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EDITORIAL

Distance education technologies have long been recognized as effective means for extending access to students at all levels of the educational system. In addition to allowing the equitable allocation and extension of traditional resources, however, modern communications technologies can support innovations in processes and organizational structures that allow significant changes in educational practice and outcomes. Teaching and learning can be transformed as these technologies provide students and teachers with access to information from around the world into which local issues and curricula can be integrated and then discussed and understood.

In this issue of DEOSNEWS, authors Bruce Barker, James Bannon, and Patricia Miller report on the delivery of a live, interactive, hands-on science class to over 13,000 elementary school students in 475 classes in the Hawaii public school system. The students and teachers within each classroom were able to interact not only with each other, but also with their distant KidScience TV teacher, students in other classrooms among the different islands, and with scientific experts both on Earth and in an orbiting space shuttle to address scientific issues of both local and global concern. The positive evaluations of the KidScience TV project by both teachers and students indicate that this program has been a valuable resource for supporting the goals of increased student involvement in learning and flexible learning-group arrangements promoted by advocates of educational reform and restructuring.

THE HAWAII KIDSCIENCE TELESCHOOL PROGRAM: A  
DESCRIPTION AND EVALUATION

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## INTRODUCTION

During the 1992-93 school year, the Hawaii State Department of Education (DOE) and the DOE's Distance Learning Technology (DLT) division broadcast KidScience TV, a live interactive distance learning science program for fifth and sixth grade students throughout the state of Hawaii. TV broadcasts represented the program's second year of operation. The program began at the start of the 1991 school year and was broadcast to sixth grade classes. After eight weeks of on-air broadcasting, the program was being watched by more than 3000 students in 115 classrooms at 53 schools across Hawaii (Kakesako, 1991).

For the 1992-93 school year, the program was expanded to include fifth grade students as well as sixth. By the end of the school year, over 13,000 students from 475 classes were receiving KidScience TV programs at 111 schools. Participation extends across the entire state and in each of the state's seven school districts. For 1992-93, the total fifth grade participation was 251 classes (52.8 percent of total). Total sixth grade participation was 224 classes (47.2 percent). Of the 475 classes in the state watching KidScience, 365 (76.8 percent) are on Oahu. The remaining 23.2 percent were scattered across the Big Island of Hawaii (10.8 percent); Kauai (8.4 percent); and Maui, Molokai, and Lanai (4.0 percent). The average number of enrolled classes per participating school is 4.4, and the average student enrollment per class is 28.5.

This article provides the reader with background information about the KidScience program, the Hawaii DOE's use of distance learning technologies to deliver the program to isle students, and student and teacher opinions about the quality and value of KidScience TV.

## KIDSCIENCE TV PROGRAM DELIVERY AND OPERATION

The KidScience program is offered, at no cost, to public schools across the state of Hawaii. The program originates in Honolulu from the University of Hawaii's Kuykendall Auditorium. Four one-hour broadcasts are aired four times each week. The fifth grade lessons are telecast on Monday mornings at 10:30 to 11:30, then repeated at 12:30 to 1:30. The lesson is again telecast on Tuesdays during the same time slots. The sixth grade curriculum airs twice each Thursday and Friday at 10:30 and 12:30, respectively. A new lesson is presented for each grade level every

week. Hence, students watch the program for one hour each week in participating schools. The fact that lessons are repeated allows for flexibility in scheduling at the local school or for review of a particular lesson if desired. No programs are aired on Wednesdays.

Program delivery is in a live, one-way video, two-way audio format. Each participating classroom has its own TV to view the program and a direct telephone line to call-in to the TV teacher for audio interaction during telecasts. Students are able to see and hear the KidScience TV teacher from TV sets in their classrooms. They can also hear other students who are on-line via telephone with the teacher. The teacher, however, cannot see students at the schools nor can students see their "classmates" who are viewing the program in other classrooms or at other schools. In addition to a telephone in each classroom for audio interaction, most participating classes also have either a videotext terminal or a computer and modem as part of the Hawaii CALLS statewide electronic mail system. Hence, students and teachers are able to exchange messages with the KidScience teacher through the convenience of E-mail.

