Educational media serve as informal educators within the home by supplementing young children's development. Substantial evidence documents the contributions of educational television to preschoolers' acquisition of a variety of skills; however, television's natural capacity as storyteller and the role it plays in preschoolers' early literacy development has been largely overlooked. This study examined the effects of viewing different TV program types on 311 at-risk preschoolers' story knowledge and narrative skills. Children were assigned to one of four viewing conditions (i.e. watching up to 40 episodes of a particular program type): no viewing; expository; embedded narrative; or traditional narrative. Story knowledge scores were higher for those viewing either narrative type. In contrast, viewing specific narrative types differentially affected the component skills of narrative competence. Story retelling and identification of explicit story events were higher after repeat viewing of embedded narratives while generating implicit story content was higher after repeat viewing of traditional narratives.

Developmental growth trajectories associated with language and literacy skills are established early in life and are difficult to change (Baydar, Brooks-Gunn, & Furstenberg, 1993; Linebarger, Kosanic, Greenwood, & Doku, 2004; Whitehurst & Lonigan, 1998). Research has shown that children from ethnic minority subgroups and socio-economically disadvantaged families are at particular risk for literacy difficulties (Chatterji, 2006; Dee Nichols, Rupley, Rickelman, & Algozzine, 2004; Juel, Griffith, & Gough, 1986). For example, despite the documented benefits of high-quality preschool or child care (e.g. Connor, Morrison, & Slominski, 2006; Magnuson, Meyers, Ruhm, & Waldfogel, 2004), the US Department of Education reports that, relative to European American children, African American children are less likely to be enrolled and are more likely to be below modal grade for their age in school (KewalRamani, Gilbertson, Fox, & Provasnik, 2007). Moreover, socioeconomically disadvantaged children are likely to live in homes with few financial resources and poorly educated parents (Smith,
Brooks-Gunn, & Klebanov, 1997) and in neighbourhoods where print use is infrequently modelled and print materials are of poor quality or non-existent (Neuman & Celano, 2001), resulting in fewer opportunities to develop early language and literacy skills. Finding ways to both bolster the early literacy skills of these at-risk children as well as ways to sustain these gains is an important goal (Linebarger & Piotrowski, 2006).

**Early literacy skills**

Given the opportunity, via the environment or available materials, preschoolers will often spontaneously engage in early literacy activities. Children will eagerly listen as a story is read or may even page through a storybook, constructing a story all their own. They may help a parent ‘write’ a shopping list or a letter to a friend. They may sing rhyming songs with classmates or play letter games during a long car ride. These are just some examples of activities that can enhance a young child’s early literacy (see also Teale & Sulzby, 1986). Consisting of the ‘skills, knowledge, and attitudes that are presumed to be developmental precursors to conventional forms of reading and writing . . . and the environments that support these developments’, early literacy skills are critical components for future literacy skills (Whitehurst & Lonigan, 1998, p. 849).

The early literacy perspective argues that literacy is a developmental continuum with its origins early in a child’s life, as opposed to an ‘all or none phenomenon’ that begins when children begin formal schooling (Whitehurst, Epstein et al., 1994; Whitehurst & Lonigan, 1998). Now pervasive among literacy professionals, this view recognizes that the early literacy behaviours of preschool children are legitimate, important, and predictive of later fluent reading (Aram, 2005; Teale & Sulzby, 1986; Whitehurst et al., 1999).

As recognition of the importance of the early years has grown, there has been equally significant growth in the number and types of interventions targeted at this age. Although varied, the interventions commonly focus on promoting one, some, or all of the following: (1) children’s motivation and interest in print, (2) environments that are conducive to literacy development, and (3) skills and knowledge necessary for conventional literacy. While there are interventions that have focused exclusively on either children’s motivation or the literacy environment (e.g. Jordan, Snow, & Porche, 2000; Morrow & Weinstein, 1986; Neuman, 1999), interventions generally include or exclusively target the development of children’s skills and knowledge.

