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Lessons from children's television: The impact of the Children's Television Act on children's learning

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This special issue of the *Journal of Applied Developmental Psychology* is dedicated to our friend and colleague, Rodney R. Cocking. Among the many contributions Rod made to developmental science, one was to advance the media research field. Rod understood the importance of media in the lives of our developing youth as well as the need to embed this research into a broad theoretical context. Although his life was over all too quickly, Rod's legacy continues.

We are grateful for the indelible mark he left on our field.

Abstract

The 1990 Children's Television Act (CTA) requires broadcasters to provide educational and informational television programs for children. A multimethod, multidisciplinary approach, utilizing both cross-sectional and longitudinal designs, was used to investigate the degree to which the CTA has had an effect on children's viewing experiences and learning. Second- to sixth-grade children's preferences and comprehension of content from prosocial and academic programs broadcast by the four major commercial networks (ABC, CBS, NBC, and FOX) were compared to those for similar programs broadcast by PBS and Nickelodeon. Overall, girls and younger children liked educational and informational television programs more than boys and older children did. Girls and older children understood the programs best, particularly the prosocial ones. Over the course of 9 months, however, viewing educational and informational television programs declined, particularly for older boys. Nevertheless, lessons were reported more often after viewing favorite educational than favorite entertainment-driven programs. Results suggest beneficial effects of many commercial educational and informational children's television programs as well as the value of protections, such as requiring broadcasters to provide 3 h of educational and informational programs each week, to ensure that educational television programs survive in the competitive market place. Such policy decisions

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provide our children with access to quality television programs that can improve their social, emotional, and cognitive well-being.

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1. Why should we support children's educational television programs?

Beneficial effects of television programs with academic and prosocial messages have long been documented. Preschool children who view academically oriented television programs are often better prepared for school (e.g., [Linebarger, Eskrootchi, Doku, Larsen, & Kosanic, 2001](#); [Wright et al., 2001](#)), and are often even better students when they attend high school ([Anderson, Huston, Schmitt, Linebarger, & Wright, 2001](#)). Similarly, children who view prosocial television programs are often more altruistic (see meta-analyses by [Mares, 1996](#)). For example, children who viewed a prosocial episode of *Lassie* were later more likely to help an animal presumed to be in distress ([Sprafkin, Liebert, & Poulos, 1975](#)) and in another study ([Collins & Getz, 1976](#)), children who saw a constructive compared to a destructive model from *Mod Squad* were more likely to help a peer who was working on a task in another room. In spite of these cognitive and social benefits, commercial broadcasters have overwhelmingly broadcast strictly entertainment programs as their venue for children ([Calvert, 1999a](#)).

Years of debate and attempts to implement voluntary compliance policies, by which broadcasters were expected to regulate themselves, led to little change in the quality of children's television programs ([Kunkel & Canepa, 1994](#)). This failure and 25 years of pressure by public advocacy groups led Congress to take action and pass the [Children's Television Act of 1990](#) ([Kunkel & Wilcox, 2000](#)).

1.1. *The Children's Television Act*

The Children's Television Act (CTA) linked the renewal of the local broadcaster's license to airing educational and informational children's television programs. The FCC commissioners defined educational and informational programming as those that have content that "furthers the positive development of the child in any respect, including the child's cognitive/intellectual or social–emotional needs" (Federal Communications Commission [FCC], 1991, p. 2114). Broadcasters decided which of their television programs were educational and informational, and indicated that identification on their license renewal forms.

The flexibility of the FCC guidelines, in keeping with their dual obligation to enforce the law while protecting freedom of speech, immediately led to controversy about the quality of the programs being broadcast to meet the requirements of the CTA. Researchers who examined broadcaster reports to the FCC often discovered distorted and inaccurate classifications of educational and informational television programs (Kunkel & Canepa, 1994). For example, the license renewal form for WDIV-TV in Detroit, MI, listed *GI Joe*, a violent action–adventure cartoon, as an educational and informational television program. This broadcaster described one episode as follows: "The Joes fight against an evil that has the capabilities of mass destruction of society. Issues of social consciousness and responsibility are show themes" (Center for Media Education and Institute of Public Representation, 1992, p. 6). Such interpretations of educational and informational programming were inconsistent with the intent of the law.

Because researchers repeatedly documented problems with local broadcaster compliance in meeting the requirements of the CTA, the FCC moved to strengthen the implementation of law. In 1997, the FCC introduced several new guidelines, which came to be known as the "Three-Hour Rule." Those who complied with these guidelines were rewarded with an expedited license renewal. Those who did not comply had to follow the usual but lengthier full license renewal procedure (Calvert, 1999a).

Core educational programming is one provision that became required for an expedited license renewal under the 1997 guideline of the Three-Hour Rule. Core programs must be (a) designed to meet the educational and informational needs of children aged 16 and under; (b) aired between 7:00 a.m. and 10:00 p.m.; (c) scheduled on a weekly basis; and (d) at least 30 min in length (FCC, 1996). Effective January 2, 1997, broadcasters also had to label educational and informational television programs with an E/I (Educational and Informational) logo so that parents and children could find them (FCC, 1996).

1.2. *Educational and informational programming before and after the Three-Hour Rule*

Content analyses conducted by the Annenberg Public Policy Center (APPC) on samples of Philadelphia, PA, programs documented no change in the *number* of E/I programs shown before and after implementation of the Three-Hour Rule. However, the Annenberg group did find that programs broadcast after implementation of the Three-Hour Rule were more likely to be shown when children were awake and in the viewing audience (Jordan & Woodward, 1997; Schmitt, 1999). In particular, before the Three-Hour Rule, educational and informa-

tional programs were broadcast at times when it was unlikely that any child would see them, such as 5 a.m. (Jordan, 1996). After the Three-Hour Rule, most E/I programs were shown during the 7 a.m.–10 p.m. time period, when children are likely to be in the viewing audience (Jordan, Schmitt, & Woodward, 2002). This meant that children were more likely to view E/I programs since the Three-Hour Rule was implemented.

However, investigations of the educational strength of children's programs, based on evaluations of the primary lessons of E/I programs (e.g., lesson clarity, integration, involvement, and applicability) demonstrated that the educational value of the E/I shows actually declined from the 1996–1997 to the 1998–1999 sample of E/I programs (Jordan & Woodward, 1997). Prior to the Three-Hour Rule, the 1996–1997 sample had a greater proportion of programs that were rated highly educational (43%) rather than moderately educational (35%). The reverse was true in the year following the institution of the Three-Hour Rule. Only one third of the 1998–1999 sample of E/I shows were found to be highly educational and 46% were rated as moderately educational. In addition, 21–22% of programs in both samples were minimally educational over time (Jordan et al., 2002; Jordan & Woodward, 1997). The types of programs that broadcasters chose to air to meet the Three-Hour Rule guidelines may have affected the overall educational strength of the shows. For example, Jordan et al. (2002) found that academically oriented programs such as *Bill Nye the Science Guy* and *Magic School Bus* were generally rated higher on educational strength than were programs with social and emotional themes, such as *Disney's Doug* and *Disney's Recess*. But broadcasters overwhelmingly chose to present prosocial programs rather than academically oriented shows to meet the Three-Hour Rule (Jordan et al., 2002). Programs were also generally targeted at a middle-childhood audience (Jordan et al., 2002). Although the in-depth content analyses of E/I programs conducted by APPC group over several years revealed important information about what type of shows were available to children as a result of the Three-Hour Rule, 13 years after the passage of the CTA and 6 years after the institution of the Three-Hour Rule, we know very little about children's learning from E/I programs mandated by the CTA.

1.3. Children's learning from television programs

In the new science of learning, comprehension and understanding play a more central role than does mere knowledge of explicit content (Bransford, Brown, & Cocking, 1999). In the television area, learning with comprehension taps into comparatively abstract skills such as whether children can generalize program lessons into their own lives, can understand important abstract content, including implicit as well as explicit content, and can remember important content over time.

1.4. Developmental differences in children's comprehension of television content

Many studies using a variety of methods demonstrate that children's comprehension of television programs improves with development (e.g., Calvert, Huston, Watkins, & Wright, 1982; Collins, Wellman, Keniston, & Westby, 1978; Wright et al., 1984). The findings of this

research also suggest that the format of such programs, story versus magazine format for example, can affect children's interest in the television programs that they view and their understanding of the content of those shows (Wright et al., 1984). Televised stories (e.g., *Hey Arnold* and *Disney's Pepper Ann*), which present content in an audiovisual narrative form with program events woven together over time and space, typically convey social–emotional content such as helping others. By contrast, magazine formats, which most often present the content of the show in an expository format of discrete vignettes (e.g., *Sesame Street* and *Bill Nye the Science Guy*), are typically used to convey academic content (Calvert et al., 2002).

For children to understand narrative plot lines, they must engage in specific cognitive activities. In particular, children must (1) separate the central, plot-relevant from the incidental, irrelevant program details; (2) order that content into a story scheme; and (3) draw inferences about the motivations and feelings of characters as well as connect and integrate cause–event sequences that are presented across the narrative structure (Collins, Berndt, & Hess, 1974; Collins et al., 1978).

Experimental investigations document that the ability to remember more central plot-relevant than incidental irrelevant details after viewing television programs increases with age (Calvert, 1999b; Calvert et al., 1982; Collins, 1970). Comprehension of the implicit central content, which involves inferences and understanding of character motivations, feelings, and abstract relations, improves by Grade 5, about age 10, whereas comprehension of the explicit central program content occurs earlier, by about Grade 2 if the television presentations are clearly and sequentially organized (Collins et al., 1978). Preschool and young elementary school children do not remember implicit program content that requires inferences well, even when studies assess memory immediately after viewing.

1.5. Visual and verbal measures of comprehension

Children's ability to display the content of television programs that they understand also depends on the way they are required to demonstrate their knowledge. Children's comprehension of television programs has been assessed with measures that vary along two major dimensions: (1) the amount of content children must produce versus recognize, and (2) the form of the assessment, such as the use of verbal versus visual measures. Free recall measures, in which the child has to tell someone else what happened without any reminders or hints being available, is far more difficult than answering a multiple-choice question or responding to a visual representation where the child only needs to recognize or identify some aspect of the show from several response alternatives. Both free recall and recognition measures are often verbal, though recognition tests, i.e., multiple-choice measures, are sometimes supplemented with a relevant picture taken from the television program (e.g., Calvert et al., 1982).

The audiovisual nature of the television medium lends itself to assessment of children's visual memories. For example, picture-sequencing measures have been used to assess how well children can temporally integrate the visual events of a plot line (Wright et al., 1984). Regardless of the type of measure used, older children remember more information from televised material than younger children do. Even so, the use of multiple memory measures ensures that children have different ways to display what they know about televised material.

For instance, young elementary school children, 7–8 years old, may better display their knowledge with a multiple-choice or picture-sequencing measure, where verbal and visual recognition skills are required, than with a verbal free recall measure, where verbal production skills are required.

1.6. The value of program choice in learning: Naturalistic versus experimental paradigms

Our knowledge of children's learning from television programs comes primarily from experimental studies in which children view specific television programs that have been selected and/or varied through the investigator's manipulation of the content, presentation format, and organization of the materials presented. Little study has been directed toward what children learn from programs they choose to view. The latter naturalistic approach has the advantage of more closely approximating the everyday experience of children (Calvert et al., 2002). The experimental focus of most television studies means that researchers have little information about what children learn from programs that they like or do not like and that they choose to watch or not. The child's involvement with programs may vary considerably based on whether the child chose to watch it or was simply shown that program as part of a study. Cognitive research suggests that children learn material they are interested in better than material that they find to be boring, in part because interesting material maximizes their attention as they process the content (Malone, 1981). Therefore, programs that appeal to children, i.e., popular programs, may well be processed more thoroughly than are unpopular programs thereby maximizing children's comprehension and learning of the content of appealing programs. If this premise is true, programs selected by children as favorites would be expected to be remembered better over time.

The television programs that children like may vary with specific characteristics of a child, such as age or gender (Calvert, 1999a). For instance, programs that are age-appropriate—that are just about at the target age or slightly older than the viewer—seem to be better liked (Acuff, 1997). Similarly, boys show a strong preference for television programs that feature male casts and male interests, for example, programs that feature action–adventure plots (Huston, Wright, Rice, Kerkman, & St. Peters, 1990). Girls, by contrast, will view programs that feature boys as well as girls (see Acuff, 1997; also Valkenburg & Cantor, 2000, for a review). Girls, unlike boys, strongly prefer programs that feature social and emotional themes (Calvert et al., 2002). While educational television programs often appear to be gender neutral (Jordan et al., 2002), girls and younger children may find E/I programs to be more appealing than boys and older children do. By contrast, boys prefer, and hence may learn more information from, programs that are more strictly entertainment based, i.e., that are not designed to carry an educational message.

1.7. Summary

The [Children's Television Act of 1990](#) requires broadcasters to provide educational and informational television programs that are designed to improve the well-being of children. Well-designed educational television programs have been found to have immediate and

enduring academic and social benefits for child viewers (Anderson et al., 2001; Wright et al., 2001). Research suggests that young preschool and elementary school children's social behavior benefits from viewing prosocial programs (Sprafkin et al., 1975), but they have difficulty remembering essential plot-relevant events in prosocial stories, even when retention is assessed immediately after viewing (Calvert et al., 1982). This comprehension problem is particularly salient because the type of program of choice to meet the requirements of the CTA is a prosocial story. Do young children understand the prosocial, social emotional messages embedded in these programs?

1.8. The present research

In the studies reported in the present research report, we examined five different aspects of the impact of educational and informational programs on children in Grades 2–6: (1) children's viewing patterns were investigated using a naturalistic method that collected data online; (2) Nielsen data from a national sample of children who were a similar age to those in the naturalistic study sample were analyzed to validate our online findings with information from a national sample; (3) measures of appeal and of learning and comprehension data for educational programs were compared for frequently versus infrequently viewed programs; (4) the relationship of appeal and comprehension measures in children's online reports were compared to content analyses of children's programs independently conducted by the APPC at the University of Pennsylvania; and (5) the lessons learned by children at different ages from favorite educational shows and from favorite entertainment programs were compared.

Overall, the purposes of these studies were to (1) investigate the impact of the CTA and Three-Hour Rule with respect to the E/I shows that children actually watch on broadcast television; (2) gather information on what children have learned from the shows available since the implementation of the CTA and Three-Hour Rule, (3) explore the developmental implications of the CTA and Three-Hour Rule, i.e., are children of different ages impacted differently by the CTA and what kinds of educational lessons are they learning?; (4) investigate differential patterns of program preferences for boys and girls with an eye towards understanding the different potential effects of E/I programming on boys' and girls' experiences and learning; and (5) introduce new ways of assessing children's experiences with media sources through the use of on-line data collection supplemented with evidence from Nielsen reports.

2. What are children watching on TV? A naturalistic longitudinal study of children's viewing patterns

Our first study examined the nonexperimental, naturally occurring viewing of educational and informational television programming reported by 2nd–6th grade children. To do so, we created an Internet site where children provided monthly reports from remote locations, primarily from their schools. Children's viewing behaviors, preferences, and learning from programs broadcast by the four major commercial networks (ABC, CBS, NBC, and FOX)

were compared to programs broadcast by PBS and Nickelodeon. PBS and Nickelodeon were selected as comparison networks because both are leaders in the creation of quality children's television programs. The comparison of children's experiences with commercial broadcast television programs to programs from these high quality children's networks can provide important information regarding how successful the four major commercial broadcast networks have been in meeting the intent of the CTA and Three-Hour Rule.

2.1. Hypotheses for the naturalistic study

Our hypotheses are based on prior studies that demonstrated age and gender differences in children's preferences for, and understanding of, television program content (Calvert et al., 1982; Collins et al., 1978). Hypotheses were also influenced by prior information concerning broadcaster preferences for creating educational television programs for children in the elementary school grades, i.e., about 6–11 years old, for older preadolescent children, and for programs with social and emotional themes (Jordan et al., 2002). Therefore, when children were left to select their own viewing venues, we expected that (1) younger children would view more educational and informational programs than older children, in part because more programs would be targeted at their age group and in part because younger children appear to like educational programs more than older children do (Calvert et al., 2002; Jordan, 1997); (2) children would view more different Nickelodeon/PBS educational programs than commercial broadcaster E/I programs because more quality programming is available from these noncommercial sources (Jordan & Woodward, 1997); (3) an age shift from viewing more animated to more live action programs would be observed in children in the targeted age range (e.g., Huston et al., 1990); (4) children's reports would reveal that they view shows that focus primarily on social–emotional themes rather than those with academic content in part because they like those programs better than other types of shows (e.g., academic or news shows) and in part because more shows with such themes are available for them to view (Calvert et al., 2002; Jordan et al., 2002); (5) children's reports were expected to demonstrate that they learn more social emotional lessons from shows broadcast on commercial networks than from Nickelodeon/PBS educational programs because there is a broadcaster preference for programs with social and emotional themes (Jordan et al., 2002); (6) as a result of older children's greater cognitive skills (Calvert et al., 1982), we predicted that older children's reports would show greater educational strength than younger children's reports; and (7) descriptions of enhanced skills in transferring knowledge that occur with development (Bransford et al., 1999) led us to expect that generalization of program themes to children's everyday experiences would occur with increased age in the sample of school-aged children studied.

