyed the competitive nature of the game, and were overall enthusiastic and responsive. We found that the variety of experiences and backgrounds of the participants added another dimension to the game—personal stories were shared about navigating college in a wheelchair, being the only female in a physics department, and even being married to a woman who has a bachelor's degree in physics from Turkey.

DISCUSSION AND FUTURE PLANS

A number of positive outcomes have resulted from Future Faces of Physics Jeopardy, including heightened awareness among the SPS community of physics contributions by members of under-represented groups and of the demographics of the physics community. In addition, this game has been highly visible at many meetings and there is evidence that diversity discussion ensued when the game was appropriately moderated.

Several modifications to the Jeopardy game format are underway, including development of a more scripted guide to facilitate in-depth discussions, and an improved web presence that links to a broad array of diversity resources. We are also in discussion with members from other science, technology, engineering, and math (STEM) organizations about creating a collaborative STEM version for broad dissemination.

Several colleagues have suggested that SPS consider packaging the jeopardy game for use in high schools. Many SPS chapters take science demonstrations into their local school systems, and arming them with an appropriate version of Future Faces of Physics Jeopardy might be a good way to address diversity issues with a younger audience and encourage high school students from under-represented groups to consider physics as a viable career option.

All assessment thus far has been informal, consisting of discussions with participants and reports from meeting attendees. We recognize the need for a plan for assessing impact, and hope to partner with experts in the field that can help us determine the effectiveness of this activity with regard to provoking discussions on issues of diversity in physics.

We expect that by honing the Future Faces of Physics kit and jeopardy game within the SPS community, we can present a model for a fun, non-threatening, and educational approach to the diversity issues for use in other communities.

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