Evaluation of The Human Genome Project: Exploring our Molecular Selves

Executive Summary

Prepared by
Elizabeth R. Bachrach, Ph.D.
Maria Fusaro, B.A.
Irene F. Goodman, Ed.D.

Submitted to
The National Human Genome Research Institute

August 2003
ACKNOWLEDGEMENTS

The evaluation reported here was developed under a grant from NHGRI, Award #1 RO3 HG02565-01.

Goodman Research Group, Inc. would like to acknowledge the following who made valuable contributions to this evaluation.

We would like to thank those Educational Kit orderers who agreed to participate in our evaluation. We especially thank the four high school teachers who provided student data for our research.

We also thank the NHGRI staff, in particular, Joy Boyer and Karen DeLeon, for their guidance during the proposal and research design process. They provided the database from which we randomly sampled for our evaluation and granted us the flexibility to implement the evaluation in the most effective manner.
OUTCOME EVALUATION OF
THE HUMAN GENOME PROJECT: EXPLORING OUR MOLECULAR SELVES
EXECUTIVE SUMMARY

INTRODUCTION

Goodman Research Group, Inc. (GRG), a research firm in Cambridge, MA that specializes in evaluation of educational materials and programs, was contracted by the NIH National Human Genome Research Institute (NHGRI) to conduct an outcome evaluation of its multimedia educational kit, The Human Genome Project: Exploring our Molecular Selves.

As part of their work on the U.S. Human Genome Project (HGP), NHGRI produced this kit in an effort to increase access to current information about the HGP, to enhance sciences education, and to enhance presentations and discussions about the HGP, genetics, and genomics. Intended to reach a wide audience, including high school biology teachers and students as well as the general public, the Educational Kit contained a multimedia CD-ROM, a video documentary, a wall poster, and an informational brochure, and was available free, online. Released in February 2001, Kits were distributed throughout Spring 2001.

SUMMATIVE EVALUATION GOALS AND METHODS

The primary purpose of the evaluation was to assess the reach of the Educational Kit, including who ordered it and who used it, how and with whom it was used, and its perceived effectiveness among users. GRG gathered data to develop a detailed profile of users, to explore factors that predicted degree of use, and to examine users’ perceived impact of the Educational Kit. Among those who did not use the kit, data were gathered to explore reasons for non-use.

GRG used a mixed methods evaluation design to collect data at various points in time from a sample of those who ordered the Educational Kit online.

• Preliminary brief email surveys were sent one year after Educational Kits were distributed to confirm the receipt of materials and record recipients’ plans for use during the coming year (N=1,062)
  - Subsequent data were gathered from the sample of 1,000 who ordered the Educational Kit and responded to the initial survey
• Written surveys were mailed in winter 2003 to gather detailed information about users and non-users, implementation styles and practices, and perceived effectiveness (N=523)
• Phone interviews were conducted with a sub-sample of 21 educators and 10 non-educators in spring 2003 to gather more in-depth information about use and satisfaction with the materials, as well as suggestions for improvement (N=31)
• Student pre-post surveys were administered to a subset of 4 high school biology teachers to assess potential change in students’ HGP-related knowledge and attitudes (N=295)

This document highlights key findings of the evaluation study.
KEY FINDINGS

Receipt and Use of the Educational Kit

Overall, the Educational Kit was successful in its wide release, as demonstrated by the number and range of people who ordered it and the wide range of reasons people gave for their order. At the time of the survey, most recipients had already used the resource and three quarters of those who had not used it yet planned to use it in the future.

Those who ordered the Educational Kit represented a range of ages (13 – 75 years old) and occupational roles (from students and homeschooling parents to researchers and those who had a personal interest in the materials). Three quarters were educators. Of those, most were high school teachers.

Nearly all (90%) had at least a college degree; 45% had a Master’s degree, and 23% had a doctorate or other post-graduate degree. About half had taken courses in general science and biology in high school or college and nearly half had taken genetics courses in college. One third had taken graduate courses in genetics and one quarter had conducted graduate research in biology.

Most survey respondents (85%; n=444) said they had received the Educational Kit. Among recipients, 77% (n=341) had used it (“Users”) at the time they completed the survey. Among those who had not yet used the Educational Kit (“Non-users”), nearly three quarters (73%; n=61) planned to use it later. Timing or scheduling issues were most frequently cited as reasons for non-use among those who planned to use the kit in the future.

Significant predictors of use of the Educational Kit included being currently employed, ordering in the role of college professor, and ordering out of personal interest. A significantly larger proportion of Users than of Non-users had taken graduate courses and conducted graduate and professional research in genetics.