2.2. Method

2.2.1. Participants

A snowball sampling procedure was used to obtain a national sample of girls and boys representing different ethnic groups, socioeconomic statuses, and geographic regions. Our

sample mainly came from schools, and children primarily came online from their classrooms. Schools were located in Severna Park, MD (suburban); Yonkers, NY (large inner city); West Chester, PA (suburban); Norwalk, CT (small city); Alcoa, TN (small city); Austin, TX (city); Salt Lake City, UT (private school in a city); Yuma, CO (rural school); Los Alamitos and Chino Hills, CA (suburban); and Ardsley, NY (suburban). Children attending an after-school program serving low-income children from Fayetteville, AR (small city) also participated. We studied younger (2nd/3rd/4th graders) and older (5th/6th graders) school age groups in order to obtain information from those in early elementary and late elementary (preadolescence) school. Interest in E/I programs, and hence exposure and effort expended to comprehend the content, tends to show a developmental shift during these age periods (Calvert et al., 2002).

Data were collected within the framework of a short-term longitudinal design consisting of three waves. The duration of the study spanned 9 months that roughly corresponded to the television season as well as the school year. We tracked children over time in order to consider seasonal variations in viewing patterns, changes in viewing patterns after children are introduced and become accustomed to the new fall viewing schedule, and how aging in the short term might alter viewing patterns in the course of the year. During Wave 1 (October–December 31, 1999), 557 children (278 boys and 279 girls) in Grades 2–4 ($n=293$) and 5–6 ($n=264$) participated in the study. During Wave 2 (January–March 31, 2000), 551 children (281 boys and 270 girls) participated from 2nd–4th ($n=296$) and 5th–6th ($n=255$) grades. During Wave 3 (April–June 30, 2000), 475 children (234 boys and 241 girls) participated from 2nd–4th ($n=269$) and 5th–6th ($n=206$) grades. A total of 631 different children visited our site.

2.2.2. *Materials and procedures*

2.2.2.1. *Internet web site for the Georgetown Hoya TV reporters.* A data collection technique was developed using the Internet as a way to gather information from a national sample of children. To do so, we created a web site,¹ <http://kidtv.georgetown.edu>, where children came online as Georgetown Hoya Reporters. Our site was part of the Georgetown University site. Georgetown University is home to the Hoya Bulldogs.

To increase and sustain children's interest in the activity, our site was set up as an ongoing game. Our Hoya Reporters came online each month to tell us about (1) what they viewed on television; (2) what their favorite program was; and (3) what they learned from their favorite program. Children received 5 points each time they visited the site and entered the Bulldog Hall of Fame after 50 points were accumulated. Children also could become a "Top Dog" and received bonus points by writing the best reports within their age group. Archival records of past Top Dogs could be accessed on the Hot Dog page.

¹ The site was built with Cold Fusion, Microsoft Access, HTML, and Java Script programs. Clip art and original art was used to create graphical images. Cold Fusion passed children's reports immediately into our Microsoft Access tables. Data from these tables was later exported into SPSS-X for statistical analyses.

As children entered the Hoya Reporter web site, an animated boy and girl greeted them at our *front door* and asked if they had visited our site before. If not, children went to two pages that described what we were doing. One of these pages was a permission form, approved by the Georgetown University Human Subjects Review Board, where we explained what we were doing and told children to get permission from a teacher or parent before proceeding. Although our research was exempt from obtaining written permission from parents, many schools still sent out written consent letters to parents and some schools had already obtained a blanket permission form for children to use school-approved Internet projects with teacher supervision.

Children then went to a page where they provided descriptive information about themselves. They created a fictitious reporter name, to be used with their real first names, to preserve their anonymity on our site. Returning reporters used their real first name and their pretend reporter name to enter the site and access their own unique data file.

After identifying information was provided, children moved to our *TV Guide* page. This page was updated during the fall and spring as broadcasters added new programs to the schedule. Here children selected the names of the educational and informational programs that they had viewed the preceding week. Commercial network programs were selected for inclusion in the *TV Guide* page if they had an E/I label at the beginning of programs, as mandated by 1997 FCC requirements. For comparison purposes, programs targeted at grade school children from PBS and Nickelodeon were selected from the *Kidsnet Media Guide*, a computerized clearinghouse for children's television programs. A panel of six judges from our research team viewed and classified the latter programs for educational and informational content since public television and cable broadcasters are not required to meet the guidelines of the CTA, and hence, do not broadcast their programs with E/I labels.

2.2.2.2. The television programs. For the 1999–2000 season, 32 target programs² for 2nd through 6th grade children were as follows: ABC (6 shows): *Brand Spanking New Doug*, *Disney's Pepper Ann*, *Disney's Recess*, *Squigglevision*, *Sabrina: the Animated Series*, *The Weekenders*; CBS (6): *Anatole*, *Flying Rhinos Junior High*, *Mythic Warriors*, *Rescue Heroes*, *Blaster's Universe*, *Secrets of the Cryptkeeper*; FOX (2): *Magic School Bus*, *Sherlock Holmes in the 22nd Century*; NBC (5): *City Guys*, *Hang Time*, *New Saved by the Bell*, *NBA Inside Stuff*, *One World*; PBS (4): *Bill Nye the Science Guy*, *Wishbone*, *Kratts' Creatures*, *Zoom*; Nickelodeon (9): *Hey Arnold*, *Doug*, *My Brother and Me*, *Shelby Woo*, *The Secret World of Alex Mack*, *Nick News*, *Clarissa Explains it All*, *Cousin Skeeter*, and *The Wild Thornberrys*.

² During the year, there were changes in available programming. Nickelodeon dropped three of the target programs from their schedule, and hence, we dropped them from our sample. The Nickelodeon programs that were no longer broadcast after Wave 1 were *Clarissa Explains it All*, *The Secret World of Alex Mack*, and *My Brother and Me*. *Shelby Woo* from Nickelodeon was no longer broadcast after Wave 2. *The Weekenders* began airing on ABC broadcasters in the spring and was added to our site in Wave 3. *Bill Nye* originally aired on PBS broadcasters, but due to licensing changes, it became a syndicated program after Wave 1 and was broadcast on various commercial broadcasters, including FOX. We therefore, included *Bill Nye* as a FOX broadcast program after Wave 1.

Of the 32 programs in our sample, 24 (75%) focused on prosocial themes whereas only 8 (25%) focused on academic themes. Of those 8 academic programs, 4 were from PBS and 1 was from Nickelodeon. Clearly, commercial broadcasters preferred prosocial over academically oriented programs. Except for the NBC line-up and a few of the Nickelodeon programs, most of these programs target an early elementary aged rather than a preadolescent audience (Jordan et al., 2002).

During Wave 1, there were 18 commercial broadcaster programs and 13 Nickelodeon/PBS programs classified as educational offerings for purposes of this study. In Wave 2, there were 19 commercial broadcast programs and only 10 PBS/Nickelodeon programs. By Wave 3, there were 20 commercial broadcaster programs and only 9 Nickelodeon/PBS programs. Put another way, there was a 30% drop during the October-to-June season in the number of different PBS/Nickelodeon educational programs available for an audience of middle childhood viewers. The number of commercial broadcast programs was stable, and perhaps even increased a bit, over this same 9-month period. Most of the programs dropped from the Nickelodeon line-up (*Shelby Woo*, *The Secret World of Alex Mack*, and *Clarissa Explains it All*) targeted the preadolescent/adolescent age group.

Using the APPC coding system that was used to rate the educational/informational content of E/I commercial network shows, two independent raters classified each of these programs for (1) genre, the kind of program, and (2) program structure, narrative (lesson woven into a story) or expository (lessons shape content). For genre, 17 programs (53.1%) were animated comedies, 10 (31.3%) were live action comedies or dramas, and 5 were news/magazine formats (15.6%). For program structure, 28 programs (87.5%) were narratives and 4 (12.5%) were expository. Interrater reliability was 93% for genre and 97% for program structure.

2.2.2.3. Children's reports. Children reported which of the programs on our *TV Guide* page they had viewed during the previous week. First they clicked on an icon and name of each educational program that they had viewed the previous week. These programs were then passed to the next page where children selected their favorite program by clicking on it. Then children went to the "Reporting" page where they wrote about the lessons they learned from their favorite program. There they were asked to pretend that they were writing to a friend who had not seen the program. They were asked to tell their friend what the program was about and what they had learned from viewing it. Finally, children posted their reports to an animated boy or girl newspaper editor, Will or Kate, on the site.

Children could also visit "The Top Dogs," in which the reports of weekly winners and runner-ups for each age group received The Blue Ribbon and Gray Ribbon Awards, the colors of Georgetown University. Top Dogs were selected based on children's report strength (the clarity, consistency, engagement, and generalizability of the lesson reported) and served to reinforce children for submitting reports. Although instructions were not provided about how these selections were made for the Top Dogs, children could read those written by other children to gain an understanding of how to receive an award. Children could also view their own reports in an individual, cumulative file. Once 50 points (5 per visit plus bonus points for the Top Dogs) were accumulated, children entered the Bulldog Hall of Fame. Both the

Bulldog Hall of Fame and the Hot Dogs, our past Top Dogs, were also available for children to visit.

2.2.2.4. Scoring system for children's learning. Data were collected on three dependent variables: (1) number of different educational and informational programs viewed by each child; (2) identification of favorite educational and informational programs viewed by each child; (3) record of kind of lessons in children's reports; and (4) strength of children's reports.

Measures of the content of the lessons that children perceived in the television shows were adapted from the APPC content analyses of television programs. The presence (0 = no; 1 = yes) of different types of lessons children described in their reports were based on (a) 11 cognitive skills (e.g., learning how to think); (b) 35 social–emotional skills (18 interpersonal skills, 13 intrapersonal skills, and 4 values skills (e.g., learning how to live with yourself; getting along with others); (c) 23 knowledge/information skills (e.g., learning about the world); and (d) 6 physical well-being/motor development skills (e.g., learning to take care of our bodies). Scores for communication of values (e.g., doing what is right) were included in the social–emotional category and scores for story comprehension skills (e.g., inferential reasoning) were included in the cognitive skills area. The scoring system is presented in the Appendix.

Measures of the strength of the children's report of the lessons were also adapted from the APPC coding system that was previously used to evaluate the content of shows selected by broadcasters as their E/I presentations. The scores for strength of reported lessons reflected the degree to which the child's report reflected comprehension of the lesson presented in the program. Scores reflected the degree (0 = not at all; 1 = somewhat; 2 = very well) of the (a) lesson clarity (child's report presents a clear lesson); (b) lesson consistency (discusses lesson throughout the report); (c) lesson engagement (reports lesson in an engaging manner, e.g., excitement and involvement); and (d) lesson generalizability (describes lesson as applicable to own life).

2.2.2.5. Interrater reliability. Children's reports were scored by four different raters. One scorer was assigned as the target rater for each report. Data for 20% of the sample were scored by a second rater. Rater reliability was determined according to the formula $(2 \times \text{the number of agreements}) / (\text{total number of scores for Rater 1} + \text{total number of scores for Rater 2})$. For the kind of lesson, interrater reliability was 98% for cognitive lesson, 96.5% for informative lesson, 90.3% for social–emotional lesson, and 97.5% for physical well-being lesson. For the report strength measure, interrater reliability was 80.7% for clarity; 77.0% for consistency; 82.9% for engagement; and 79.2% for generalizability.

2.3. Results and discussion

2.3.1. What E/I shows were popular? Reported viewing patterns and reported favorite shows

2.3.1.1. Description of popular and unpopular educational and informational television programs. We were especially interested in the educational and informational television programs that children liked the most as these programs are most likely to be viable in the

commercial marketplace and are also likely to provide vehicles for learning due to their interest value (Bransford et al., 1999; Calvert et al., 2002). Popular programs were those selected by children as favorites or were reported as the most frequently viewed programs. The least viewed programs were considered to be unpopular. All reports of children who participated in the study were included in the list, including those who visited the site during one wave only.³

The educational shows that children selected as their favorites (left side of the table) from the *TV guide* and those that they watched most often (right side of the table) are reported in Table 1 for the group overall (top row) and for different age boys and girls (lower part of the table) for each wave of data collection. The most popular programs for the sample as a whole (four out of the five programs) remained constant over time, as indicated by viewing preferences across the three waves of data collection. As Table 1 shows, the five most popular educational programs were *Hey Arnold* (selected as the favorite 18% of the time; viewed most frequently at 42.9%), an edgy, humorous cartoon in which children deal with realistic dilemmas in their city neighborhood; *Doug* (13% favorite/viewed by 34.8%), an animated, humorous cartoon in which children struggle with realistic childhood dilemmas, including early attractions and friendships; *The Wild Thornberrys* (11.5% favorite/viewed by 30.5%), an animated, action-oriented cartoon in which a family travels around the world and films animals in their natural habitats (note: Eliza, the main character, can talk to animals); *Recess* (11.2% favorite/viewed by 25.8%), an animated cartoon in which children deal with issues such as friendships and power struggles on their school playground; *Cousin Skeeter* (7.8% favorite/viewed by 22.3%), a live-action program in which Skeeter, a puppet, interacts with his cousin Bobby, a live character, who faces various difficult personal and interpersonal issues; and *Sabrina the Animated Witch* (7.7% favorite/viewed by 17.1%), an animated cartoon in which relationship issues are featured (Jordan et al., 2002). *Hey Arnold!* was clearly in first place, with *Doug* and *The Wild Thornberrys* vying for second place depending on the time of year. All of the programs selected share the common qualities of being prosocial, of dealing with realistic issues that children face, and of having humorous content embedded in them. Not surprisingly, the shows that the children indicated were their favorites were also the ones most often viewed. This concurrence provides some evidence of the convergent validity of their reports of favorites.

³ Attrition Analysis: Because children participated in the study for different periods of time, subsequent analyses examined potential differences for children who came online for one, two, or three waves of data collection. There were 407 children with three complete waves of data, 138 children with two waves of data (74 with Waves 1 and 2, 29 with Waves 1 and 3, and 35 with Waves 2 and 3) and 86 with only one wave of data (47 with Wave 1, 35 with Wave 2, 4 with Wave 3). Children with only one wave of data were dropped from the analyses.

Attrition analyses were conducted to determine if there were differences in children with complete waves of data and those with incomplete data. A comparison between children with three waves and those with only two demonstrated that children with three full waves of data watched proportionately more of the different television programs than those with only two waves of data, $t(543) = -3.624$, $p < .001$ ($M = 10.68\%$, $SD = 9.29$ vs. $M = 7.56\%$, $SD = 6.89$). For the 138 children with two waves of data, data for the third wave was estimated by regressing the other two available waves of data for each variable on each one of the missing per week. There were no other differences between these two groups.

Table 1
Favorite and most viewed programs for each age group in each wave

Age group	Favorite programs			Most viewed programs		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
All	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold
	2) Doug	2) Thorn	2) Thorn	2) Doug	2) Doug	2) Thorn
	3) Thorn	3) Doug—Tie	3) Doug	3) Recess	3) Thorn	3) Doug
	4) Recess	4) Recess—Tie	4) Recess	4) Thorn	4) Recess	4) Recess
	5) Skeeter	5) Sabrina	5) Skeeter	5) Skeeter	5) Skeeter	5) Skeeter
YG	1) Arnold	1) Arnold	1) Arnold—Tie	1) Doug	1) Arnold	1) Arnold
	2) Thorn	2) Thorn	2) Thorn—Tie	2) Arnold	2) Doug	2) Thorn
	3) Doug	3) Sabrina	3) Doug	3) Thorn	3) Thorn	3) Doug
	4) Sabrina	4) Doug	4) Recess	4) Recess	4) Recess	4) Recess
	5) Recess	5) Recess	5) Sabrina	5) Skeeter	5) Skeeter	5) Skeeter
YB	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold
	2) Doug	2) Thorn	2) Thorn	2) Doug	2) Doug	2) Doug
	3) Skeeter	3) Recess	3) Recess	3) Thorn	3) Thorn	3) Thorn
	4) Recess	4) Skeeter	4) Doug	4) Recess	4) Recess	4) Recess
	5) Thorn	5) Doug	5) Skeeter	5) Skeeter	5) Skeeter	5) Skeeter
OG	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold
	2) Recess	2) Thorn	2) Thorn	2) Doug	2) Thorn	2) Thorn
	3) Thorn	3) Sabrina	3) Pepper	3) Recess	3) Recess	3) Doug
	4) Sabrina	4) Recess	4) Sabrina	4) Thorn	4) Doug	4) Recess
	5) Doug	5) Skeeter	5) Doug	5) Sabrina	5) Sabrina	5) Skeeter
OB	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold	1) Arnold
	2) Doug	2) Doug	2) Thorn	2) Doug	2) Doug	2) Thorn
	3) Recess	3) Recess	3) Skeeter	3) Recess	3) Thorn	3) Doug
	4) Skeeter	4) Thorn	4) Recess	4) Thorn	4) Recess	4) Skeeter
	5) Thorn	5) Skeeter	5) Doug	5) Skeeter	5) Skeeter	5) Recess

ALL=all age groups, YG=younger girls (Grades 2–4), YB=younger boys (Grades 2–4), OG=older girls (Grades 5–6), OB=older boys (Grades 5–6).

Although the pattern of favorite shows was similar for boys and girls, the same pattern of overall favorites (*Arnold–Doug–Thornberrys–Recess–Skeeter–Sabrina*) did not entirely hold up for both boys and girls. For example, girls selected *Sabrina the Animated Witch* (and *Pepper Ann* for the older girls) as favorite programs but these programs did not even make it into the boys' top five list for any of the waves. *Sabrina* was replaced by *Cousin Skeeter* in the boys' lists of favorite programs. The programs differ in that *Sabrina* features a female lead while *Cousin Skeeter* features a male lead. In addition, *Sabrina* focuses on interpersonal relationships while *Cousin Skeeter* uses more “put down” forms of humor.