Early literacy, as well as conventional literacy, is thought to consist of two interdependent sets of skills and processes which work simultaneously: code related skills and oral language skills (Whitehurst & Lonigan, 1998). Referred to as inside-out processes by Whitehurst and Lonigan (1998), code-related skills encompass the rules for translating print (e.g. letter-sound correspondence, phonemic, and phonological awareness, letter-naming abilities). In contrast, oral language skills (also referred to as outside-in processes) support children’s understanding of the meaning of print and include vocabulary knowledge, story schemas, conceptual knowledge, and narrative comprehension skills (Whitehurst & Lonigan, 1998). Relationships among code-related skills and oral language skills require the complex coordination and integration of these skills. Whitehurst, Lonigan, and their colleagues argue that in the early stages of literacy development, preschoolers primarily develop their code-related skills (Storch Bracken, 2005; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 1998). However, recent evidence suggests that both sets of skills are important at all stages of literacy development and that developing these skills early does relate to later fluent reading.
Since these skills are not often influenced by the same type of experiences, intense and multifaceted interventions are necessary for maximum reading achievement (Whitehurst & Lonigan, 1998).

The home environment is one arena where effective interventions can have a substantial impact on young children. A wealth of research has documented the relationship between the home literacy environment and children’s literacy skills (Bracken & Fischel, 2008; DeTemple, 2001; Mason, Stewart, Peterman, & Dunning, 1992; Purcell-Gates & Dahl, 1991; van Kleeck, 2003). Unfortunately, parents of at-risk children may be unable or unaware of how to structure a stimulating home literacy environment for their children. Dickinson and colleagues documented that many families have difficulties providing children the early literacy and language experiences that are needed because parents who are financially challenged have limited access to books and potentially limited literacy skills themselves (Dickinson, McCabe, & Anastasopoulos, 2003). While interventions within the home can be effective (e.g. Whitehurst, Arnold et al., 1994), such programs are often costly and difficult to sustain or scale to reach a wider audience. One potential vehicle for intervention sitting within the homes of nearly all Americans and especially valued by families from low-income and minority backgrounds is a potential learning tool that is inexpensive, sustainable, and scalable: the television set.

Nearly all children living in the US ages 6 months to 6 years (99%) live in a home with at least one television and 79% of 4- to 6-year-old children watch television on a typical day (Rideout & Hamel, 2006). Moreover, children whose parents have lower incomes or less formal education tend to watch more television (Rideout & Hamel, 2006) and value this experience as a way to relax (Knowledge Networks, 2005) or learn ‘interesting things’ (Roberts, Foehr, & Rideout, 2005). Although these data were collected in the US, similar patterns have been documented across other industrialized countries. In an analysis of media use habits across 11 countries, researchers concluded television is a universally used medium to which children allot the most time (Beentjes, Koolstra, Marseille, & van der Voort, 2001). Furthermore, paralleling findings in the US, these researchers found that children from low socio-economic status (SES) homes spend more time watching television and video than children from high SES homes. Television’s natural strength is its unique ability to reach young children from all segments of society (Mielke, 1994). Because television is a familiar medium to most children, it can function as an important and motivating bridge for a variety of school readiness skills including oral and print-based literacy by providing meaningful, motivating, and complex comprehension opportunities (Fisch, 2004; Goldman, Varma, Sharpe, & CTGV, 1999; Schmidt & Anderson, 2007).

Although television and literacy may seem an ‘unlikely marriage’ (Linebarger, 2007), scholars (Linebarger, 2006; Neuman, 1995; Sadoski & Paivio, 1994) argue that the cognitive skills used in processing different kinds of media are the same and that the skills learned in one medium can be transferred for use in other media contexts (Harste, Burke, & Woodward, 1994; Kendeou, Bohn-Gettler, White, & van den Broek, 2008; Kendeou et al., 2005). As such, a synergistic relationship develops and provides children with more frequent opportunities for literacy-enriching interactions. This argument has largely been supported with research demonstrating the powerful educational role that well-developed television programming can play for augmenting children’s early literacy skills across a variety of domains including vocabulary development (e.g. Naigles & Mayeux, 2001), phonemic awareness and phonics (e.g. Linebarger et al., 2004), reading
fluency (e.g. Linebarger, 2001), and text comprehension (e.g. Kendeou et al., 2008; Kendeou et al., 2005). Much of this research has either used televised stimuli developed with the explicit intent of supporting literacy skills (e.g. Between the Lions, Linebarger et al., 2004; Sesame Street, Wright et al., 2001) or has focused on how specific literacy information is presented (e.g. use of concrete visuals to match verbal referents, Fisch, McCann Brown, & Cohen, 2001; movement of print onscreen, Linebarger, Lapierre, & Vaala, 2007). While both methodologies offer information critical to the development of quality children's programming, they do so often at the expense of how the content is delivered. Television is a ‘centralized system of storytelling’ (Gerbner, Gross, Morgan, Signorielli, & Shanahan, 2002, p. 44) and yet, with the exception of Uchikoshi’s (2005) work analyzing the role of televised narratives in supporting the narrative skills of bilingual children, it appears that television’s storytelling capabilities have been largely overlooked.