The broadcast signal is aired on KHET TV's PBS channel and via the Hawaii Interactive Television System (HITS) network. HITS is a microwave communications network between the Hawaiian chain of islands and is the vehicle for sending the broadcast from Oahu to neighbor islands where it is redistributed via local cable television public access channels. Because the program is aired over public access channels, it can also be viewed on cable TV in residential homes throughout Hawaii. The toll-free phone number for student interaction, however, is released only to schools which have agreed to participate in the program. In addition to KidScience, the DOE also broadcasts Advanced Placement Calculus and a variety of teacher inservice program over HITS.

Each participating school is to provide a telephone and access to a direct telephone line for participating classes. Schools are also responsible to provide television sets in participating classrooms and assure that either a videotext terminal or computer/modem connected to the DLT phone line in each school is accessible to students and classroom teachers to use for E-mail.

Classroom teacher duties include collecting and organizing materials needed for class, facilitating student involvement and participation during the TV lesson, checking cable connections and other equipment prior to each lesson, and assisting students to "call-in" on days their class is scheduled to be "on-line" with the KidScience teacher. In addition, teachers are expected to encourage students to send E-mail messages to the KidScience teacher and to assist them in proper use of the state's E-mail network.

Typically, 3-4 schools are on-line for each broadcast and conversation/questioning is encouraged from students. A regular flow of E-mail messages sent from DLT offices to participating classrooms also encourages interaction with students and the KidScience teacher.

Students are given assignments during the telecast each week. Most ask that students write a summary of the experiment(s)

performed in that week's lesson which includes recording of data and writing conclusions. Other assignments are less structured, thereby encouraging student creativity. Classroom teachers in participating schools are given information for follow-up lessons they might use with students after the telecast. The responsibility for receiving, grading, or otherwise following-through on student assignments is the responsibility of the classroom teacher.

#### KIDSCIENCE PROGRAM TOPICS

For 1992-93, 34 lessons were taught to fifth grade students and 33 lessons were delivered to sixth graders. Each lesson is broadcast four times during the week (twice per broadcast day) in order to allow for scheduling flexibility at local schools and/or review if desired.

Selection of topics for the KidScience curriculum is determined by DLT program administrators. Topics selected for 1992-93 were taken from fifth and sixth grade science books used in the schools and what was deemed appropriate for Hawaii. Selected topics for fifth grade students included: sea water investigations, ocean currents, ocean floor and echo soundings, flotation and transportation, navigation, outside influences on the environment, whales, the Jason project, water safety, etc. Selected sixth grade topics have included natural resources, the water cycle, water pollution, watersheds, oil spills, water purification, Biosphere II, wind and hydroelectric power, geothermal and solar power, etc.

In addition to the scheduled lessons each week, two program specials for both fifth and sixth grade classes aired during the year. One program focused on the voyage of the ancient Hawaiian vessel, the Hokule'a, between the Hawaiian Islands and the Cook Islands, and the other was on sharks. Several live, interactive conversations were held with crew members aboard the Hokule'a during the Hokule'a special. Also, as part of another telecast held during the year, conversations over the air were held with astronauts in the space shuttle. As part of the regular lessons, and during special programs, invited scientists are frequently at the KidScience studio to interact with students and to add to the lesson. Students in classes which are "on-line" during these programs have been able to speak live with these experts and ask questions.

#### RESEARCH FINDINGS FROM STUDENT QUESTIONNAIRES

Student evaluative data were obtained from a sample of 11 classes in 10 schools. The classes selected for the sample were determined by DLT personnel with an attempt to select classes which represented each of the state's seven districts. Those participating in the study included four schools on Oahu, two schools on the Big Island of Hawaii, two schools on Kauai, one school on Maui, and one school on Molokai. Completed questionnaires were returned from seven fifth grade classes and three sixth grade classes.

An eleven item self-administered questionnaire was prepared in March 1993, validated by DLT personnel, and sent from DLT offices in Honolulu to the 11 selected schools in May. Completed questionnaires were returned from 10 schools for a return rate of 90.9 percent. The questionnaires were completed by 144 fifth grade students in seven classes and by 105 sixth grade students in three classes. The Statistical Package for the Social Sciences (SPSS) was used to tabulate student responses to objective questions.