It is striking that all of the children's favorite programs were stories with social–emotional themes. None of the favorite programs or most frequently viewed programs had an academic focus. In addition, the top three shows overall and four out of the top five shows were aired on Nickelodeon (*Hey Arnold*, *The Wild Thornberrys*, *Doug*). The remaining favorite programs were aired on ABC (*Recess* and *Sabrina*).

The most unpopular programs, as assessed by viewing frequency, are presented in [Table 2](#). The least viewed programs were *Anatole* (viewed by 1.23%), an animated story of an adult mouse and his family dealing with issues such as self-reliance; *Flying Rhinos Junior High* (1.27%), an animated prosocial story about personal issues like humility and confidence; *One World* (1.27%), a preteen/teen live program dealing with difficulties of teen life such as adoption and alcoholism; *Blaster's Universe* (1.39%), an animated story of a male character and his futuristic experiences; *Rescue Heroes* (1.39%), an animated action adventure story; *Mythic Warriors* (1.65%), a series of animated adventure stories about mythic characters from the past with themes such as self-esteem and resisting temptation; *Squigglevision* (2.32%), an animated academically oriented story that teaches science in a court of law, e.g., how levers work ([Jordan et al., 2002](#)).

As was the case with popular shows, unpopular television programs were relatively constant over the three waves of data collection, although *Flying Rhinos Junior High* appears to have become even more unpopular as the season progressed. All but one of the least

Table 2
Least viewed programs for each age group in each wave

Age group	Least viewed programs		
	Wave 1	Wave 2	Wave 3
All	1) Anatole 2) Blasters 3) Rescue 4) Rhino 5) Mythic	1) Rescue 2) Rhinos 3) Anatole 4) Blasters 5) One World	1) Rescue 2) Rhinos 3) Anatole 4) Mythic 5) Blasters
YG	1) Crypt 2) Anatole 3) NBA 4) Squiggle 5) Rhinos	1) Anatole 2) Sherlock 3) Crypt 4) Rescue 5) Rhinos	1) Mythic 2) Rhinos 3) One World 4) Crypt 5) Sherlock
YB	1) Blasters 2) One World 3) Anatole 4) Mythic 5) Rhinos	1) Blasters 2) One World 3) Crypt 4) Mythic 5) Rhinos	1) Rescue 2) Sherlock 3) Rhinos 4) Anatole 5) Squiggle
OG	1) Anatole 2) Mythic 3) Blasters 4) Rescue 5) Rhinos	1) NBA 2) Anatole 3) Rhinos 4) Rescue 5) Sherlock	1) Rhinos 2) Rescue 3) Anatole 4) Mythic 5) Blasters
OB	1) Rescue 2) Anatole 3) Crypt 4) Rhinos 5) Mythic	1) One World 2) Rescue 3) Rhinos 4) Squiggle 5) Blasters	1) Anatole 2) Blasters 3) City Guys 4) Rhinos 5) Mythic

ALL=all age groups, YG=younger girls (Grades 2–4), YB=younger boys (Grades 2–4), OG=older girls (Grades 5–6), OB=older boys (Grades 5–6).

viewed programs had a social–emotional rather than an academic focus. This pattern indicates that the academically oriented programs fell in the middle of the distribution with respect to viewing frequency, rather than being particularly favored or disfavored by the children in this sample.

The pattern of viewing suggests that age might have been a factor with respect to lack of an audience for *Rescue Heroes* and for *Blaster's Universe*, with older girls particularly unlikely to tune in for *Rescue Heroes*. Younger children, especially younger girls, were not in the audience for *Secrets of the Crypt Keeper*, in comparison to the other groups. Finally, examination of the six educational shows that were viewed the least out of the 29–31 offerings over the three waves reveals that five of the six were offered by CBS (*Anatole*, *Blasters Universe*, *Rescue Heroes*, *Mythic Warriors*, *Flying Rhinos Junior High*) and the other (*One World*) was broadcast by NBC.

2.3.1.2. Number of different educational and informational television programs viewed. A Grade level (2) \times Gender (2) \times Wave (3) mixed ANOVA was conducted on the percent of different educational and informational television programs viewed to determine if boys and girls of different ages differed in their propensity to watch educational TV programs. As expected, there were significant differences between the younger and older children, $F(1,541)=5.48$, $p<.05$, and between girls and boys, $F(1,541)=7.18$, $p<.01$, in how many different educational shows they watched. Younger children watched more different educational and informational programs than older children did [M_s (and SD_s)=10.70% (9.33) vs. 8.86% (8.04), respectively]. On average, younger children saw about three different educational programs per week whereas older children saw only about two different educational programs per week. Others have found that older children, particularly older boys, like educational programs less than younger children do (Calvert et al., 2002), particularly when they carry E/I labels (Krcmar & Albada, 2000). These differences may occur because younger children might still have viewing behavior shaped and restricted by parents and other adults more so than older children (Kotler, 2001). Older children may also receive more social pressure from their peers to view more adult-oriented programs or they may have more school and activity demands during the Saturday morning blocks when E/I programs are typically shown.

The gender difference in number of different educational shows viewed was due to a higher viewing rate by girls than by boys [M_s (and SD_s)=10.85% (9.41)% and 8.86% (8.04), respectively]. Girls have historically liked relationship-based television programs more than boys, and since many of these programs focus on relationships, they may well find these programs more appealing than do boys (Calvert et al., 2002). In addition, girls have been found to tolerate male leads in programs more than males have tolerated female leads, thus potentially making educational programs as a whole more appealing to girls than to boys (Calvert, 1999a).

This analysis also showed that children viewed more different educational programs in Wave 1 than in Wave 2 [M_s (and SD_s)=10.92% (9.60) and 9.34% (9.51) for Waves 1 and 2, respectively] and Wave 3 [9.31 (11.83)], $F(2,540)=11.20$, $p<.001$. Overall, then, children viewed the most different educational programs after the new fall line-up of television

programs appeared. When examined as a specific number of different programs rather than a percentage of the programs, a decline in the average number of programs viewed occurred over time as well [M s (and SD s)=3.38 (2.28), 2.71 (2.76), and 2.70 (3.43) for Waves 1, 2, and 3, respectively].

We were also interested in the number of children who did not view any educational and informational television programs. Children who viewed no educational programs during a particular wave are as follows: Wave 1, 31 out of 510 children (6.1%); Wave 2, 31 out of 516 children (6.0%); and Wave 3, 77 out of 471 (16.3%). It appears that the number of children who simply tune out educational programs altogether increases late in the season. Older boys were least likely to view educational programs (12.1% in Wave 1; 14.8% in Wave 2; and 34.9% by Wave 3) during all the waves of data collection, but this pattern became more pronounced late in the viewing season.

Television viewing has been observed to peak at the end of the elementary school years at 3 1/2 h/day (Roberts, Foehr, Rideout, & Brodie, 1999), but we found a decline in educational television viewing for our older elementary school children, particularly our older boys. While boys aged 8–18 spend more time viewing television programs than their girl peers (3 h, 26 min vs. 3 h, 4 min; Roberts et al., 1999), in our study boys were viewing fewer programs than girls [M s (and SD s)=2.64 (2.38) and 3.23 (2.79), respectively]. The younger children and girls in this naturalistic investigation viewed a greater number of E/I shows than older children and boys [M s (and SD s)=younger: 3.18 (2.76) and older: 2.64 (2.38), respectively]. These data suggest that boys and older children are watching television; it is just not educational and informational television programs. Even if children may have been watching some of these educational programs repeatedly, the finding that they were viewing only about three different educational and informational programs across all six broadcasters each week means that the potential value of exposure to quality television programs for children is not being realized for older children, particularly older boys.

2.3.1.3. Number of different Nickelodeon/PBS versus commercial broadcast programs viewed. The data concerning favorite shows presented in Table 1 were consistent with the hypothesis that children would prefer educational shows presented by Nickelodeon/PBS over commercial broadcast programs. A Grade (2) \times Gender (2) \times Type of broadcaster (2) \times Wave (3) mixed ANOVA was computed on the percent of different programs viewed by children to determine if the boys and girls did indeed prefer the programs offered by Nickelodeon/PBS over those offered by the commercial networks. Grade and gender were between-subjects factors; type of broadcaster (Nickelodeon/PBS vs. ABC, NBC, CBS, FOX) and wave were within-subjects factors.

As expected, children watched more different educational programs from Nickelodeon/PBS than from the five commercial broadcasters, $F(1,491)=555.70$, $p < .001$. In fact, the children watched almost three times as many different Nickelodeon/PBS shows as commercial network shows [M s (and SD s)=19.51% (14.35) and 7.13% (7.22), respectively]. While there are many potential explanations for why children watched nearly three times as many different Nickelodeon and PBS shows as different commercial educational programs, two of the most plausible are that (1) there are more potential options to view educational programs

on Nickelodeon and public television broadcasters than on the commercial broadcasters; and (2) the Nickelodeon programs were often the favorites of children, and hence, they were more likely to view them. One implication is that once you have an established audience, particularly an audience where you are showing their favorite programs, you may be able to keep them for other programs as well.

Over time, there was a significant decline in the number of different educational programs viewed from Wave 1 [M (and SD) = 3.38 (2.98)] to Waves 2 [2.71 (2.76)] and 3 [2.70 (3.43)], $F(2,490) = 5.67$, $p < .001$. This finding, coupled with a similar effect found for commercial broadcasters, suggested that the educational shows generally failed to hold their audience throughout the television season. However, there was also a significant Broadcaster type \times Wave interaction, $F(2,490) = 7.48$, $p < .01$ for the Nickelodeon/PBS program viewing trends that qualified this conclusion. In addition to the finding that Nickelodeon/PBS programs were viewed more than broadcast programs in all waves, the changes in children's viewing of Nickelodeon/PBS programs over time differed from the pattern of decline over the viewing season observed for commercial educational shows. Children viewed more different Nickelodeon/PBS programs during Wave 3 [M s (and SD s) = 21.08% (18.64)] than during either Wave 1 [19.12% (15.44)] or Wave 2 [18.32% (16.04)], which did not differ from each other. There was no such change over time for commercial broadcast programs.

The predicted main effect for type of broadcaster was also qualified by a Broadcaster \times Grade interaction, $F(1,491) = 8.37$, $p < .01$. Follow up t tests indicated that there was no difference between younger and older children in the number of commercial broadcast programs viewed [M s (and SD s) = 6.98% (7.34) vs. 7.33% (7.06) for 2nd–4th graders and 5th–6th graders, respectively]. However, the younger children viewed more Nickelodeon/PBS programs than the older children did [M s (and SD s) = 20.66% (15.28) vs. 18.02% (12.96), respectively]. The Nickelodeon/PBS line-up appears to focus on the early elementary rather than the preadolescent age group, as indicated by Nickelodeon's decisions to drop three of their preadolescent programs from their line-up over the course of the year². Since Nickelodeon's share of the audience actually improved after making this decision, it seems that their line-up at this time was geared toward, or more attractive to, the younger rather than later elementary grade audience.

2.3.2. Genre: *Animated comedy/dramas, live comedy/dramas, news/magazine*

We expected to find a developmental shift from a preference for animated to live program formats because the content presented in a cartoon format is usually preferred by younger children while the content in live formats is often more developmentally sophisticated. Cartoons may also be perceived by the children as a format that is more appropriate for younger than for older children. A Grade (2) \times Gender (2) \times Genre (3) \times Wave (3) mixed ANOVA was computed on the number of different programs that children viewed of each type of genre as the dependent variable to examine if there were age or gender differences in preferences for the types of show genres. Grade and gender were between-subjects factors, and genre and wave were within-subjects factors. This analysis yielded main effects for genre, $F(2,490) = 137.20$, $p < .001$, and wave, $F(2,490) = 10.98$, $p < .001$. Animated programs were preferred the most [13.76% (9.12)] followed by live programs [9.58% (11.51)] which, in turn,

were viewed more than news/magazine programs [7.31% (10.27)]. These patterns mirror the availability of these different kinds of genres for viewing.

As expected, younger children viewed more news/magazine programs than older children did, $F(2,490) = 7.53, p < .01$. An average (and *SD*) of 8.66% (11.45) of the educational shows younger children watched were news/magazine shows, while the 4th–5th graders watched only an average of 5.56% (8.20) news/magazine shows. There were no differences between the two grade groups in viewing patterns for animated comedies/drama or live comedy/dramas. The news/magazine programs were more academic in nature, and may have been more acceptable to a younger than to an older audience. Older girls, for instance, rarely selected an academic program as a favorite.

There was also a significant interaction between genre and child gender, $F(2,490) = 9.20, p < .001$. Specifically, girls viewed more live programs than boys did [*Ms* (and *SDs*) = 10.71% (12.73) and 8.32% (9.84) for girls and boys, respectively]. Because girls mature more rapidly than boys, the content of cartoons may continue to appeal to boys while girls are shifting to more sophisticated content about social relationships presented in live formats.

2.3.3. *Kind of lessons learned*

The types of lessons children wrote about were classified as cognitive, informational, social–emotional, or physical well-being. The possible range was 0–1 for each of these four lesson dependent variables (See the description of scoring categories in the Appendix). The actual range of scores earned by the children was as follows: cognitive lessons (0–.39), informational lessons (0–.89), social–emotional lessons (0–1.00), physical well-being lessons (0–.67).

To examine the kind of lesson that children learned from the educational/informational shows they watched over the three waves, a Grade (2) × Gender (2) × Wave (3) × Type lesson (4) mixed ANOVA was conducted with the frequency of type of lessons learned as the dependent variable. Significant main effects for gender, $F(1,491) = 3.91, p < .05$; lesson, $F(3,489) = 302.21, p < .001$; and wave, $F(2,490) = 18.78, p < .001$, were obtained. Girls reported more lessons than boys did [*Ms* (and *SDs*) = 0.62 (0.36) vs. 0.56 (0.35)] and fewer lessons were learned with successive waves of data collection [*Ms* (and *SDs*) = Wave 1: 0.65 (0.45) vs. Wave 2: 0.60 (0.47) vs. Wave 3: 0.52 (0.47)]. As expected, social lessons were reported most often [*Ms* (and *SDs*) = 0.42 (0.32)], followed by knowledge/information lessons [*M* (and *SD*) = 0.11 (0.18)], physical well-being lessons [*M* (and *SD*) = 0.04 (0.09)], and cognitive skills lessons [*M* (and *SD*) = 0.02 (0.06)]. The greater number of social and emotional themes reported may well have occurred because that was the main kind of program available for children to view.

The main effects of lesson and gender were qualified by a Lesson × Gender interaction, $F(3,489) = 5.59, p < .01$. Girls reported learning more social–emotional lessons than boys did [*Ms* (and *SDs*) = 0.46 (0.33) vs. 0.38 (0.30)]. By contrast, boys reported more cognitive lessons than girls [*Ms* (and *SDs*) = 0.03 (0.08) vs. 0.01(0.05)]. There were no gender differences in frequency of informational or physical well-being lessons learned. The results may reflect girls' strong preferences for programs with social and emotional themes (Calvert et al., 2002). Few programs with physical well-being or cognitive lessons were available,

though boys did report slightly more cognitive lessons than girls, perhaps reflecting boys' traditional interest in science (Ruble & Martin, 1998).

The main effect of wave was qualified by a Lesson \times Wave interaction, $F(6,486) = 5.27$, $p < .001$, which is depicted in Fig. 1. As can be seen in Fig. 1, a consistent pattern was evident over time in the kinds of lessons children learned. Specifically, social–emotional lessons were learned most often, followed by informational lessons, physical well-being lessons, and cognitive skills lessons, respectively. Over time, however, social emotional lessons declined in frequency, slightly from Wave 1 to Wave 2, but with a significant drop in Wave 3. Reports containing informational lessons also declined over time, but a significant decrease occurred in Wave 2 and remained lower in Wave 3 than they had been in Wave 1. There was no change by wave in the number of cognitive skills or physical well-being lessons reported, but those were already low in frequency.

We were also interested in the number of children who did not write reports that had any discernible lesson. Although almost all children had a discernible lesson in at least one wave of data, there were 31 students (6.3%) who reported no discernible lessons in any of their reports submitted for all three waves of data.

2.3.3.1. Kind of lesson learned from shows on different types of broadcast stations. We hypothesized that children would learn more social–emotional lessons from commercial broadcasts than from Nickelodeon/PBS programs. To examine broadcaster differences in the kind of lesson that children learned, a Grade (2) \times Gender (2) \times Type of broadcaster (2) \times Type of lesson (4) mixed ANOVA was conducted on the frequency of each kind of lesson contained in the children's reports. Grade and gender were between-subjects factors while broadcaster and lesson and wave were within-subjects factors.