Television: Storyteller and information conveyor

Through television, children experience content via different genres including expository frameworks and narrative-based stories. Children can be exposed to conceptual information and world knowledge in short vignettes linked together by a common theme and they can hear and see stories in the traditional narrative style. Each presentation genre (i.e. narrative, expository) with its accompanying framework and specific content focus is associated with different sets of skills. Reading print-based expository books is related to conceptual knowledge and vocabulary development, stronger comparative/contrastive abilities, and the use of classificatory language structures when describing the book content (Duke & Kays, 1998). In contrast, exposure to narrative-based stories through book reading has consistently been linked to early literacy skills as well as later school success (e.g. Nord, Lennon, Liu, & Chandler, 1999; Scarborough & Dobrich, 1994) and has been found to support language development (Dickinson & Tabor, 2001), knowledge of story structure and print concepts (Allor & McCathren, 2003; Neuman & Roskos, 2005), and narrative skills (Dickinson & Smith, 1994). Considered by some a ‘basic human quality’ (Kinnebrock & Bilandzic, 2006, p. 5), narrative skill development is the focus of the current study. Because a synergistic relationship forms among multiple media types (Harste et al., 1994; Kendeou et al., 2008; Kendeou et al., 2005; Linebarger, 2006; Neuman, 1995), it is likely that the skills acquired through repeated experiences with narrative-based storybooks would also be acquired through or transferred to understanding similarly constructed, narrative-based televised stories. These skills play a critical role in the development of reading comprehension skills which are, in turn, strongly related to overall fluent reading.

Early socialization experiences are critical to the development of narrative skills (McCabe, 1997; Paris, Carpenter, Paris, & Hamilton, 2005) because narratives become part of the daily experience for young children (Paris et al., 2005). As parents tell family stories in the presence of their children, they model narrative construction (McCabe & Peterson, 1991). Moreover, parents assist with a child’s event narration by scaffolding via questions (Wiley, Rose, Burger, & Miller, 1998) or through joint book-reading experiences where children learn to understand and produce narratives (Lonigan & Whitehurst, 1998; Teale, 1986). The children most at-risk for literacy difficulties often do not have these necessary early socialization experiences. Television may offer an opportunity to provide these experiences when parents cannot.
Beck & Clarke-Stewart (1998) suggest that television is particularly adept at presenting stories, leading to higher levels of narrative expression because (1) television is enjoyable and typically maintains children’s attention, (2) information is redundant, supporting children’s acquisition of the gist of a story even if they momentarily lose attention, (3) information is presented in dual models (i.e. visual and verbal) leading to additive effects on memory, and (4) audiovisuals offers more obvious emotion content that is more likely to be remembered (see also Beagles-Roos & Gat, 1983; Hayes, Kelly, & Mandel, 1986; Sadoski & Paivio, 1994).

**Story knowledge, narrative skills, and narrative presentation**

While watching a televised story, children are exposed to the structure of stories. This structure, or story grammar, is the set of rules that identify important elements in a story as well as the manner in which these rules are logically ordered and related to one another (Buss, Yussen, Mathews, Miller, & Rembold, 1983; Fitzgerald, 1989). Through exposure to stories that conform to the prototypical story grammar (Mandler & Johnson, 1977; Stein & Glenn, 1979), children develop a story schema or ‘memory structures which consist of clusters of knowledge about stories and how they are typically structured and the ability to use this knowledge in processing stories’ (Fitzgerald, 1989; Gurry, 1981). In other words, through exposure to stories, children learn the basic structure of stories and can use this developing knowledge to aid in processing previously constructed stories or in creating their own new stories.

Processing and constructing stories involves using one’s developing story knowledge or schema (1) when attending to stories to aid encoding and comprehension, (2) to act as a retrieval mechanism during recall, and (3) to guide one’s production of narratives (Buss et al., 1983; Fisch, 2000; Hudson & Shapiro, 1991; Low & Durkin, 1998; Mandler & Johnson, 1977; Meadowcroft, 1986; Meadowcroft & Reeves, 1989). Children who are exposed to repeated televised narratives should develop a stronger story schema resulting in greater involvement with a narrative (regardless of media format) because they have the cognitive structures in place to help encode the narrative content more efficiently. As a result of this efficient encoding, these children will be better able to produce retellings of the narrative that more closely conform to a prototypical story format. Moreover, these children will be better able to comprehend key content within the narratives (i.e. explicit content) allowing them to free up their cognitive resources to further focus on generating inferences from the explicit content to more abstract or inferred content (i.e. implicit content).