#### Student Interest in KidScience

Of the students submitting completed questionnaires, 82.5 percent stated that they liked to watch the program. In fact, three-fourth's of the students (74.1 percent) indicated that they preferred to study about science from the KidScience TV teacher rather than from their own classroom teacher at school. Similarly, three of four students (76.9 percent) felt that learning about science from a TV teacher was a good idea.

In regard to the level of student interest in KidScience, just under half of the students (42.9 percent) said it was "very interesting," while 35.5 percent said it was "kind of interesting." Only 11.8 percent reported the program to be "boring" and 9.8 percent had no opinion.

Of responding students, 58.8 percent said they "sometimes" do science experiments at home after watching KidScience in school; 31.8 percent said they "never" do experiments at home; and 9.4 percent reported doing experiments "many times."

#### Positive Aspects of the Program (Fifth and Sixth Grade Students)

A total of 247 written responses were provided by students noting positive aspects of the program. Upon review, these seemed to fall into five basic areas: (1) students enjoyed doing the experiments; (2) students found the programs to be interesting and acknowledged that new information was learned; (3) students felt the programs were fun; (4) students enjoyed talking on TV via the telephone; and (5) students enjoyed the personality of the TV teacher and/or science guests on the programs. Numerous other comments, following no particular pattern, were also provided.

The highest frequency of positive comments were directed toward the hands-on science experiments/activities completed in class. Of the 247 written responses, 136 (55.1 percent) were deemed as directly related to student enjoyment of the experiments done in class. Thirty-one comments (12.6 percent of responses) clustered around comments suggesting that the programs were interesting and that new knowledge was gained. A total of 27 responses (10.9 percent) noted specifically that the programs were fun. This might also be construed to mean that students believed that the science experiments were fun. Twenty-six responses (9.1 percent) expressed student interest in working with new technology, particularly interacting with the KidScience teacher via telephone on TV. Finally, 18 comments (7.3 percent of responses) were directed toward satisfaction in watching the TV teacher and science experts who appeared on the programs.

#### Negative Aspects of the Program (Fifth and Sixth Grade Students)

A total of 218 written comments by students identified aspects of the program which they did not like. A review of responses suggests three basic groupings: (1) insufficient time to complete assignments; (2) nothing; and (3) note taking or writing things down during telecasts.

The most frequent criticism was the fact that there was not enough time to complete experiments. Forty-six comments (21.1 percent) seemed to be related to this concern. While not a criticism -- in fact, a compliment to the program -- the next highest frequency of comments written by students was "nothing." Thirty-nine students (16.5 percent) wrote the word "nothing" (or a suitable derivative) on their questionnaires. Twenty-three students (12.8 percent of responses) complained about the need to take notes, write things down, or do work sheets. Other concerns expressed were technical problems such as low audio volume on the TV, not being on-live as much as desired, some lessons were boring, etc.

#### RESEARCH FINDINGS FROM TEACHER QUESTIONNAIRES

In May 1993 a 42 item self-administered questionnaire was mailed from DLT offices in Honolulu to all 475 participating teachers whose classes were receiving the KidScience program. Completed questionnaires were returned from 206 teachers for a return rate of 43.4 percent. The return breakdown was 106 fifth grade teachers (51.5 percent of return) and 94 sixth grade teachers (45.6 percent). Six teachers (2.9 percent) taught both fifth and sixth grade classes. Each of the state's seven districts were represented by teacher response to the questionnaire. As reported by teachers, the average number of students in fifth grade classes watching KidScience was 27. In sixth grade classes, the average number of students per class was 30.

The Statistical Package for the Social Sciences (SPSS) was used to tabulate teacher responses to objective questions. Written comments by teachers were hand tabulated.

#### Demands on Teacher Time to Participate in KidScience

Classroom teachers who participate in KidScience agree to collect the necessary items/products needed for hands-on classroom experiments and to set-up these experiments for use by students during the broadcasts. On average, 91.6 percent of teachers said that collecting the necessary materials for the science experiments usually took 60 minutes or less of their time per week. In rank order this was reported as follows: 33.9 percent of the teachers said that on the average collecting materials took about 30 minutes per week; 24.2 percent said they typically spent about one hour (60 minutes) to gather materials. Of the remaining 41.8 percent, 9.8 required between 30 to 60 minutes; 23.1 percent usually required less than 30 minutes; and only 8.4 percent required more than one hour per week.