The same pattern of significant findings for types of lessons overall and for types of lessons reported by boys versus by girls were obtained for the 328 children included in

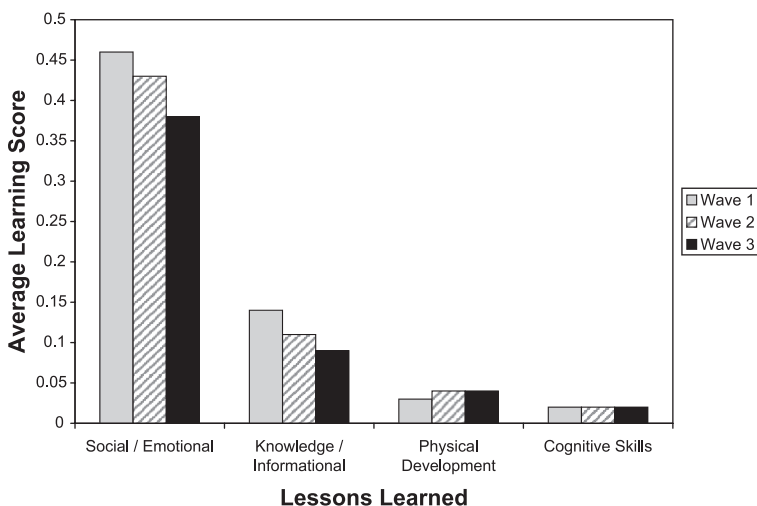


Fig. 1. Kinds of lessons learned as a function of time.

this analysis.⁴ In addition, this analysis of the frequencies of types of lessons generated for Nickelodeon/PBS versus commercial broadcasters yielded a Type of broadcaster \times Gender interaction, $F(1, 326)=7.64, p<.01$. Contrary to prediction, boys reported a significantly greater number of social–emotional lessons from Nickelodeon/PBS programs than from commercial broadcast programs [M_s (and SD_s)=0.42 (0.39) vs. 0.33 (0.42) for the two types of broadcasters, respectively]. The girls' ratings of social–emotional lessons did not vary with type of broadcaster. There was also a significant Broadcaster \times Gender interaction for number of informational lessons reported, $F(1,326)=3.98, p<.01$. Boys reported significantly more informational lessons from commercial broadcast programs than from Nickelodeon/PBS shows, [M_s (and SD_s)=0.19 (0.35) vs. 0.12 (0.26)]. Again, there were no differences between types of broadcasters for the girls' reports of informational lessons [M_s (and SD_s)=0.11 (0.27) vs. 0.12 (0.24) for commercial vs. Nickelodeon, respectively]. For cognitive lessons, there was a significant effect for gender, with boys reporting more cognitive lessons than girls [$F(1, 326)=11.27, p<.01$; M_s (and SD_s)=0.03 (0.10) vs. 0.01 (0.05)]. There were no significant effects when lessons about physical well-being were analyzed.

In sum, there was no support for the hypothesis that children learned more social–emotional lessons from programs broadcast on commercial stations than on Nickelodeon/PBS. Instead, boys reported more social–emotional lessons from Nickelodeon/PBS programs and more informational lessons from commercial broadcast programs. There were no differences in any of the types of lessons learned across the different types of broadcasters for girls. Put another way, boys learned different kinds of lessons from different broadcasters' programs, but girls did not. Girls mainly reported social–emotional themes, regardless of broadcaster.

2.3.4. Report strength: Clarity, consistency, engagement, and generalizability

The assessment of the strength of children's reports reflects how much of the lesson inherent in the television show was conveyed through the child's report as well as the quality of their understanding of the lesson. These components of lesson strength were defined in terms of clarity of the lesson presented in the report, the child's inclusion of the lesson consistently throughout the report about the entire story line, the child's engagement in conveying the show line, and the child's generalization of the story lesson from the specific situation in the show to their own life. The strength of children's reports was expected to be greater for older children, particularly for lesson generalization, because we expected transfer of knowledge to occur more readily for older than for younger children (Bransford et al.,

⁴ This analysis was conducted only with children who chose both commercial broadcast and Nickelodeon/PBS programs as favorites across waves ($n=328$) so that a within-subjects comparison could be made across broadcasters. The analysis was collapsed across waves because only 12 children chose favorite programs from both commercial and Nickelodeon/PBS programs within and across waves. There were 140 children who chose only Nickelodeon/PBS as favorites and 27 who chose only commercial broadcast broadcasters as favorites. These children were not included in the present analysis. However, there was no significant difference in overall lessons reported by students who chose only Nickelodeon/PBS programs compared to those who only chose either broadcast programs or both kinds of broadcaster programs.

1999). The ratings of the strength of children's reports were analyzed using a Grade (2) × Gender (2) × Wave (3) × Strength component (4) mixed ANOVA. For each of the strength components (clarity, consistency, engagement, and generalizability) the possible range of scores was from 0–2 (see Appendix).

The analysis yielded a main effect for gender. Overall, girls' reports were rated as stronger than boys' reports [$F(1,491)=5.83, p<.01$; M s (and SD s)=2.75 (1.96) and 2.33 (1.68) for girls and boys, respectively], a finding supported by prior reports of girls' superior writing skills during this age (Ruble & Martin, 1998). There were also differences observed for wave, $F(2,490)=6.18, p<.01$, and across the four strength components, $F(3,489)=168.22, p<.001$. Total report strength scores were not significantly different at Waves 1 and 2 [M s (and SD s)=2.62 (2.12) and 2.66 (2.30), respectively], but the overall strength of reports was higher during Wave 1 than at Wave 3 [M (SD)=2.36 (2.28)]. A significant interaction of wave and strength component [$F(6,486)=6.75, p<.001$] revealed that it was the clarity and generalization aspects of report strength scores that dropped over time. Scores for the children's clarity of the reported lesson in the TV shows during Waves 1 and 2 were similar to one another and both were higher than Wave 3 scores [M s (SD s)=0.80 (0.71) and 0.79 (0.72) for Waves 1 and 2, respectively; and 0.66 (0.69) for Wave 3]. Similarly, lesson generalization scores during Waves 1 and 2 did not differ from one another [M s (SD s)=0.90 (0.72) and 0.87 (0.73)] and both were higher than Wave 3 scores [M (SD)=0.77 (0.75)]. As children developed over the course of the study and became more familiar with these programs, they may have found the lessons in the programs less relevant to their own lives, thereby decreasing generalization. Some of the programs were also reruns; repeated exposure might have helped students notice and/or consolidate some of the lessons presented, or children may have become more bored if repetition occurred too frequently. Some reports that vary on the dimensions of clarity and generalization illustrate the differences in strength of reports along these dimensions.

Prosocial program Wave 2 report about Hey Arnold! by Marroon Typhoon, 5th grade girl: (High clarity)

This episode is when Arnold and his class go to the aquarium and his friend tells him about this big scary animal named Lock Jaw. When Arnold finally sees Lock Jaw, he is just a turtle and he has paint on his shell and kids throw stuff at him. Arnold was the only one who realized it. Afterwards Arnold and his Grandmother went to the aquarium and they cleaned Lock Jaw and sent him free. I learned that you should do your best to keep the environment and the animals in it clean and healthy.

Prosocial program Wave 3 report about Hey Arnold! by CeCe, 5th grade girl: (Low clarity—no clear lesson in child's report)

On ARNOLD'S Danengreous Lumber Arold Has to hit 3 Home runs for the kurs to Beaver. But if he does not hit 3 home runs He will be kurst forever. The kurs is Dangrous lumber. One of the famous baceball players named micke kay line had a friend with

dangerous lumber. At the end Arnold's dangerous lumber is over. and thay wine the of baceball agonts the 5 graders.

Prosocial program Wave 1 report about Sabrina by Aleah#5, a 6th grade girl: (High generalization—describes lesson as applicable to own life)

Today Sabrina brought back TommasEdison from the past to help her with her science project. She has a limited time to keep Tom there because all of the things he invented were disappearing. Bringing him back was a way of cheating. I learned you should never cheat on a test. It's funny there was a science test today in school and one of my friends said that another one of my friends cheated. Well I guess I learned the same lesson twice.

Prosocial program Wave 3 report about The Wild Thornberries by dog, 5th grade girl: (Low generalization)

Some monkeys are causing a proplem. There are diffrent monkeyes there are good monkeyes and bad monkeyes. Eliza is on the good side and Darwain is on the bad side. They didn't want to fight.

The findings concerning higher overall lesson strength scores for girls than for boys were also qualified by a Gender \times Strength component interaction, $F(3,489) = 3.54$, $p < .05$. Follow-up tests indicated that girls' superiority in strength of their reports of the lessons lay mainly in the components of consistency [M_s (SD_s) = 0.64 (0.54) and 0.48 (0.43) for girls and boys, respectively], and involvement [M_s (SD_s) = 0.45 (0.43) and 0.33 (0.36), respectively]. See the following reports as illustrations of these differences.

Academic program report about Magic School Bus by Louise, a 5th grade girl: (High consistency)

The show was about the water cycle. It was teaching me about accumulation, precipitation, condensation, and evaporation. It taught me how they work and it goes over and over. When the water comes up it turns into little dots and turns into clouds. Then it goes together to make one big cloud and rains. Water goes throw soemthing that cleans the water and turns fresh. I learned that we can learn more about the water cycle and get a good grade for testes. This can also be a hlep by studying it.

Academic report about the Magic School Bus by Scott, a 5th grade boy: (Low consistency)

They went on a trip. They went in the ocean. and a volcano came up. I learned about what it looks like inside your stomach.

Academic program report about Nick News by Hippie, a 5th grade girl: (High engagement)

I watched Nick News. It was about ADD. I was very intested in it because I have ADD. I learned to take whats given to you to help this and maby it will help the problem.

Academic program report about Bill Nye the Science Guy, by Art, a 6th grade boy: (Low engagement)

We learned stuff about science and other stuff.

The predicted advantage of older over younger children in report strength occurred only in the beginning of the season, during Wave 1, $F(2,490)=3.92$, $p<.001$; means (SDs)=2.92 (2.32) and 2.39 (1.92), respectively. Furthermore, this age difference was due to stronger reports of older children in the area of engagement, i.e., a significant Grade \times Strength component \times Wave interaction was found, $F(3,489)=7.43$, $p<.001$. Older children were more engaged than younger children during Wave 1 [M s (and SD s)=0.48 (0.46) and 0.33 (0.35), respectively]. Contrary to prediction, older children did not generalize program lessons more than younger children. This may have occurred because the lessons in the programs were often directed at our younger more than at our older preadolescent participants, thereby making it easier for the younger children to draw links between the program lessons and their own lives.

The ratings of different aspects of report strength all differed significantly from one another, suggesting that these skills might develop asynchronously during the elementary school years. Lesson generalization was rated most highly in the children's reports, M (SD)=0.84 (0.59), followed by lesson clarity, $M=0.75$ (0.56), lesson consistency, $M=0.56$ (0.49), and lesson engagement, $M=0.39$ (0.41). Recall that scores range from 0–2, which indicates that lesson engagement is quite low overall compared to other areas of lesson strength, suggesting that children are not tremendously engaged by these educational television programs. The generalization scores suggest that applying the material to children's own lives may be the most relevant activity for them and may be an important reason for selecting a program as a favorite and for continuing to view educational programs at home.

2.3.5. Relation between the kind of lesson reported and report strength

Partial correlations controlling for gender and grade were computed to examine the relationship between the kinds of lessons learned and report strength collapsed across all waves. As seen in Table 3, scores for each kind of lesson were related to measures of report strength. That is, when the reports contained any form of social–emotional, informational, physical well-being, or cognitive lessons, the lessons tended to be presented more clearly, more fully integrated throughout the report, demonstrated greater lesson engagement, and were more generalizable, i.e., applied by children to their lives.

Table 3

Partial correlations between kinds of lessons learned and lesson strength controlling for children's age and gender

Lesson type	Educational strength			
	Clarity	Consistency	Engagement	Generalizability
Social–emotional	.76***	.73***	.61***	.82***
Informational	.23***	.10*	.09*	.20***
Physical well-being	.18***	.13**	.11*	.13**
Cognitive skills	.12**	.10*	.21***	.13*

* $p < .05$. ** $p < .01$. *** $p < .001$.

The relationship between type of lesson reported and educational strength was consistently strong for reports that contained social–emotional lessons. Although the partial correlation coefficients for educational strength were also significant for the other kinds of lessons, i.e., for informational, physical well-being, or cognitive lessons, the correlations were low, reaching toward a moderate degree of association in only a few cases, such as strength of clarity and relevance in learning reports taken from informational lessons and degree of engagement in lessons focused on cognitive skills (See Table 3). A report that received high scores on all components of report strength is included to illustrate this correlation among the strength components. Note that it is a well-written report by an older boy, a member of the group that we often lost during the course of the year.

Prosocial program report about Hey Arnold, by Nyeinyboy, a 6th grade boy: (High in all report strength components)

This episode was about Dino Spemoni (a musician). Dino Spemoni was Arnolds grandparents favorite singer of all times. But now he died in a boating accident. Everybody was real sad but the next day he showed up in a garbage can by Arnolds house. Arnold ended up hiding his friend in their grandparent's bording house. Arnold found out that Dino had a plan, he figured his sales were down, after all he was a 50's singer, and most people don't make real money untill they're dead. Nobody knew he could swim so he jumped overboard and swam to shore so people would think he's dead, even though he really isn't. most people in the bording house thought Dino was a ghost. Dino thought he was having a good time, but he really wasn't. Dino had created a great new song but then Arnold made him remember that to everybody else in the world he was either dead or a ghost. Dino kept on living like that untill there started being Dino impersonaters that made big bucks. That made him really mad! So Dino walked him self right over to the Incredibly Real Spemoni Simulation, knocked out the impersonater, and sang his song, to the whole world! From this I learned That life is to precious to waste just for money, and to live life for all it's worth, and for the basketball player to keep shooting, the artist to keep painting, the scientist to keep studying, and the singer to keep singing!

The particularly strong relation between educational strength components for social–emotional programs may be occurring because these are the kinds of programs they are often viewing.

2.3.6. Viewing information from Nielsen Media Research

Although the sample of children included in the present study represented different age groups, geographical locations, socioeconomic statuses, private and public schools, and lived in different types of communities, data available from the Nielsen ratings provide an opportunity to validate some of the observations made using our on-line reporting procedures with a larger, randomly selected national sample that is also followed over time. Nielsen viewing pattern data were available for two thirds of the programs included in the naturalistic study. Data for PBS programs were unavailable. The Nielsen data included a representative

national sample of both boys and girls. Their age categories differed slightly from the age groups of the present study. The Nielsen younger children ranged from 6–8 years old as compared to 7–10 years in our study; the older children in the Nielsen sample were 9–11 years old whereas the older children in our sample were approximately 11–13 years old.

Nielsen uses three major ways to analyze data: ratings, shares, and audience in thousands. Ratings reflect the percent of the total population viewing a particular program while shares signify the percent of the available audience viewing a particular program (Calvert, 1999a). Audience in thousands is a measure of the number of viewers of specific programs during the average minute. We analyze the audience of specific programs in thousands for all programs from our sample that Nielsen Media Research could provide for three waves of data. We collapsed across broadcaster since data were not available for PBS programs.

Data that describe the most viewed programs in the Nielsen data are presented in Table 4. As seen in Table 4, the most frequently viewed programs for girls and boys at younger and older ages are similar to those obtained from the sample studied on-line in the present study (cf. Table 1).

Two separate Gender (2) \times Wave (3) mixed ANOVAs were conducted on audience in thousands for the 23 programs for older children (20 programs for the younger children) in our study that Nielsen also included in their data gathering. This analysis did not include the factor of type of broadcaster since the Nielsen data do not include PBS programs. Separate analyses were conducted for younger and older children because there was an imbalance in the data available for children in the two age groups, with more Nielsen data available for older than younger children.

Table 4
Rankings of most viewed educational television programs by age and sex based on Nielsen ratings

Rank	Time period (wave), child age group and child gender					
	Younger boys (6–8 years)			Younger Girls (6–8 years)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
1	Skeeter	Thornberrys	Arnold	Thornberrys	Thornberrys	Arnold
2	Thornberrys	Skeeter	Skeeter	Skeeter	Sabrina	Thornberrys
3	Arnold	Arnold	Thornberrys	Arnold	Arnold	Skeeter
4	My Brother	Sherlock	Sherlock	My Brother	Skeeter	Sabrina
5	Doug	Sabrina	Magic	Clarissa	Pepper	Doug
	Older Boys (9–11 years)			Older Girls (9–11 years)		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
1	Skeeter	Thornberrys	Arnold	Skeeter	Sabrina	Sabrina
2	Thornberrys	Arnold	Skeeter	Sabrina	Thornberrys	Skeeter
3	Sherlock	Skeeter	Thornberrys	Thornberrys	Skeeter	Arnold
4	Arnold	Sabrina	Sherlock	Arnold	Arnold	Thornberrys
5	Sabrina	Sherlock	Sabrina	My Brother	Doug	Doug

Recess, which was very popular in our sample, was not available as a separate program in Nielsen data. It was combined with *One Saturday Morning*, part of the Disney line-up. Therefore, *Recess* could not be included here. Courtesy of Nielsen Media Research.

Fig. 2 presents the average viewing audience per thousand for boys and girls in each age group during each wave of data collection in the present study. As seen in Fig. 2, there was a decrease in viewing educational programs across waves by older children, $F(2,21)=11.15$, $p<.01$, as was found in the data gathered in the course of the on-line data of our naturalistic study.

Although this difference reached the level of significance only for older children in the Nielsen data set, the Nielsen means for girls' versus boys' frequency of viewing of educational programs were consistent with our findings. During all waves, girls viewed more educational shows than boys, $F(1,22)=4.40$, $p<.05$. Thus, Nielsen data provide important validity information concerning the observations obtained in the on-line naturalistic study of viewing patterns.

2.3.7. Summary: What we know about the natural television viewing experiences of children after implementation of the Three-Hour Rule

2.3.7.1. *Favorite shows and viewing patterns.* Overall, children's favorite programs and most viewed programs were the same, and those selections were consistent over time. The congruence between the children's reports of their favorite shows and reported viewing patterns provides some evidence of the reliability of the children's reports. Consistent with broadcaster beliefs (Jordan, 1996), the reports of favorite shows, reports of viewing behaviors, and Nielsen assessments show that younger elementary school children watch educational and informational programming more frequently than older children. The number of different educational and informational shows that the children reported watching varied with gender, period of the viewing season, and type of broadcaster as well as age. Girls watched more different educational programs than boys.