Use of the Educational Kit Components

Users, both educators and non-educators, reviewed all four components of the Educational Kit. The Video and CD-ROM had the most repeated use and were rated as most useful.

Nearly all Users viewed the video (91%) and read at least part of the brochure (91%), and most tried at least part of the CD-ROM (84%). More educators, and particularly high school teachers, viewed the video and displayed the wall poster.

All components were rated as useful (mean scores ranged from 3.85 to 4.41 out of a possible 5). The video and CD-ROM were rated as more useful than the brochure and poster. Users of the video felt it was well produced and appreciated the accuracy with which it showed components of the Human Genome Project, including the human, social, and scientific
issues. CD-ROM users found it helpful that the program was interactive, self-paced, and could be adapted for diverse audiences. Users read the brochure to familiarize themselves with the information contained in the video and CD-ROM.

Perceived Effects of Implementation

Users found the Educational Kit to be on the same level or better than past educational resources used to teach about the Human Genome Project. Particularly for a product that was free, Users found the Kit to contain detailed and current information presented in an engaging format.

- Educational Kit Users indicated that compared to previous materials, the HGP Educational Kit provided information in a more interesting format. They believed that the materials enhanced users’ understanding of the Human Genome Project. Several educators also described the kit as easy to use and listed features they saw to be educationally sound.

Student Outcomes

Students, particularly those whose teachers used both the video and the CD-ROM in the classroom, demonstrated increased understanding of the Human Genome Project and related terminology.

- Each teacher used from one to three components of the Educational Kit with students. All showed the video during class and two used the CD-ROM as part of a presentation or demonstration.

- Before exposure to the Educational Kit (“Time 1”) one quarter of the students (24%) indicated they had heard of the Human Genome Project. Most of them had heard of the HGP at school in 8th or 9th grade (55%) or on television (51%).

- After classroom exposure to the Educational Kit (“Time 2”), significantly more students selected (from a multiple-choice format) the correct definition of “genome” than did at Time 1. Additionally, at Time 2, more students who had previously heard of the HGP selected the correct response (61%) than did students who had not previously heard of the HGP (50%).

- After exposure to the Educational Kit, more students (23%) correctly described the relationship between genes and protein than did students before exposure (2%).

- Students answered three open-ended questions about the goals, controversial issues, and ways scientists use information about the Human Genome Project. The number of correct responses to these questions was combined to create a composite “Understanding of the HGP Score” (range: 0 to 3 correct). Students demonstrated increased understanding of the HGP after exposure to the Educational Kit.
While all students, on average, demonstrated increased scores, this was particularly true for those students who had previously heard of the HGP and for those students whose teachers had used both the video and CD-ROM in the classroom.

Students used 5-point scales to rate the importance of studying the HGP and their interest in the Educational Kit components. Three quarters of the students rated the importance of studying the HGP a 3 or 4 out of 5. Mean interest ratings for Educational Kit components were slightly higher than the midpoint. The video was rated as significantly more interesting among students who had heard of the HGP before exposure to the kit than among students who had not.

One third of the students (33%) reported that the way their teacher had taught about the HGP differed from the rest of Biology class that year. These students indicated their teacher:
- used more technology and/or hands-on activities than usual (35%),
- made the content more interesting (28%), and
- covered the HGP in more depth than other topics (23%).

Users’ Suggestions for Educational Kit Revisions

Users’ suggestions to improve this and future multimedia educational kits included maintaining current, updateable content, adding depth or opportunities to expand upon the content, incorporating resources to increase likelihood of classroom use, and enhancing further the adaptability and flexibility of the materials for use with different audiences.

Survey respondents recognized that the Human Genome Project is part of a dynamic science field, in which new information and technologies are constantly emerging. Most were receptive to future editions of the Educational Kit, updated to reflect current knowledge and implications of the Human Genome Project.

Several respondents suggested adding to the breadth of the resource, including more content and supplemental visuals, more ELSI issues to consider, and vignettes about people affected by such issues.

Because the majority of respondents teach, several suggestions were made to add materials specifically for educators: supplementary materials and activities that high school teachers could use in laboratory classes with students, and other materials appropriate for students at various age levels.

Because the Educational Kit Users worked with a wide variety of audiences, suggestions related to depth of information in future kits included both (a) making the package more in-depth for more knowledgeable audiences and (b) making it less technical for audiences for whom the information is new. Creating multiple versions or paths would increase the likelihood of use by diverse audiences.
Regarding mode of content delivery, information that can be delivered in short (5-10 minute) segments would be useful for many educators who prefer to pick and choose components of the CD or video to use during class. Some Users requested that future CD-ROM programs continue to be compatible with both MAC and PC interfaces. Some teachers encountered problems due to having only one copy of the CD; they would have liked separate copies to install on each student’s computer.