On the average, less time was spent by teachers to actually set-up the experiments than to acquire materials. The vast majority of teachers, 85.0 percent, said that set-up time was typically 30 minutes or less. Only 13.5 percent usually took between 30 to 60 minutes, and just 1.5 percent typically required more than 60 minutes of set-up time.

#### Teacher Attitudes about the KidScience Program

On a Likert rating scale of "1" to "5," only about one in three teachers (36.2 percent) agreed that KidScience was their students' main exposure to science instruction in their classroom. In fact, almost two-thirds of the teachers (64.7 percent) indicated that they regularly supplemented the TV KidScience instruction with their own teaching. More than three-fourths of teachers (77.1 percent) felt that KidScience was an excellent resource for their students. An almost equal number (74.3 percent) felt that learning activities presented in the TV programs are on the appropriate level of understanding for their students. About two-thirds of the teachers (62.2 percent) reported the program topics to be of real interest to students; half of the teachers (49.5 percent) rated student interest to be "very high" and just under half (44.6 percent) said their students looked forward to watching the program each week. Most teachers (90.5 percent) felt that their students enjoyed talking live with the TV teacher during the times they were on-line, and most (79.7 percent) also agreed that the telephone call-in component of the program is an important feature that students enjoy. Of note, 55.0 percent of the teachers indicated that their students' interest and enthusiasm for science increased as a result of participating in KidScience and 43.5 percent reported that their students frequently used new vocabulary or discussed new ideas among themselves after watching KidScience.

Almost all teachers (97.5 percent) remain in the classroom with their students during the KidScience program, and the bulk of teachers (80.6 percent) agree that they have personally gained much new information about science from watching the program themselves. Likewise, most teachers (80.3 percent) indicate that their school principal is very supportive of the program. Essentially the same number (78.7 percent) reported that they find the printed lesson materials to be both informative and useful. Two-thirds of the teachers (67.3 percent) agreed that the KidScience TV teacher's personality seems to "reach out" and excite young people about science.

Television screen size is a concern for one-third (34.8 percent) of the teachers, who indicated that the TV screen in their classroom was not large enough for all students to see easily. Also, two-thirds of the teachers (65.3 percent) are of the opinion that participation in KidScience has not freed them up or given them more preparation time for other subject areas. Likewise, about one-third (32.8 percent) of the teachers report that obtaining the items needed for each week's TV science experiment has been too time consuming for them. Of interest, 83.5 percent of teachers noted that students who are absent from class during the day of the KidScience telecast seldom watch the program later on videotape.

Eighty percent of the teachers (79.7 percent) indicated that other

Teleschool programs should be provided to schools in addition to KidScience. Recommendations for new courses, in the highest order of frequency reported, were: (1) social studies (history, current events, current issues, geography, civil war, etc); (2) mathematics (hands-on math, manipulative, geometry, algebra, etc.); and (3) language arts (English, literature, speech, drama, etc.).

#### Teacher-Perceived Program Strengths and Weaknesses

A total of 441 written comments by teachers identified positive aspects about the KidScience program. A selective word count using the WordPerfect 2.1 word processing program identified four general areas which received high numbers of positive responses. Clearly, the most positive aspect of the program was the hands-on activities and science experiments demonstrated for students. A total of 126 comments (28.6 percent of responses) were identified as relating to the hands-on nature of science experiments and the fact that these activities were fun and interesting for students. The next two most frequently identified categories, 78 responses and 75 responses respectively, focused on: the opportunity to interact with the TV teacher, to call in on the telephone, and to see what was happening in other science classrooms across the state; and the fact that new information and timely topics were presented to students. The fourth most frequently identified category (34 responses) related to the KidScience TV teacher's teaching skills, personality, caring concern for students, knowledge of the content, and to comments related to good lesson preparation, and guest experts who appeared on the programs.