More educational shows were watched by the children in this study and those captured in the Nielsen ratings at the beginning of the television season in the fall months than later in the season. Thus, educational and informational television programs lost much of their potential

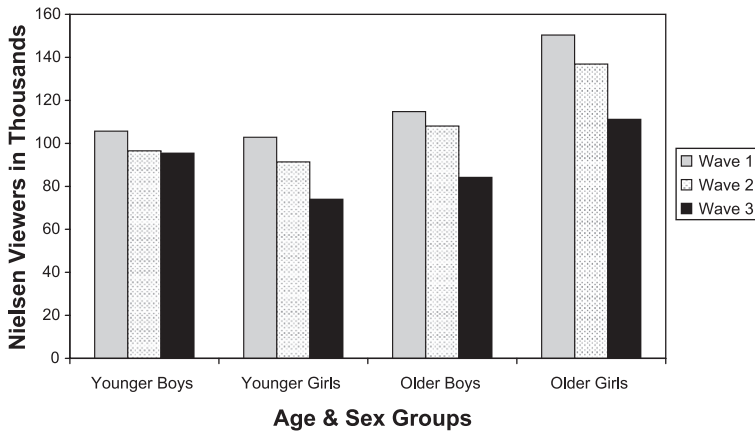


Fig. 2. Nielsen educational program viewership over time by age and sex groups.

audience after the new fall season, which brought new program offerings, had passed. During the course of the year, Nickelodeon began to drop some educational and informational programs from their schedule. However, children did watch more different educational shows on Nickelodeon/PBS at the end of the season than they did at the beginning of the season. Dropping these programs seems to have increased the overall percentage of different Nickelodeon/PBS programs that children viewed, perhaps as an artifact of having a smaller base of educational shows at the end of the season. By contrast, the commercial broadcasters added a couple of programs to their schedule and did not drop any programs. This kept their overall viewing rates of different programs similar over time, though they could not beat the combined Nickelodeon/PBS lineup. This could have also been due to the tendency of the commercial networks to run their educational lineups against one another on Saturday mornings and to broadcast their programs less frequently than Nickelodeon/PBS did with their lineup, which enabled children to sample more programs from the total lineup from Nickelodeon/PBS.

Overall, children watched a greater number of educational programs on Nickelodeon/PBS than on commercial television broadcasters. But this finding might be due to the behaviors of the younger viewers. It was also found that younger children watched more different educational shows on Nickelodeon than on the commercial networks, but the younger and older children did not differ from one another in their viewing of educational shows on the commercial networks. The low level of viewing Nickelodeon programs by older children may have occurred because Nickelodeon dropped most of the programs targeted at the preadolescent age group. Perhaps Nickelodeon and PBS have become branded as a station for younger children because they pull young children into their line-up early with Nickjr (for preschoolers) and PBS Kids (mainly for preschoolers), thereby contributing to their later loss of the oldest viewers by the end of the elementary age years who may then think of these broadcasters as being for younger viewers.

2.3.7.2. Genre. The genre of programs that children viewed was consistent with the kinds of programs available for them to view (see Jordan et al., 2002). Findings indicated that children preferred educational programs that were animated more than live action shows, and preferred news/magazine formats the least. Within these categories, though, younger children watched more expository news/magazine format shows than older children, and older children preferred live action shows more than younger children did.

2.3.7.3. Kinds of lessons learned. Social–emotional lessons were reported most often, followed by informational lessons, physical well-being lessons, and cognitive skills lessons. These findings are consistent with a prior assessment of children’s learning from educational television programs (Calvert et al., 2002). The high incidence of social–emotional lessons might reflect the higher frequency of shows with socioemotional themes. Within the types of lessons assessed, girls reported more social–emotional lessons than boys, who, in turn, reported more cognitive lessons. These findings are consistent with girls’ preference for social–emotional programs that have demonstrated positive effects of prosocial television, particularly altruism, on girls (Mares, 1996). The findings that boys in the present naturalistic

study were more likely than girls to report cognitive lessons from their favorite educational and informational television programs suggest important academic benefits might exist. Prior studies have shown, for instance, that boys who watched educational television programs during the preschool years had better academic success when they were adolescents (Anderson et al., 2001).

Socioemotional lessons were more likely to be reported in the earlier two phases of the viewing season than during the last wave of data collection. When boys reported social–emotional lessons, they were more likely to be from shows broadcast by Nickelodeon/PBS than from commercial broadcasters; when the boys reported informational lessons, the lesson were more often from shows from commercial television than from Nickelodeon/PBS. Girls primarily reported social and emotional lessons, regardless of the broadcaster.

2.3.7.4. Strength of lesson reports. Report strength was found to be higher in older than younger children, but this effect was due to high report strength for older children only during the first wave of data collection. This age difference was due to greater engagement during the beginning of the viewing and reporting season, perhaps because that is when the new fall schedule of programs began.

In addition, girls' reports were rated higher in strength than boys' reports in the areas of consistency and engagement. The lessons in children's reports were stronger for clarity and for generalization in the first two waves of data collection than during the third wave. Over all reports, children scored highest in the area of generalizability, followed by clarity, consistency, and engagement. All four components of report strength were strongly correlated for programs that had social and emotional lessons, even when grade and gender were controlled.

The decline in the number of programs viewed, the number of lessons reported, and the educational strength of lessons paralleled the decrease in the number of different educational and informational children's programs broadcast on Nickelodeon and PBS. The data suggest that children eventually moved away from educational and informational programs, even if they watched them early in the school year. Alternately, children may be watching the same shows repeatedly because Nickelodeon and PBS show the same series over the course of the week. That is, a child may have viewed *The Wild Thornberrys* four times, but we only captured it once. However, Nielsen data provided validation for the decline we found in older children's viewing of educational and informational television programs, suggesting that there is a real decline in children's viewing of educational programs over the course of the viewing season.

3. What do children experience from E/I programs?

3.1. Popular and unpopular educational programs: Children's interest and learning

The findings from the longitudinal naturalistic study suggest that younger children and girls are most likely to view a number of different educational and informational programs,

and that older children and girls generally demonstrate stronger reports of lessons than younger children and boys. Findings also revealed that children in all grades might lose interest in educational and informational television programs over the viewing season. Older boys in particular became least likely to view any educational programs at the end of the season, from April–June.

A second study of children's learning from the most- and least-viewed programs was conducted in order to discover what makes some of these educational programs interesting and understandable to children. Multiple measures of memory, including free recall, recognition of multiple-choice items, and picture sequencing, were used to assess children's comprehension and learning. A motivational measure was included to enable us to examine the appeal of specific programs. These measures were used because we assumed that when children are interested in particular television programs, they also tend to recall them better (Calvert, 1999a, 1999b). Finally, the relationship of children's viewing patterns and learning was linked to the educational strength of the content of television programs. APPC scorers who were trained in content analysis of educational/informational television programs had evaluated the educational strength of those programs independently.

Our major hypotheses for this study were that (1) younger children would like the educational and informational programs more than would older children because the programs are targeted at their age group (Calvert et al., 2002; Jordan et al., 2002); (2) children would prefer the prosocial programs more than the academic programs (Calvert et al., 2002); (3) children would like the popular more than the unpopular programs; (4) older children would understand the content more than would younger children (Calvert et al., 1982); (5) children would understand the content presented in the popular programs more than content presented in the unpopular programs (Calvert, 1999a); (6) children would understand the content from the prosocial programs better than content from the academic programs; and (7) children would learn more from programs that had been rated higher in educational strength by the APPC because we expected their messages to be clearer, more understandable, and more applicable to their lives (Jordan et al., 2002).

3.2. Method

3.2.1. Participants

The participants were 141 children from one elementary and one middle school in suburban Maryland who also were participants in the broader naturalistic Internet study. There were 60 second, third, and fourth graders (n 's = 28 boys, 32 girls) and 81 fifth and sixth graders (44 boys, 37 girls).

3.2.2. Materials and design: Television shows as experimental stimuli

Based on children's naturalistic viewing patterns during the first wave of data collection (which was supported by information from the Nielsen Media Research), we selected the most- and least-viewed educational television fare for programs with

two types of content: prosocial (presenting social–emotional lessons) and academic (presenting cognitive skills/informational lessons).⁵ The 16 programs from Nickelodeon/PBS and the four commercial networks formed four cells of a design that crossed program popularity (most- vs. least-viewed programs) with broadcaster type (commercial network vs. PBS/Nickelodeon). The design of the study is represented in Table 5. Within each cell, two programs focused on academic content and two focused on prosocial content.

Within age groups and schools, small groups of children were randomly assigned to view one academic and one prosocial program from one of the four cells of Program popularity \times Broadcaster type. Within each cell, half of the children viewed one pair of academic and socioemotional programs and the other half viewed the other pair. This yielded a $2 \times 2 \times 2 \times 2 \times 2$ (Grade \times Gender \times Program popularity \times Broadcaster type \times Program Content: academic vs. socioemotional) design with program content as a within-subject variable. Pairs of programs with academic and socioemotional content were nested within program popularity (defined by viewing frequency) and broadcaster type.

Adult raters at the APPC scored, or had previously scored, the content of each of the 16 program episodes for each of the components of educational strength, i.e., lesson clarity (explicitness of the lesson in the program presentation), integration (salience and presentation of the lesson throughout the program), involvement (degree of challenge and engaging quality of the lesson), and applicability (usefulness of the lesson to the child's life). Lesson clarity, integration, and applicability were scored according to presence [either No (0) or Yes (1)]. Scores for lesson involvement were based on “no” versus “yes” responses to three different criteria: (1) whether the program included characters that were children or childlike; (2) whether the majority of production techniques were appropriate and engaging; and (3) whether the conveyance of the lesson was appropriate for the target audience. Scores for lesson involvement were then standardized on a 0–1 scale to yield scores that were consistent with the other measures of program educational strength. The components of program educational strength, i.e., lesson clarity, lesson integration, lesson applicability, and lesson involvement, were summed for each of the 16 episodes to form a composite score with a possible range of 0 to 4. Scorers at APPC also assigned each program episode a categorical score for subjective educational quality (minimally educational, moderately educational, highly educational), and a global assessment score (0–2) that reflected the coder's assessment of the success of the episode in teaching the target audience something meaningful. The APPC scores assigned to the content of each of the 16 episodes included in the experimental study are presented in

⁵ The program sample from Wave 1 included 31 educational and informational programs broadcast by the four major commercial networks and by PBS/Nickelodeon. Because only one program from PBS/Nickelodeon fell in the bottom half of the distribution, two episodes of that program were used as least viewed “unpopular” stimuli. In addition, the four commercial networks provided only three academically oriented programs as examples of their E/I programming, so two episodes of the unpopular academic program were used as stimuli. Except for the episodes that were added, the specific television programs shown were drawn from the 1998 and 1999 APPC samples of programs that had been rated for educational strength.

Table 5

Categorization by popularity and content of the 16 television programs used as stimuli in the experimental study

Type of program	Type of broadcaster	
	Commercial broadcasters	Nickelodeon/PBS
Popular		
Academic	<i>Magic School Bus</i> (S)	<i>Wishbone</i> (S)
	<i>Bill Nye</i> (M)	<i>Zoom</i> (M)
Prosocial	<i>Recess</i> (S)	<i>Hey Arnold</i> (S)
	<i>Sabrina</i> (Animated) (S)	<i>Doug</i> (S)
Unpopular		
Academic	<i>Squigglevision-Siphon</i> (S)	<i>Kratts' Creatures</i> (M)
	<i>Squigglevision-Rocks</i> (S)	<i>Nick News</i> (M)
Prosocial	<i>Anatole</i> (S)	<i>Shelby Woo-UFO</i> (S)
	<i>Blaster's Universe</i> (S)	<i>Shelby Woo-Baseball</i> (S)

S = story, narrative format; M = magazine, expository format.

Table 6. The 16 episodes are presented in order of popularity from most popular (1) to least popular (16), with popularity defined by viewing frequencies of children included in the naturalistic study. For reliability and other information on the APPC Coding System, see [Jordan \(1996\)](#).

Table 6

Popularity and educational strength of programs in the experimental study

Popularity rank	APPC coding for program educational strength		
	Composite score ^a	Global score ^b	Categorical score ^c
1. Hey Arnold!	3.00	2.00	high
2. Doug	2.66	1.00	moderate
3. Recess	2.66	1.00	moderate
4. Sabrina	3.66	1.00	moderate
5. Wishbone	4.00	2.00	high
6. Magic School Bus	4.00	2.00	high
7. Zoom	4.00	2.00	high
8. Bill Nye	4.00	2.00	high
9. Kratt's Creatures	4.00	2.00	high
10. Shelby Woo/UFO	2.66	1.00	moderate
11. Shelby Woo/Baseball	4.00	2.00	high
12. Nick News	4.00	2.00	high
13. Squigglevision/rocks	4.00	2.00	high
14. Squigglevision/siphon	4.00	2.00	high
15. Blaster's Universe	3.00	1.00	moderate
16. Anatole	2.00	.00	minimal

^a(Scale 0–4).^b(Scale 0–2).^c(Minimally Educational–Highly Educational).

3.2.3. Procedure

Children were randomly assigned to small groups who viewed the two television programs they were assigned on two separate days. Children sat at school desks or on beanbag chairs as they viewed a program in a classroom. Comic books were available for reading as a distractor task, as has been done in previous studies (e.g., Calvert et al., 1982; Wright et al., 1984).

After viewing a program, each child responded to a series of questions designed to assess their motivation to view the show and then completed three types of comprehension measures: (1) free recall of the program content; (2) multiple-choice questions of the central and inferential program content; and (3) picture sequencing of key program events. Two 45–60-min sessions were required for each group of children to view the programs and to complete the motivation and learning measures. Older children read the directions and answered questions by themselves. An adult read the directions and questions to the younger children.

3.2.4. Motivation and comprehension measures

3.2.4.1. Motivational measure. Children's motivational appeal was assessed using several Likert items that assessed how much children liked the particular programs that they saw (Calvert, 1999b). For example, children were asked, "How much did you like *Doug*?" Potential responses were "I did not like it" (score = 1), "It was OK" (2), or "I liked it a lot!" (3). The range of possible appeal scores was 1–3. A similar Likert measure assessed the degree to which children found the program to be for kids who were their age or their own gender, qualities that were expected to relate to how much they liked the program. For example, children were asked to respond to items that assessed whether the program was for children "younger than me" (1), "about my age" (2) or "for someone older than me" (3). The ideal score is "about my age" or "older than me" rather than "younger than me" as the latter suggests that the content is "babyish."

3.2.4.2. Free recall. After completing the motivational measure, children were given a sheet of paper with the same question that was asked in the naturalistic Internet study. Specifically, they were asked to write a story so that a friend who had not seen the program would understand it, and they were asked to write what they had learned from viewing the program. This measure provided information about the lesson that the children saw in the program on their own, as expressed in their own words. It also provided an opportunity to compare the quality of reports that were written on the computer versus "live" and by hand.

3.2.4.3. Multiple-choice measure. Comprehension of content was also assessed using a multiple-choice measure. This measure focuses on whether children can recognize aspects of the lesson that they might not have been able to spontaneously produce on their own with a free recall measure. In addition, this method enables assessment of understanding

of the program while minimizing possible age or gender differences in children's verbal expressive skills (Calvert et al., 1982).⁶

A core set of 10 explicit (central) and 7 implicit (inferential) questions for each program were placed in a booklet in a random order in a multiple-choice format. The explicit questions tapped children's understanding of main themes and facts that were directly stated or shown in the program. Implicit questions tapped children's understanding of main themes that were implied in the program but were not explicitly shown or stated. This measure tested children's ability to make inferences, to understand character emotions, and to comprehend abstract cause–effect sequences and relations. Understanding this kind of information is a key to comprehension and deep learning. The possible range of scores was 0–100% correct for both explicit and implicit contents. Three response options were included for each question. An example of an explicit item from *Squigglevision*, an academically oriented story that teaches science, is:

What causes the liquid in a siphon to move?

- (a) the way a tube is shaped
- (b) the holes in the hose
- (c) gravity

An example of an implicit item from *Sabrina*, an animated prosocial story, is: “Why does Sabrina hurt Melinda?”

- (a) Because she is jealous of her musical talent
- (b) To try and get Dave to like her instead of Melinda
- (c) So Melinda will quit and Sabrina can take her place in the concert

Children selected a response to each item. Percent correct answers were recorded for explicit and implicit items.

3.2.4.4. Picture sequencing measure. Children were also asked to sequence visual pictures of the events representing key scenes in each program. This kind of measure assesses

⁶ Seventeen multiple-choice questions consisted of content that 11 adults judged as essential to the program message. The 11-person research team had rated each question as essential or nonessential to the program plot (if it was a story) or lesson (if it was a magazine), and they answered each question. Material that was rated as essential by a minimum of 70% of the adult judges was retained. The surviving essential program material was then classified into one of two categories: (1) central content *explicitly* presented in the program; and (2) central, inferential content *implicitly* presented in the program. The implicit, inferential program content required the viewer to go beyond the information given and figure out how characters felt, what their motivations were, what the cause–effect sequences in the program were, and what the abstract concepts and lessons of the program were. As such, implicit comprehension is a deeper measure of understanding than is memory of the explicitly presented central content. Explicit and implicit classifications were made by having two project members review each question as they viewed the television program to determine whether or not the answer to the question was concretely shown (explicit) or had to be inferred from the program content (implicit).

children's skills for temporally organizing and integrating important visual events from the program (Wright et al., 1984). This measure also has the advantage of controlling for differences in verbal skills on comprehension measures.