**Mentor Program**

As of early April 2003, awareness of the Mentor Program among Educational Kit Users was low. Housed on the NHGRI Web site, the program provides a list of genetics-related professionals available to answer questions about the HGP and the Educational Kit. Volunteer mentors suggested ways to promote the program and to make selecting and accessing the volunteers easier.

Two of the ten mentors GRG interviewed had been contacted by local high school teachers; teachers requested a guest speaker visit their classroom. One mentor arranged for a co-worker in research genetics to lead the presentation and one visited the school and personally made presentations.

Suggested avenues for promotion included: links to popular Web sites, announcements through professional teaching organizations and conferences, and NHGRI contacting schools or teachers directly, or sending information directly to Kit recipients. Two mentors suggested the current Mentor Program site would be improved by adding a record of the mentors’ areas of specialization and preferred mode of contact.

**RECOMMENDATIONS**

Based upon users’ reactions and perceived effectiveness of the Educational Kit, we make the following recommendations for the continued production of this and other similar educational materials developed by the NHGRI and its partners.

- **Future versions of this Educational Kit or other similar resources would benefit from being primarily an online resource with the options for ordering the CD-ROM, video, brochure, or poster for the cost of producing the materials.**

  After distribution, the Educational Kit was made available online. Most of those who accessed the information online also had a copy of the Kit. Making this and similar educational materials available online will allow for the information to be continually updated, which was described as invaluable by all users and corresponds with a primary goal of the resource. In addition, the online format may lend itself more easily to teachers’ suggestions -- perhaps by incorporating different “paths” for users to follow -- to make the information more adaptable to different ages, skill levels, and interests of the end-users.
As is, the Educational Resource section of the NHGRI Web site offers access to the materials. This Web site can also be used as a dynamic area in which Kit Users can find updates on the HGP presented in a format similar to that of the Kit itself. Additional teacher-oriented downloadable files might also be added to the site.

- **In promotional materials and in the kit itself, specify more clearly both the direct and indirect intended audiences of the product. Include tips about how different elements within the kit components can be adapted to different skill and knowledge levels.**

About one quarter of recipients did not use the Educational Kit and did not plan to use it in the future. The most frequently reported reason for not using the kit in the future was the perception of disconnect between the content and audience. Because the Educational Kit was designed for use with a wide range of audiences, recipients would benefit from an indication of whether and how the materials can be adapted to meet various needs and interests.

With direct suggestions about how the content included can be presented in either an advanced or a basic way to fit the needs of different audiences, educators would be better equipped to use the materials with a wide range of students. Introductory information about an educational product should answer the question, “How can this product be useful for my needs?” This information should be presented in a way that also encourages non-educators to see the value of the Kit for themselves, their family members, and/or their colleagues.

- **Develop strategies for further promotion of the Mentor program among the community of Educational Kit users.**

Promotion opportunities exist through professional teaching organizations, conferences, newsletters, and direct correspondences with Kit Orderers and/or Web site users. A clear message about the intent and purpose of the program may increase awareness, interest, and use of the service.

- **Future educational kits and materials would benefit from evaluation that employs a rigorous experimental or quasi-experimental design.**

The current evaluation study, while employing a multi-method approach, gathered primarily post-only data because the grant was awarded after the Educational Kits had been distributed. For the evaluation of future kits, an even stronger argument for success can be made if responses to the materials are compared to baseline knowledge and attitudes, using a pre-post design. Comparison of responses to a group who did not use the same educational materials would also enhance the authority of an argument that increases in knowledge can be attributed to the educational materials under study. For example, a comparison group design is useful for ruling out alternative hypotheses such as increased knowledge due to maturation.
When offering a free product to be ordered online, individuals should be required to complete only those fields that are absolutely necessary.

Through recruiting participants for this User study, we found a number of incorrect entries in the database, particularly regarding email addresses. Because email correspondence was not required for receipt of the kit, but was required on the form, individuals tended to type in information just to fill in the space. Recipients who did not want to share their email address filled in a random address (e.g., xxx@xxx.com), which the order form accepted. In the future, specifying a reason for including the field on the order form (e.g., email confirmation that order was received) may reduce the occurrence of faulty entries.

Overall, findings from the current evaluation study provide evidence that the Educational Kit met its primary goals of reaching a wide audience including educators, non-educators, students, and various professionals and members of the general public as well as increasing access to current information about the HGP and enhancing related discussions and presentations. NHGRI and its partners would be well-advised to continue developing similar materials with wide promotion and dissemination plans similar to those used for The Human Genome Project: Exploring our Molecular Selves.