Classroom teachers offered 235 written comments which might lead to program improvement. The most frequently expressed concern was related to the issue of time -- not enough time for students to finish experiments, too much information presented in a telecast, too much work for students to do, etc. Among other concerns/suggestions expressed with considerably frequency were requests by teachers that printed materials arrive more promptly to the schools, that the pace of lesson presentation be slowed down somewhat, and that technical concerns be corrected (in limited cases poor audio, loss of video signal, delayed call-in, etc.).

#### SUMMARY AND CONCLUSIONS

The Hawaii KidScience Teleschool program has been popular with the majority of teachers and students who have participated during the 1992-93 academic year. As evidenced by highly positive findings from students and teachers as well as the extensive growth of the program during its second year of operation, it is clear that KidScience is a valuable resource for Hawaii's public schools. A summary of evaluation results indicates:

1. Interest in KidScience by Hawaii teachers and students has been high. During the program's inauguration year (1991-92), some 3000 students in 111 sixth grade classes at 53 schools participated. At the close of the 1992-93 school year, 475 classes

in 111 schools participated in KidScience. And, over 13,000 fifth and sixth grade students participated in the program, representing each of the state's school districts.

2. Provided at essentially no cost to participating schools, the program is a positive example of a statewide partnership between the Hawaii Department of Education, the University of Hawaii at Manoa, the Hawaii Interactive Television System, independent cable TV carriers, public television, and the public schools. This partnership effort provides fifth and sixth grade students across the state with a centrally coordinated science instruction and experimentation program that is delivered directly to their schools each week via telecommunicated distance learning.

3. Data collected from a sample of KidScience students indicates that students enjoy the KidScience TV teacher and the program. In fact, three-fourths of the students surveyed stated that they preferred to study science from the KidScience Teleschool program, rather than from their classroom teacher.

4. Clearly the most popular aspect of KidScience as reported by students and teachers is the "hands-on" experiments which are a part of most telecasts. The interactive features of the program are also highly positive aspects noted by teachers and students. These include on-line discussions with students by telephone to talk to the TV teacher during broadcasts and E-mail exchanges over the Hawaii Calls computer network after broadcast hours.

5. The most frequent criticism about the program noted by students and teachers was that not enough time was given to complete the hands-on science experiments. One-fourth of the teachers also felt that the one-hour program length was too long.

6. There is concern on the part of some teachers in terms of the time it takes them to collect materials for KidScience experiments as well as the time it takes in class to set-up the experiments. About one-third of the teachers said gathering materials was "too time consuming" for them. One-fourth of the teachers said they typically spend about one hour per week to gather materials, whereas one-third said they usually spend about 30 minutes per week. Set-up time for most teachers (85 percent) usually takes 30 minutes or less per week.

7. Essentially all participating teachers (99 percent) are of the opinion that KidScience should be continued in its present format because it provides a wealth of information not only to students, but also to teachers. In addition, 80 percent of teachers feel that other Teleschool programs should be delivered to elementary schools. In rank order, these include social studies programs, mathematics programs, and language arts programs.

8. Almost all teachers (98 percent) remain in the classroom with their students during KidScience telecasts, and 81 percent agree that they have personally gained much new information. Most teachers agree that the printed materials accompanying lesson telecasts are informative and useful. Most teachers are also pleased with the KidScience TV teacher's presentation style and interaction with students while on-line.

9. Technical concerns and TV screen size remain issues for some

schools. About one-third of teachers feel that the TV screen is too small for all students in their classroom to easily see. In most classes there is only one TV and the typical screen size is only 19 inches.

The Distance Learning and Technology Office, under the direction of the Hawaii Department of Education has taken a leadership role in making distance learning courses a reality in Hawaii's public schools. Few states in the nation can match Hawaii for its achievements in distance learning technology and the extent of its coverage across the entire state. Due to the state's island make-up and Hawaii's geographical isolation from the rest of the nation, there is little need to question the value of distance learning as a viable means for helping educate Hawaii's youth. Educational policy makers and leaders should continue to pursue a state-wide agenda for distance learning that brings educational opportunity to students and inservice training for teachers regardless of the school they attend or the island on which they live.

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