Six pictures from key scenes in each program were selected, placed in a random sequence, and duplicated into one page of a booklet. Children were asked to put the pictures in order from the first thing that happened in the program to the last. They indicated the order by placing the numbers 1–6 in small boxes located at the top of each picture. Following procedures created by Wright et al. (1984), picture sequencing scores were created by determining (1) how close each picture was to its correct absolute position in the sequence (i.e., 1 point for each picture that had a lower number to its left); and (2) how many pictures were in their correct place, regardless of absolute position (i.e., 1 point for each correct adjacent pairs of pictures). Both parts of this measure were summed to yield a picture-sequencing score that was then transformed into percent correct, with possible scores ranging from 0 to 100%.

3.3. Results and discussion

Each dependent variable (motivation measures, free recall measures of learning and understanding, multiple choice measures of comprehension of explicit and implicit content, and the picture-sequencing measure of understanding the organization of the program story) was analyzed by applying $2 \times 2 \times 2 \times 2 \times 2$ [Gender \times Grade \times Program popularity \times Broadcaster type (PBS/Nickelodeon vs. commercial broadcasters) \times Program type (academic vs. socioemotional)] mixed ANOVA to the dependent variable. Program type was the only within-subject variable. When follow-up tests were necessary to analyze significant interactions involving program type, differences between variables were first tested separately by program type. Mean (and standard deviation) scores of boys and girls at each grade level for each measure of learning are presented in Table 7 for popular and unpopular programs. These means are presented separately for the Nickelodeon/PBS broadcasts and the four commercial broadcast networks.

3.3.1. Motivational measures

Appeal, age appropriateness, and gender appropriateness scores were indices of motivation that were assumed to affect children's comprehension of the program content.

3.3.1.1. Appeal. The 5-factor ANOVA revealed that younger children liked the programs more than older children did, $F(1,125)=39.90$, $p<.001$ for grade, and girls liked the programs more than boys did, $F(1,125)=14.46$, $p<.01$. As predicted, and as the means presented in Table 7 show, the children liked programs with prosocial content more than programs with academic content, $F(1,125)=9.13$, $p<.01$. This pattern of findings for ratings of appeal is consistent with the reports of favorite programs and with viewing patterns that were found in the naturalistic on-line study with the larger sample.

In addition, the content of the program (prosocial or academic) was involved in an interaction with popularity and broadcaster type, $F(1,124)=8.33$, $p<.01$. Follow-up Popular-

Table 7

Means (and *SD*) for motivational appeal score and percent correct for explicit recognition, implicit recognition, and picture sequencing

Dependent variable	Gender, grade level, broadcaster type, and popularity								Total
	Gender		Grade		Broadcaster		Popularity		
	Boys	Girls	2nd–4th	5th–6th	NICK/PBS	Commercial	Low	High	
<i>Appeal^a</i>									
Academic	1.92 (0.67)	2.32 (0.61)	2.40 (0.62)	1.90 (0.62)	2.10 (0.66)	2.13 (0.68)	2.03 (0.72)	2.20 (0.60)	2.11 (0.61)
Prosocial	2.14 (0.68)	2.46 (0.56)	2.60 (0.56)	2.07 (0.61)	2.23 (0.68)	2.37 (0.59)	2.24 (0.62)	2.35 (0.66)	2.30 (0.64)
Total	2.03 (0.56)	2.39 (0.44)	2.50 (0.40)	1.99 (0.52)	2.14 (0.58)	2.27 (0.49)	2.16 (0.54)	2.25 (0.54)	2.21 (0.54)
<i>Explicit^b</i>									
Academic	80.02 (15.94)	82.32 (15.35)	77.10 (17.08)	84.10 (13.86)	79.18 (14.73)	83.14 (16.38)	77.29 (15.87)	84.95 (14.54)	81.15 (15.64)
Prosocial	89.86 (13.89)	91.30 (12.12)	87.67 (12.26)	92.72 (13.23)	93.66 (9.30)	87.43 (15.39)	88.71 (14.74)	92.39 (10.88)	90.57 (13.03)
Total	84.94 (11.41)	86.81 (11.18)	82.42 (12.20)	88.41 (9.91)	86.42 (10.44)	84.29 (12.15)	83.00 (11.90)	88.67 (9.97)	85.86 (11.30)
<i>Implicit^b</i>									
Academic	82.21 (18.40)	84.47 (16.93)	76.43 (20.00)	88.42 (13.76)	81.15 (18.22)	85.51 (16.94)	80.61 (18.69)	85.98 (16.30)	83.32 (17.67)
Prosocial	87.70 (13.63)	89.44 (14.21)	85.95 (15.67)	90.48 (12.16)	82.49 (15.12)	94.69 (9.16)	86.94 (14.94)	90.14 (12.68)	88.55 (13.89)
Total	84.95 (12.65)	86.96 (12.96)	81.19 (14.70)	89.45 (9.89)	81.82 (13.75)	90.10 (10.27)	83.78 (13.21)	88.06 (12.10)	85.93 (12.80)
<i>Picture-sequencing^b</i>									
Prosocial	74.07 (29.06)	76.09 (29.63)	71.94 (29.35)	77.37 (29.14)	78.40 (25.98)	71.67 (32.15)	58.81 (28.34)	91.08 (19.89)	75.06 (29.25)

^aMean range possible 0–3.^bPercent correct.

ity \times Broadcaster ANOVAs, [$F(1, 137) = 4.73, p < .05$] and post hoc tests conducted on scores for liking the shows revealed that for popular prosocial programs, children liked the commercial network programs more than the Nickelodeon/PBS programs, $t(69) = 2.50, p < .05$ [M_s (and SD_s) = 2.54 (0.51) vs. 2.17 (0.74), respectively]. However, there was no difference in the motivational appeal of commercial network programs versus Nickelodeon/PBS for unpopular shows with prosocial content [M_s (and SD_s) = 2.20 (0.63) vs. 2.29 (0.62), respectively]. There were also no significant differences between commercial network programs and Nickelodeon/PBS academic programs with academic content regardless of popularity. When children were exposed to popular shows with prosocial educational content, they found the shows broadcast by the commercial networks to be more appealing than those aired by PBS and Nickelodeon. This finding could be an artifact of the episodes sampled for

the experimental study. More specifically, children chose their own favorite programs in the naturalistic study, but had more limited options during the experimental study. Even so, both Nickelodeon and ABC were creating popular programs. The results suggest that if it is a good show, it does not matter who the broadcaster is.

3.3.1.2. Age appropriateness. Next we considered whether children found the program to be age appropriate. The five factor ANOVA computed on age-appropriate scores yielded a main effect of grade, $F(1,122)=26.11$, $p<.001$. Compared to 5th–6th grade children, the 2nd–4th grade children were more likely to think the programs were for them or for someone older than they were ($M=1.92$, $SD=0.43$ for younger children versus $M=1.58$, $SD=0.40$ for older children). The implication is that children think, regardless of broadcaster intent, that educational television programs are intended for a younger rather than an older child audience. Alternately, it may be that the programs were designed for the younger age group.

Next correlations between motivational appeal scores and age appropriateness scores were computed for the academic and the prosocial programs. For academic and prosocial programs, children's ratings of how much they liked the program were positively related to their ratings of age appropriateness of both types of programs, $r(141)=.27$, $p<.01$ and $r(140)=.40$, $p<.001$, for academic and prosocial programs, respectively. Children liked programs that they thought were made for them or for an older audience, but not for a younger audience.

3.3.1.3. Gender appropriateness. For the academic shows, 140 out of the 141 children believed that the programs were meant for both boys and girls. For the prosocial programs, 128 of 141 (90.8%) children believed that programs were meant for both boys and girls. Two boys thought that certain programs were meant just for boys, and 11 children thought that certain programs were meant just for girls. While gender-neutral programs are inclusive, this belief can create a potential problem if boys or girls want programs directed at their own gender. More specifically, efforts to create programs targeted at both boys and girls may miss traditional areas of interest that girls and boys have, thereby losing potential ways of pulling that audience into the viewing arena (Calvert, 2000). For instance, *Sabrina*, a girls' favorite program, and *Cousin Skeeter*, a boys' favorite program, were very popular, even if it was only with one gender.

3.3.1.4. Summary of analysis of motivational measures. In summary, girls and younger children liked educational programs more than boys and older children did. Most children, regardless of age, liked prosocial programs, which presented socioemotional content, more than academic ones. The finding that girls found the programs more appealing than the boys did was consistent with findings from the naturalistic study in which children chose which programs they watched. However, the appeal of popular shows with a prosocial theme aired by commercial networks was higher than the appeal of popular prosocial shows presented by Nickelodeon/PBS. This finding was not expected. When children in the prior online study had been left to their own devices about which shows to watch, there was a preference observed for shows broadcast by Nickelodeon/PBS, most notably by Nickelodeon.

Younger children thought the programs were more age appropriate than older children did. Children liked programs better when they saw them as appropriate for children their own age or a bit older. This was true for programs with either prosocial or academic lessons. Thus, the child's view of age appropriateness of programs is a consideration if one is interested in creating a show that children will like. The association between appeal and judgments of age appropriateness are modest at best, however, suggesting that there are other factors involved in the nature of appeal. Most children thought the educational programs were for both boys and girls, i.e., gender neutral.

3.3.2. Free recall scores

The free recall measure paralleled the measure used to obtain reports from the child "reporters" on our Internet site. The free recall measure was scored for the kind of lesson learned and for report strength, just as the Internet reports had been scored.⁷ Aggregate strength scores were created for the online Internet and experimental data, respectively. Correlations were computed between the overall strength of the data from the two studies. There was a significant correlation between the two scores, $r(137) = .29$, $p < .001$.

A Research method (2: naturalistic vs. experimental) \times Grade (2) \times Gender (2) ANOVA conducted on the overall report strength scores showed that the children wrote stronger reports in the present experimental study than in the naturalistic study, $F(1,136) = 18.93$, $p < .001$ [M_s (SD_s) = 3.55 (1.85) vs. 2.68 (1.83), respectively]. However, this difference was due to older children demonstrating better comprehension of the lesson during the experimental study than during the naturalistic study, $F(1,79) = 38.48$, $p < .001$ [M_s (and SD_s) = 4.00 (1.78) vs. 2.43 (2.05) for the experimental vs. the naturalistic study, respectively]. The strength of the younger children's reports did not vary across the two studies, as indicated by a significant Grade \times Research method interaction effect, $F(1,136) = 21.98$, $p < .001$ and the nearly identical ratings for strength of reports for the younger children under the two methods [M_s (SD_s) = 2.95 (1.78) and 3.01 (1.43)]. This difference may have occurred because children's memory was tested immediately after viewing a program in the experimental study, but after a delay of about a week in the naturalistic study. In addition, it is likely that older children can easily understand these programs when they watch them, but that they generally do not choose to invest much energy in them because they are targeted at younger children. In other words, children view "up to" programs designed for older ages, rather than "down to" programs designed for younger ages when in their natural settings where they have choices. Thus, the programs are comprehensible to the older age group; they just are not as interested in them when given the choice of which programs to watch.

⁷ There were 29 students in the study who were not included in the naturalistic study because they only visited the site during one of the waves of data collection. For the free recall analyses, average educational strength was taken from their one available wave. One student did not view any programs during his one wave and was not included in the analyses.

3.3.3. Comprehension of explicit and implicit content (multiple-choice items)

The percent of comprehension questions answered correctly are presented in the center section of Table 7 for items that assessed the children's understanding of explicit lessons. A Grade (2) \times Gender (2) \times Program type (2: academic vs. prosocial) \times Popularity (2) \times Broadcaster type (2: commercial broadcaster versus Nickelodeon/PBS) mixed ANOVA with program type as a within-subjects factor was conducted on the percent of correct answers to multiple choice questions about the explicit content of the programs.

3.3.3.1. Comprehension of explicit content. See the center section of Table 7 for the mean percent correct comprehension scores for explicit content for each group. Overall, children's comprehension of the explicit program content was quite good, typically averaging between 80% and 90%, although the full range of scores was from 20% to 100% correct.

As expected, children understood the explicit content in prosocial programs better than in academic programs, $F(1,125)=42.82, p<.001$; they understood more explicit content from the popular than from the unpopular programs, $F(1,125)=8.36, p<.01$; and older children understood explicit content better than younger children did, $F(1,125)=11.59, p<.01$.

The finding that children understood explicit messages presented in prosocial shows more than those in academic shows was qualified by a Program type \times Broadcaster interaction, $F(1,125)=11.51, p<.01$. Children understood explicit academic program lessons equally well regardless of whether commercial networks of PBS or Nickelodeon aired the shows [M_s (SD_s) = 79.18% (14.73) vs. 83.14% (16.38) for Nickelodeon/PBS and commercial broadcasters, respectively]. But children understood explicit prosocial (social-emotional) content better from shows presented on Nickelodeon/PBS than those aired by commercial network programs, $F(1,133)=8.75, p<.01$; M_s (SD_s) correct = 93.66% (9.30) vs. 87.43% (15.39), respectively; mean comparison $t(139)=-2.92, p<.01$. This suggests that the commercial networks do not do as good a job making prosocial lessons explicit as Nickelodeon/PBS.

When programs were popular ones, children also appeared to understand the explicit lesson content more for programs presented by Nickelodeon/PBS than for programs aired by the commercial networks, [Popularity \times Broadcaster type interaction, $F(1,125)=8.49, p<.01$ [M_s (and SD_s) = 91.69% (5.75) vs. 85.57% (12.29) for Nickelodeon/PBS and Commercial broadcasters, respectively]. There were no differences in children's understanding of explicit lessons in unpopular programs that were broadcast by Nickelodeon/PBS versus commercial networks [M_s (SD_s) = 81.00% (11.43) vs. 85.00% (12.19) for Nickelodeon/PBS and Commercial broadcasters, respectively]. The formats of the unpopular academic programs may play a role in this difference. Two of the unpopular commercial network programs were story formats while two of the unpopular Nickelodeon/PBS programs were magazine formats. An unanticipated significant Program type \times Broadcaster \times Gender \times Popularity interaction, $F(1,125)=5.65, p<.05$, was not interpretable.

3.3.3.2. Comprehension of implicit content. Scores ranged from 29% to 100% over seven multiple-choice questions that assessed comprehension of implicit content. As expected, older children understood implicit program content better than younger children did,

$F(1,125)=20.99, p<.001$. Children also understood implicit prosocial content better than implicit academic content, $F(1,125)=14.30, p<.001$. Finally, children understood implicit content presented in commercial network programs better than implicit content presented in Nickelodeon/PBS programs, $F(1,125)=20.326, p<.001$. Mean (*SD*) percent of correct items with implicit content are presented in the lower portion of [Table 7](#).

There was some indication that the older and younger children differed from one another in their ability to comprehend the implicit content that was presented in prosocial and academic programming, $F(1,125)=5.63, p<.05$. While the older children showed a greater level of understanding of implicit lessons than younger children for shows with academic content, $t(139)=4.22, p<.01$ [M_s (SD_s)=88.42% (13.76) vs. 76.43% (20.00), respectively], the difference between older and younger children's comprehension scores for implicit lessons in prosocial shows failed to reach the level of significance, $t(139)=1.93, p=.06$ [M_s (SD_s)=90.48% (12.16) vs. 85.95% (15.67), respectively]. The implicit content presented in prosocial shows seems to be more accessible to younger children than implicit material in academic shows, which enabled the younger children's scores to approach ceiling level for prosocial shows. The older children were near ceiling level in their comprehension of implicit lessons when assessed through this recognition multiple-choice format, regardless of whether the lesson was focused on academic or prosocial issues. The latter finding suggests that E/I programs are too easy for the older preadolescent age group, which might also be a factor in the loss of interest observed for these programs in the naturalistic study.

Children in the older and younger age groups differed in their ability to understand implicit content in shows presented by the different types of broadcasters as well, $F(1, 125)=5.42, p<.05$. The younger children were as capable as older children in recognizing implicit lessons in the content of shows from the commercial broadcasters [M_s (SD_s)=87.86% (10.96) and 91.79% (9.51), respectively], but the older children outperformed the younger children in comprehending the implicit messages of Nickelodeon/PBS shows [M_s (SD_s)=87.17% (9.83) and 74.52% (15.09), respectively; $t(69)=-4.27, p<.001$]. Overall, children understood implicit content presented in the commercial network programs better than implicit content presented in the Nickelodeon/PBS programs, $t(139)=5.79, p<.001$ [M_s (SD_s)=94.69% (9.16) vs. 82.49% (15.12), respectively].

3.3.4. *Picture sequencing*⁸

Children were asked to correctly sequence a series of six pictures. Scores ranged from 0% to 100% correct. Mean (and *SD*) percent correct on the picture-sequencing task are presented in [Table 7](#). As expected, children sequenced more pictures correctly after viewing popular than unpopular programs, $F(1,125)=58.30, p<.001$. There were no significant effects for grade, gender, or broadcast type.

⁸ Because sequencing magazine formats has little to do with comprehension of the program content, the academic programs were not analyzed because different cells of the design used different numbers of magazine or story formats. By contrast, the prosocial programs all relied on story formats and were analyzed.

3.3.5. Relation between educational strength of programs, children's viewing patterns, and strength of children's reports

During the experimental study, we observed that even those programs that children rarely viewed at home were capable of eliciting stories that were high in strength. Below is a story from a 6th grade girl who was randomly assigned to view *Anatole*, the least viewed program in our naturalistic sample.

This program was about a little mouse who tried her hardest in singing but just couldn't do it. The mouse gave up and ripped her opera notes up because of her frustration. When her dad (Papa) met an Opera singer named Renee, he knew that if his daughter heard her singing, she would have kept her confidence. and she did. She learned that just because you are not good at something doesn't mean you have to give up. and that is the lesson that I will keep in mind when I get frustrated with something I am not good at.

This report, and others like it, suggests that even when children watch unpopular educational shows, they may learn important lessons.

We examined children's viewing patterns and the strength of their lesson reports in relation to the APPC scores of the educational strength of each program episode. Spearman rank correlations were computed between the popularity ranking of the programs⁹ used in the experimental study and the APPC program score for educational strength. The correlation of $\rho(16) = .12$, $p = .66$, was not significant, indicating that there was not a significant relationship between popularity ranking and educational strength of the content as determined by the APPC.

The relationship between the educational strength scores for program content, as determined by APPC scorers, and the strength of children's reports of the lessons from the same shows were investigated using Pearson product-moment correlational analyses. The average educational strength from the children's free-recall response for each of the 16 episodes was used to represent the strength of lessons in children's reports. There was no significant relation between the strength of children's reports and the educational strength scores for the content of program episodes used in this study, $r(16) = .34$, $p = .19$. There were also no significant relationships found between APPC scorers' ratings of program educational strength and children's comprehension of the explicit program content, $r(16) = -.37$, $p = .16$, or implicit program content, $r(16) = -.36$, $p = .18$. However, the use of aggregate data led to a loss of specificity in the information about strength of the children's reports; because there were only 16 data points and variability of the program scores was low, this could be due to insufficient statistical power.

In sum, adult ratings of the episode content did not correspond to popularity of the shows with children. Moreover, adult ratings of the level of educational quality of programs were unrelated to the educational strength of children's reports of the lessons in the programs.

⁹ Since two shows were shown more than once, *Shelby Woo* had the rank of 10 twice, and *Squigglevision* had the rank of 12 twice.

3.3.6. Summary/discussion

Consistent with the findings from the naturalistic study of children's self-selected viewing patterns, girls and younger children liked the programs more than boys and older children did. Overall, children liked prosocial programs more than academic programs, and they also understood prosocial programs better. In contrast to the naturalistic patterns, children in the experimental study who were assigned to watch both popular and unpopular programs showed a preference for popular prosocial programs aired on commercial network television rather than those shown on Nickelodeon or PBS.

Younger children also saw the programs as more age appropriate than older children did. Most children thought the programs were for both boys and girls, a potential problem if boys are looking for gender-appropriate programs as suggested by previous studies of viewing practices and preferences (Luecke-Aleksa, Anderson, Collins, & Schmitt, 1995).

The data from this experimental study suggest that it was not a comprehension problem that took older children out of the audience for educational and informational television programs in the naturalistic study and Nielsen data corresponding to Wave 3. The multiple measures of lesson comprehension measures, some controlling for verbal skills, revealed that children understood much of the content that they viewed. Comprehension of the central explicit and implicit content, which are most important in understanding a television program (Calvert et al., 1982; Collins et al., 1978), was never lower than 72% with recognition measures and was most often 80% or higher. Older children wrote stronger reports of the educational lessons in the experimental studies than in the naturalistic study, the former study controlling which programs were viewed and including an equal number of popular and unpopular shows. Prosocial content was better understood and recalled than was academic content, but the more difficult academic content was understood by the oldest children. Older children, as found in other studies (Calvert, Huston, & Wright, 1987; Collins et al., 1978), were better able to understand the explicit and implicit program content than younger children, but even the younger grade school children understood the majority of the program content.

Older children's high level of understanding program content, particularly in the experimental study, but their reduced levels of viewing educational programs over the course of the year in the naturalistic study and Nielsen data, suggest that program content comprehensibility alone is insufficient for explaining why children invest their time in certain television programs and not others (cf., Anderson & Lorch, 1983). Comprehensibility may be a good predictor of children's visual attention in a laboratory setting, but it does not necessarily translate into higher levels of viewing in the natural environment. If a program is too easy or boring, older children do not watch it during their free time (Huston & Wright, 1983). When children liked certain programs, motivation, comprehension of explicit program content, and understanding of the organization of the program (as assessed by picture sequencing) was higher.

The findings suggest that program popularity is the factor that pulls children into viewing experiences. It is notable that in the experimental study, the younger children liked the prosocial programs more than the older children did. The particularly positive effects of popular over unpopular prosocial programs on picture sequencing tasks suggest that children are processing popular prosocial programs optimally. It is likely that motivational appeal translates into an investment of more attentional resources and effort to understand them.

Taken together, the results from the naturalistic and experimental studies suggest the importance of motivational variables for increasing children's comprehension of, and learning from, educational and informational television programs. That is, even if older children can understand these programs better than younger children as a result of their cognitive maturity and experiences, younger children are more likely to view those preferred shows, and hence, have more opportunity to learn from educational programs.

There were no significant relationships observed between the programs that children liked/did not like and the APPC ratings of the educational strength of the content of the programs in the experimental study. Nor did viewing APPC higher rated programs lead to stronger lessons on the children's parts across the variety of methods used to assess comprehension. This could be due, at least in part, to the fact that there was little variance in the APPC educational strength ratings of the programs; 9 of the 16 programs had an educational strength score of 4, the highest score possible. On the other hand, the APPC scorers rated some programs, such as *Doug* and *Recess* as moderate in educational strength, yet these shows were consistently among the most popular programs for the children. It appears that what expert adult raters view as educationally strong programs bears little relation to what children choose to watch (and what is then available to be comprehended and learned as in the case of the naturalistic study), or to how well they can understand the program content, as in the case of the experimental study.

It is notable that the APPC awarded *Doug* the outstanding E/I program of 2000, in part to acknowledge its unique contribution to the social and emotional development of children, although it was not the top-rated program for educational strength. Thus, APPC understood the multiple aspects of the value of these programs, even if they might not be the strongest in terms of objective measures.

4. Do children learn more lessons from favored educational than from favored noneducational programs?

A final goal of our study was to compare children's reports from educational favorite programs provided on our Internet site to children's "real" favorite programs, i.e., their reports of favorite shows without restriction to those included on our Internet site. During the school year of 2000–2001, we followed a subsample of 181 children who wrote about their "real" favorite programs. Fifty-six percent ($n = 102$) of the students wrote about educational programs only while 44% ($n = 79$) wrote about noneducational real favorite programs.¹⁰ However, children's selection of an educational program as their favorite may be inflated

¹⁰ During the third wave of the 2000–2001 school year, children were asked to select and write about any program they liked best. For this analysis, we were interested in children who visited the site during Waves 1 and 2 of the second year of the study but who chose a favorite program that was not on our educational menu for Wave 3. There were 43 children who named a "strictly entertainment" program, i.e., a program that was not designated as educational or informational, as their favorite. Twenty male and 23 female children fit these criteria; 17 second–fourth graders and 26 fifth–sixth graders. We randomly selected three visits to the site during each phase (Wave 1: educational; Wave 2: educational; and W 3: noneducational favorite) for analysis.

because some of these students had previously participated in the study, which had only asked about educational favorites. Therefore, they may have been primed to select an educational program as their favorite. Consequently, we looked closely at 79 students who chose a noneducational favorite; 43 of those 79 students also had prior data on their favorite educational program. We compared these students responses about educational versus noneducational favorite programs.

4.1. Hypotheses

We expected that (1) children would report more lessons, particularly social and emotional lessons, for educational than for noneducational (i.e., strictly entertainment) favorite programs because these programs were designed to educate (see Wright et al., 2001); (2) for educational programs, girls' reports would be stronger than boys' reports (Calvert et al., 2002); and (3) for entertainment programs, boys' reports would be stronger than girls' reports because boys like these kinds of programs more than they like strictly educational programs (Huston et al., 1990). Furthermore, boys are less likely to find "educational" television labels appealing (Krcmar & Albada, 2000), but might be less resistant to the themes in programs that they choose to watch.

4.2. Number and kind of lessons reported

To assess whether children were more likely to report lessons in favorite programs that were educational than in those that were noneducational programs, a $2 \times 4 \times 2 \times 2$ (Program kind: educational vs. noneducational \times Lesson type: cognitive, informational, social-emotional, physical development \times Gender \times Grade) mixed ANOVA was conducted with presence of a lesson as the dependent variable.

Children were more likely to report a lesson for educational shows that were their favorite programs than for favorite shows that were noneducational, $F(1,39)=4.29$, $p < .05$, and they were more likely to report social and emotional lessons than academic, informational or physical development lessons overall, $F(3,37)=8.60$, $p < .001$. More importantly, children reported more social-emotional lessons from their educational favorite programs than from their noneducational favorite programs, $F(3,37)=3.73$, $p < .05$ [M s (and SD s)=0.33 (0.41) vs. 0.18 (0.36) for types of shows, respectively]. This finding suggests that the intended educational content is a relevant feature of the lessons that children take from the programs designated as educational. That is, children do seem to take lessons from favorite shows that have been classified as educational or informational more than from other shows that are also considered favorites but have not been designated as educational programs.

Program report about Recess, an educational program, by Allison, a 6th grade girl:

Dear Katey, The show "Recess" is a really cool show. The episode I saw was about Gretchen (a smart kid) got a letter about going to space with Nasa, so to help her out, Gretchen's friends do all of these test (obstacles) to help Gretchen to be ready for her trip

to space. But when a astronaut comes to honor Gretchen, she finds out that she only gets a coin, but she then gives the astronaut her friends hat to send up to space. One thing I learned was to always be a good friend. You should watch this show you would love it! Sincerely Allison.

Program report about Pokemon, an entertainment program, by Red, a 6th grade boy:

On pokemon Brock fell down a hill with a whopper in his back. They fell in to the whopper preschool and there were 7 whopper. Team Rocket tried to steal the whopper but it was to slippery and fast it ran over the edge of a bridge and deafeted team rocket. I learned nothing from this show.

To assess whether the strength of children's lesson reports differed for noneducational and educational favorite programs, a Program kind (2) \times Report strength component (4) \times Gender (2) \times Grade (2) mixed ANOVA was conducted with report strength as the dependent variable.

The components of report strength varied with high scores for generalizability [M (SD)=0.55 (0.61)] and clarity [0.45 (0.50)] over consistency [0.35 (0.46)] and engagement [0.31 (0.40)], $F(3, 37)=6.62$, $p<.05$. Once again, girls' reports were stronger than the boys' reports [M (SD)=0.56 (0.53) for girls and 0.25 (0.27) for boys; $F(1, 39)=6.00$, $p<.05$].

These findings were qualified by a Type of program \times Report strength component \times Gender interaction, $F(3,37)=3.84$, $p<.05$. Contrary to expectation, girls wrote stronger reports than boys did for both noneducational and educational programs, $F(1,41)=5.00$, $p<.05$, [M (SD)=0.53 (0.70) vs. 0.14 (0.35) for girls and boys, respectively, for noneducational programs]. As expected, the girls' reports were stronger than boys' reports when the favorite program was educational, but this pattern was observed only for engagement [M (SD)=0.47 (0.48) vs. 0.17 (0.32)]. Thus, children learn more lessons from favorite educational than noneducational programs, although girls learn more than boys regardless of the educational focus of their favorite shows.

4.3. Summary/discussion

The results suggest that educational shows do appeal to children when compared to strictly entertainment (noneducational shows). In particular, 56% of children chose educational programs as their absolute favorite even when they were free to choose from all the shows they had watched. In addition, the argument that children are gaining something more from educational programs than from strictly entertainment programs is supported by the findings based on a subsample of these children who reported their "real" favorite shows. Specifically, more social–emotional lessons were reported in children's favorite educational programs than in their favorite noneducational programs. Finally, girls' wrote stronger reports for both their favorite educational and favorite noneducational programs than boys did. For educational favorite programs, reports were strongest on relevance and clarity with girls outperforming boys on engagement.

5. Lessons from children's experiences with educational television

The purpose of these studies was to examine what children are learning from educational and informational television programs that were mandated by the CTA. With the implementation of the Three-Hour Rule, more educational programs became available during times when children were in the viewing audience (Jordan et al., 2002). Our results suggest that children are learning lessons of value, particularly those of a social nature, from the commercial networks as well as from those who are leaders in producing quality programs, such as Nickelodeon and PBS. Moreover, children are learning more social–emotional lessons from their favorite educational than from their favorite entertainment-based programs. However, children are differentially interested in educational television programs, and interest in these programs diminishes over time, particularly for older boys.

5.1. Developmental and gender differences in children's interest in educational programs

The audience for educational and informational (E/I) television programs was generally young elementary school children of both genders and older elementary school girls. Both Nickelodeon and ABC broadcast programs attracted older girls, including *Sabrina the Animated Series* (ABC), *Pepper Ann* (ABC), and the *Wild Thornberrys* (Nickelodeon).

Beneficial effects of educational television for early grade school audiences is encouraging, suggesting that the preschool years are not the only ones where children will view and learn from educational programs. Beneficial effects of educational programs for girls also supplement longitudinal findings that boys are the primary beneficiaries of educational programs (see Anderson et al., 2001). However, losing older boys from the audience, and having girls who focus almost exclusively on social–emotional rather than academic lessons means that E/I television programs are not living up to their potential. Although children did understand the abstract, implicit content well, it is questionable whether deep learning is occurring when children can understand 80% of the important content in a single viewing.

Part of the problem is linked to the age appropriateness of the programs. Consistent with broadcaster beliefs, the programs appear to be targeted toward the younger grade school years, with little challenging content for older grade school children, known as tweens (see Jordan, 1996). When E/I programs featured actors who were early adolescents in social–emotional situations, as in the NBC line-up, older girls do appear to remain interested. However, similar age-appropriate programming directed at male interests was not apparent for older boys in any of the educational offerings of either type of broadcast network. Given that boys selectively search for male-directed content after they reach gender constancy in the grade school years (Luecke-Aleksa et al., 1995), gender-neutral programs may have more difficulty in pulling in tween boys.

Children's interest in educational television programs often is associated with better learning of program lessons, suggesting that broadcasters could expand their impact if they create or distribute programs that appeal to older as well as younger audiences and to boys as well as girls. Boys' traditional interest in fast-action, violent programs (Huston et al., 1990) coupled with reductions in violent content in E/I programs may make it more difficult to pull

older boys into the viewing audience of E/I shows. Even so, from the qualitative reports, it is clear that older boys can and do learn valuable social and academic lessons from their favorite educational programs, and it is worth investing some creative effort to accomplish this goal for the older male children in the audience.

Hey Arnold and *The Wild Thornberrys* are two Nickelodeon programs that did well with the male and female audience in the present studies. *Hey Arnold* features a male character that struggles with the dark side of human nature in many of the stories. Boys may well relate to these kinds of struggles, making this kind of program appealing. The quality of the reports written by children about *Hey Arnold* episodes was especially impressive. *The Wild Thornberrys* show features an animated girl character that goes off on adventures in the wild, perhaps appealing to the kinds of activities and fantasies that appeal to boys while still providing a potential nontraditional role for girls. One important area for future research is to determine what takes many older children away from educational programs—is it other kinds of programs, other activities that are seasonal in nature (e.g., exams or sports activities in the spring season), more academic work at school as the academic year comes to an end, or do they just outgrow educational programs? Potential differences in interest for subgroups of children based on ethnicity and economic levels would also be useful.

5.2. *Creating an audience for educational television programs*

Creating an audience is an important consideration for getting educational and informational television programs to children (Jordan, 1996). Within our sample, demand for Nickelodeon and ABC programs may have increased over the course of the viewing season because of their strategy of showing their program series more than once per week. Nickelodeon broadcasts their program series repeatedly. At times, they even broadcast programs from the same series for several hours in a row. Nickelodeon also takes programs that are not doing well off of the air, leaving the popular programs for children to view. Perhaps this strategy also leads children to stay with the broadcaster, i.e., staying with the NICK brand.

Another way to enhance brand loyalty is to broadcast the same programs on different stations. For instance, ABC broadcasts parts of their educational lineup, such as the series *Recess*, on other independent outlets. Even if those specific episodes are not labeled E/I, repeated options to view a series and its characters may also create brand familiarity and loyalty, thereby increasing the market share of that broadcaster's E/I programming. *Recess*, in fact, was one of the most popular programs in our sample. This strategy has continued as Disney, who owns ABC, sends educational programs such as *Lizzie McGuire* from their cable station to their broadcast station. Similarly, CBS currently broadcasts Nickelodeon programs, thereby increasing Nickelodeon's brand recognition and audience share.

By contrast, when our data were collected, NBC and CBS only broadcast their educational programs against each other and against ABC on Saturday morning. NBC concentrated on the preteen and adolescent viewing audience, particularly the girls. However, CBS ran their schedule of middle childhood programs against the popular ABC programs. While running educational television programs on Saturday morning may

level the playing field, putting no broadcaster at an economic disadvantage (Hundt, 1995), it did not create an audience for CBS's educational programs, particularly when the ABC programs were so popular with children.

Interestingly, CBS, the least-viewed commercial network for educational programs during the 1999–2000 season, dropped their entire Saturday morning lineup and replaced it with Nickjr, an educational lineup focusing on the preschool age group. This strategy provided CBS with a lineup that was highly educational, that was well known to the preschool age group, and that had few competitors for the preschool audience on Saturday morning. This strategy was consistent with broadcaster beliefs that very young children will be most interested in E/I programs (Jordan, 1996). The 2000–2001 season lineups meant that for Saturday morning, CBS had the E/I programs for young children, ABC had the E/I programs for middle childhood, and NBC had the E/I programs for preadolescents and adolescents, primarily girls. The benefit of this strategy was that there was less competition for a smaller audience, and all children had a station that targeted their particular age group. The potential problem was that there was less diversity in programs for each age group since broadcasters are only focusing on one age group.

By fall season of 2002, CBS and NBC altered their programming strategies again, increasingly relying on outsourcing for E/I programs. CBS expanded their use of popular Nickelodeon programs designed for middle childhood. Interestingly, *Hey Arnold* and *The Wild Thornberrys*, two of the most popular programs from our website, have now joined the CBS Saturday morning line-up. For *The Wild Thornberrys*, which features a female lead named Eliza, CBS promoted a series of episodes over several weeks where there is conflict between Eliza and her male cousin, perhaps a strategy designed to pull in more males. We hope it works. There is an unaddressed need for educational shows that appeal to older male children.

In December of 2002, *The Wild Thornberrys Movie* was released by Paramount. Nickelodeon has also created several online games about the *Wild Thornberrys*' characters to interest children in this series. This multimedia strategy may help the ratings of the CBS E/I and Nickelodeon programs, as they are continuing to build on the Nickelodeon brand that is very popular with children.

NBC also outsourced their children's E/I line-up to Discovery Kids with live programs like *The Crocodile Hunter* entering their line-up. The adventurous and potentially dangerous activities of Steve, an energetic Australian who wrestles with crocodiles and catches snakes with his bare hands, may well be popular with boys, pulling them into the audience in distinct, yet similar ways, to *Bill Nye, the Science Guy* who was also energetic, enthusiastic, and exaggerated in his approach to his subject matter.

5.3. Methodological innovations

Two directions emerged from our studies that add to how researchers collect data: (1) using the Internet as a data collection device for children; and (2) using favorite programs to index the impact of television viewing on children. The Internet now allows children from diverse areas of the country, and the world, to bring their perspectives to questions

that researchers ask (e.g., Cassell, 2002). With the assistance of teachers, we were able to gain access to a multiethnic sample of children from diverse economic backgrounds and geographical areas in the United States as a sample. Such access ensured that the voices of many children were heard in the public debate about how to improve the quality of the television programs they view. This kind of methodology holds similar promise for other empirical and policy issues as well.

However, there were problems that we encountered, especially in using this type of methodology with younger children. The most important was that children in early grade school do not have very effective keyboarding skills, thereby limiting their ability to spell correctly and perhaps augmenting the amount of time involved in their reporting. Keyboarding skills are an important avenue for writing on computers and one that still has not been adequately developed at the school level, in spite of its necessity for online literacy in the information age. Short cuts to spelling words such as “u” for “you” have become common and will increase if children cannot quickly write in a full grammatical structure. For those who are concerned about written literacy, basic keyboarding skills are important to consider for the curriculum.

A second methodological contribution of our studies involves the importance of children’s favorite television programs as a way to index the overall popularity and impact of specific programs on children. The concordance of the naturalistic study data and the Nielsen data suggest that Internet data collection can be valid. Moreover, we found consistency in our data set in children’s reports of most viewed programs with their favorite programs. This consistency suggests that these two methods of collecting information from children are reliable. That is, one can ask children what program they like the most, and thereby obtain information on what they view the most. This approach differs from showing children programs in a laboratory setting and examining their comprehension, for they may never view these programs in real-life. Assessment of children’s favorite programs may provide an alternative quick and useful way to target the programs that have the most influence on child viewers.

5.4. Policy implications

The CTA emerged, in part, because of grass roots pressures to improve the quality of children’s television programs (Kunkel & Wilcox, 2000). As this law moved from weak FCC guidelines, in which virtually any program could be labeled as educational and informational, to one with stronger FCC guidelines, access to children’s television has improved. More specifically, rules that require a minimum of 3 h of educational programs per week (i.e., the Three-Hour Rule), that require educational broadcasts during times when children are likely to be awake and in the viewing audience, and that require broadcasters to label their educational and informational program offerings, all work to improve the effectiveness of the CTA.

An interesting consequence of the CTA is that E/I programs contain little violence (Jordan et al., 2002), a sharp contrast from past examinations of children’s commercial network programs (Woodard, 1999). This reduction may have occurred, in part, because broadcasters

provide little time for their children's schedules because it is less profitable than adult programming (Calvert, 1999a). Consequently, the traditional Saturday morning time frame for children's television programs is now often used to meet programming rules for the CTA. Broadcasting violent content may be too risky because it is not "FCC friendly." Consequently, violent children's programs have been replaced on the entertainment broadcast networks with educational programs that are of more value to children's development.

Within children's television, quality programs need not be a financial liability. Well-designed programming that teaches social and emotional lessons can be profitable and draw large audiences, as demonstrated by Nickelodeon (Friend, 1997). Because of the potential for drawing a larger audience, thereby maximizing profits, most educational and informational programs focus on prosocial rather than academic lessons (Calvert, 1999a). Our data suggest that prosocial programs have value to children, with reports focusing on diverse themes such as kindness, honesty, social responsibility, effort, and determination.

Although the Three-Hour Rule may be particularly important in preserving educational television programs and in diminishing the prevalence of violent programs, educational television programs must still compete with strictly entertainment-driven programs that are aired on other broadcast networks and that have sophisticated advertising campaigns. Consider the competition from the cartoon *Pokemon*, a cartoon broadcast on WB. In the 1999–2000 viewing season, *Pokemon* took American children by storm. The *Pokemon* cartoon, movie, and trading cards created a synergy and immense popularity for this multimedia program in part because of its repeated appearance in children's lives (Wartella, O'Keefe, & Scantlin, 2000). In fact, Nielsen data find that *Pokemon* was responsible for eroding Nickelodeon ratings by the end of December 1999 (Kidscreen, 2001). Therefore, viewing *Pokemon* may have disrupted children's viewing of E/I programs that had to compete with it for the same viewing audience. *Pokemon* is no longer as popular as it was in the 1999–2000 season, but other television programs that are solely designed to entertain—and sell—have the same potential to pull children away from educational and informational programs that are specifically designed to benefit their cognitive and social development. In the data presented here, it was apparent that children who view educational programs learn more social lessons than those who view strictly entertainment-driven programs, which would include the likes of *Pokemon*. The implication is that the Three-Hour Rule does help to keep the playing field even and ensures that quality programs for children can survive in the competitive arena (Hundt, 1995).

One remaining policy challenge is for the FCC to encourage broadcasters to create academically oriented programs for children, particularly those that lead to deep learning. The high production cost and the limited age range for specific academic programs are two likely reasons for the reluctance of broadcasters to invest in challenging programs with an academic focus (Jordan, 1996). Both *The Magic School Bus* and *Bill Nye the Science Guy*, broadcast by the commercial networks and no longer in production, were originally created for PBS and were popular academically oriented programs in our sample. Children learned some difficult and valuable concepts from viewing these programs. Of the commercial networks, only ABC produced an original academically oriented educational program, which was subsequently cancelled due to low viewership.

Although commercial networks rarely create academically oriented programs, boys especially appear to learn important cognitive lessons from them. Moreover, adolescent males demonstrated long-term academic benefits from viewing educational programs as children (Anderson et al., 2001). Nonetheless, academically oriented programs were not the top choices of programs by children, making them less lucrative for the commercial networks to broadcast. But academically oriented programs were not the most unpopular programs either. Instead, they tended to fall in the middle of the viewing distribution. We were encouraged to find *The Crocodile Hunter* on the NBC line-up for fall of 2002, as it provides a great deal of information about animals in an exciting way that may well appeal to the middle childhood audience, particularly boys.

Another challenge is for the FCC to consider what the educational requirements of the CTA will be for digital television (see Center for Media Education, 2001; Children Now, 2001). Digital television will allow interactive television, bringing with it new opportunities for active engagement and learning. Decisions about what broadcasters must do for children with these new technological developments will frame the kinds of content available for our children to learn, the kinds of opportunities available for them to rehearse and learn key content messages through interaction, and ultimately, how our current generation of children will develop in the digital age.

6. The challenge of sustaining a quality media environment

In conclusion, the CTA has led commercial broadcasters to create and/or disseminate many educational and informational programs that children enjoy and that lead to learning. The findings of the present studies indicate that children are often learning social content, and to a lesser extent academically oriented content, from the educational television programs they are viewing. Previous research has demonstrated that prosocial content has a beneficial impact on child viewers during the middle-childhood years (e.g., Calvert et al., 1982; Sprafkin et al., 1975). Popular educational programs are particularly well liked and are most often well understood.

Although there are many critics of the prosocial over the academic preference of commercial broadcasters, the data provided here suggest beneficial effects of such programs. To make an impact on a child audience, children must be willing to view educational programs voluntarily during their leisure time, and prosocial programs attract many viewers. The comparison of educational to noneducational favorite programs revealed beneficial effects of educational programs, particularly in the social and emotional area. Even so, an academic program such as the *Magic School Bus*, created for PBS and now shown on commercial broadcasters, is also popular and well understood by children. That popularity may well reflect the careful depiction of science themes that are well integrated within stories in a comprehensible and engaging manner. We hope that such successes create a challenge and a sense of optimism for creative forces at commercial broadcast networks. Many children's futures can be affected by their ability to meet those challenges.

The CTA has brought about a new era in children's programs where beneficial educational and informational programs can exist in the commercial arena, but protections such as the Three-Hour Rule are important for ensuring their survival. In a market place where educational programs are competing against noneducational fare, commercial broadcasters may prefer prosocial rather than academic fare in meeting their CTA requirements because children like prosocial programs more, understand them better, and those programs pull in a larger audience. A remaining challenge is to create more academically oriented programs that attract a sufficiently large audience, including older boys, while delivering a comprehensible, interesting, yet challenging educational message.

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Appendix A. Scoring manual for the Georgetown Hoya TV reports

The first three variables involve scoring children's reports. For all scoring, use only explicit information in children's reports. Do not make inferences about their intent.

A.1. Program lessons in children's reports

Circle yes or no for each variable. If the response is a yes, then check all applicable lessons learned.

A.1.1. Variable 1a: Cognitive skills (Learning how to think; focus on skills that would be used in school)

Does the child's report indicate learning a cognitive lesson?

0 NO

1 YES

If yes, check all applicable categories.

Cognitive Skills

- Classification and Organization
 - Recognition and Matching
 - Problem Solving and Reasoning
 - Number Skills (counting, number concepts)
 - Reading Skills (alphabet, letter recognition, writing)
 - Investigation (knowing where to get information)
 - Decision Making and Consideration of Alternatives
 - Synthesis and Summary
 - Planning
 - Approaches to Literacy
 - Formation of Hypotheses
 - Story Comprehension Skills (e.g., inferential reasoning)
 - Other (fill in)
-

A.1.2. Variable 1b: Knowledge/information skills (Learning about the world-increasing knowledge about facts, ideas, cultures, arts, theories; focus on schoollike information)

Does the child convey a knowledge/information lesson?

0 NO

1 YES

If yes, check all applicable categories.

-
- Historical Facts
 - Current Events
 - Cultural Lessons (countries and cultures)
 - Career Information
 - Animals and Animal Behavior
 - Physical Sciences (physics, chemistry, biology)
 - Social Sciences (sociology, psychology, communications)
 - Mathematics
 - Botany (plants)
 - Vocabulary
 - Spelling
 - Colors
 - Shapes
 - Sports
 - Technology
 - Geography
 - Languages
 - Meteorology and Astronomy
 - Politics

- Economics
 - The Arts (music, literature, dance)
 - What School Is All About
 - What Happens at the Doctor/Dentist
 - Other (fill in)
-

A.1.3. Variable 1c: Social and emotional skills (Learning how to live with yourself and to get along with others.)

Does the child convey a social and emotional skills lesson?

0 NO

1 YES

If yes, check all applicable categories. Are these included in your coding?

Intrapersonal Skills

- Emotions and their Labeling
- Persistence/Perseverance
- Self-esteem
- Coping and Strategies of Coping; Effectiveness of Coping
- Motivation (how to motivate oneself)
- Impulse Control/Delay of Gratification/Self-regulation
- Development of Autonomy/Independence (esp. in contrast to peer pressure)
- Role-taking (being able to take on different roles, understand others' motivations)
- Overcoming Fears
- Knowing Where to Get Help
- Patience
- Think about Consequences before Acting
- Other (fill in)

Interpersonal Skills

- Acceptance of Diversity
- Understanding Rules
- Sharing
- Respect
- Cooperation
- Responsibility
- Honesty
- Loyalty
- Sensitivity
- Altruism
- Conflict Resolution
- Social Interaction Skills
- Collaboration
- Leadership

Interpersonal Skills

- Manners
 Helping
 Caring About Others
 Other (fill in)

Values

- Moral Values (Doing the Right Thing)
 Appreciation of Family
 Appreciation of Friends
 Valuing life (including animal life)
-

A.1.4. Variable 1d: Physical well-being/motor development skills (Learning to take care of our bodies.)

Does a child convey a physical well-being/motor development lesson?

-
- 0 NO
 1 YES
-

If yes, check all applicable categories.

-
- Hygiene (health)
 Grooming (appearance)
 Motor Skills (coordination, fine motor skills; athletic skills)
 Nutrition
 Exercise
 Safety
 Other
-

A.2. Primary lesson in children's reports

The primary goal is the overarching lesson—the lesson that receives the most time and attention. Many programs have subtexts with “mini” lessons. Write in the child’s MAIN educational lesson. Include any subtext mentioned.

Circle the response that reflects the educational goal or primary lesson that the child is conveying?

-
1. Cognitive Skills
 2. Knowledge/Information Skills
 3. Social and Emotional Skills
 4. Physical Well-being/Motor Development Skills
 5. Mixed more than one skill or type of lesson equally emphasized

- 6. None
 - 9. Cannot Code
-

A.3. The “strength” in children’s reports

Circle a response for each component of report strength.

(1) Lesson Clarity—For a narrative story, the point of the program should be clearly presented.

On this question, focus on what children say they learned.

-
- 0 Not at all
 - 1 Somewhat
 - 2 Very well
-

(2) Lesson Consistency—To what degree does the child describe the program so that you can understand it? To what degree does the child discuss the storyline of the program throughout his or her report? Also consider whether or not the child wanders off topic versus stays on task. A major and minor theme can be presented, but incidental content (e.g., jokes) should be considered off task. Note how the program/story is presented by the child. Evaluate if there is a logical temporal flow in how children present the program events.

-
- 0 Not at all
 - 1 Somewhat
 - 2 Very well
-

(3) Lesson Engagement—To what degree does the child report the lesson in an engaging manner, e.g., excitement? Does the child seem interested in what he or she is conveying in the report? Do they, for example, tell you that they learned something fun or interesting? One criterion is how much detail they provide about the program. Another is the use of affective terms such as “like,” “enjoy,” “cool,” etc., in relation to the story. A final criterion is how much they write about the program. Not all components have to be found in each report for it to rate as Very Well.

-
- 0 Not at all
 - 1 Somewhat
 - 2 Very well
-

(4) Lesson Generalizability—To what degree does the child describe the lesson in relation to his or her own life? Consider if the child relates the lesson to events in his or her own life. “I learned that I could...” is one way to target this area. Another is when the child discusses events from his or her own life that he or she links to the program

lesson. Also, consider if a lesson is stated that can be readily applied to a child's life even if a direct link is not made. Focus on what children say they learned in making this assessment.

0 Not at all
 1 Somewhat
 2 Very well

A.4. Genre of the program

- A.** Animation Comedy or Drama (e.g., Batman, Gumby). Characters are shown as “cartoon characters” through traditional or computer generated animation or claymation.
- B.** Live Action Comedy or Drama (e.g., Wishbone, Power Rangers). Human actor (with or without special effects; with or without costumes)
- C.** Quiz/Game (e.g., Where in the World is Carmen Sandiego?). Characters/actors/players are involved in a game or contest where they respond to academic questions or physical challenges.
- D.** Magazine Format (e.g., Sesame Street). Program is presented in a series of segments, or “bits,” each of which has a beginning, middle and end or tells a separate story through different genres; different characters and/or different production techniques.
- E.** Music/Concert (e.g., A Raffi Concert). Characters or actors on program are predominantly shown singing, dancing, and/or playing a musical instrument.
- F.** Exercise (e.g., Mousercise). Characters or actors on program are predominantly shown exercising.
- G.** Muppets and Puppets (e.g., Puzzle Place). Characters and primary Muppets and/or puppets.
- H.** Mixed (e.g., Bookmice). Some other genre and equal mix of two or more genres in a format outside of the magazine format.
- I.** News, Documentary, Talk Show (e.g., Rap Around, Not Just News). Program is nonfiction, featuring information, news or “chat”
- J.** Story Reading. The majority of the content consists of an actor reading from a book and visuals showing the pages of the book (in illustration).
- K.** Other (describe)
- L.** Cannot Code

A.5. Program structure for this year's sample

- A.** Expository. The Program is constructed in such a way that the lesson or lessons shape the program content. It is designed to convey information, not tell a story.
- B.** Narrative. The program is constructed in such a way that the lesson is woven into a narrative (a dramatic or comedic story) that has a beginning, middle and end.
- C.** Combination of Expository and Narrative Structure.

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