**H1:** Children who repeatedly view televised narratives will outperform peers who do not view narratives on tasks assessing story knowledge skills.

**H2:** Children who repeatedly view television narratives will outperform peers who do not view narratives on tasks assessing print-based narrative skills (i.e. involvement, retelling, explicit comprehension, and implicit comprehension).

As with print, televised programs are not all alike. While the research to date would intimate that a televised narrative using a well-structured story grammar would support both story knowledge and narrative skills, we know little about how program structure variability supports or inhibits the overall effectiveness of educational television. Program types include those that use a more typical storybook format; those that feature an inner story embedded in an outer story; and those that thread together vignettes
around a larger theme. Research suggests that embedded story presentations increase story complexity and decrease available processing power necessary for recalling relevant story events (Goldman et al., 1999). When comparing a verbal presentation of an embedded story with a video presentation, children in the video condition correctly recalled more story-relevant events than their verbal condition counterparts, suggesting that video may be a useful tool for presenting embedded stories by acting as a scaffold that reduces the amount of processing needed to remember and retell an audio-only presentation. Other research confirms the visual superiority effect for preschool children; that is, when information is complex or difficult to process, children will default to remembering the visual information. Children in the verbal only condition were unable to take advantage of visual information support, resulting in decrements in their recall of story events. While embedded stories may be more complex than traditional storybook formatted stories, this complexity may be decreased when presented in a video context. Alternatively, comprehension and recall of traditional video story formats predict later reading success (Kendeou et al., 2005) and are more easily recalled than expository video formats (Linebarger & Piotrowski, 2009).

RQ1: Do video narratives using traditional story presentations differ from video narratives using embedded story presentations in their impact on the literacy outcomes measured in this study?

Considering that a child’s initial exposure to stories is likely to come from book reading, storytelling, and viewing television, understanding the role that televised narratives play in narrative skill development is important (Meringoff, 1980), filling an important gap in the literature. Further, for low-income children who have fewer materials and literacy experiences available to them, television viewing represents a key opportunity for educational practice and redundancy (Mielke, 1994). This study contributes to the extant literature by investigating an opportunity for at-risk preschool children to gain needed early literacy experiences via the alternative and supplemental route of television.

Methods

Participants

After receiving approval from the Institutional Review Board at the University of Pennsylvania, a total of 356 children were recruited for participation. Of these children, 45 were ineligible to participate due to age (i.e. 32 children were younger than 3 years and 13 were older than 5 years). Therefore, the final sample consisted of 311 preschool children (\(M_{age} = 4.54\) years, \(SD = 0.72\); 48% boys) attending child care centres in the downtown area of a major north-eastern city in the US. All children were recruited from child care centres serving predominantly economically disadvantaged children and families. A total of 31 classrooms, across 13 schools, participated in the study.

Research design

To address the hypotheses and research question, a quasi-experimental design was used (Shadish, Cook, & Campbell, 2001). Random assignment to condition was completed at the classroom level. Given existing classroom structures and teacher preferences, random assignment by individual student was not possible. The major disadvantage of this design was that the original groupings (by classroom) may have differed from one
another in substantial or meaningful ways and, subsequently, any differences across groups may be attributable to factors such as teacher attitude, teacher behaviour, or classroom literacy environment. We attempted to reduce this problem by recruiting children from child care centres with demographically similar families. We also collected detailed information from each classroom to evaluate any initial differences. The experimental manipulation resulted in the creation of four conditions: (1) non-viewing ($N = 77; 40$ boys; $M_{\text{age}} = 4.32$ years, $SD = .76$), (2) expository viewing ($N = 78; 33$ boys; $M_{\text{age}} = 4.54$ years, $SD = .69$), (3) embedded narrative viewing ($N = 77; 36$ boys; $M_{\text{age}} = 4.67$ years, $SD = .75$), and (4) traditional narrative viewing ($N = 79; 39$ boys; $M_{\text{age}} = 4.64$ years, $SD = .62$).

**Stimuli**

Children in viewing classrooms viewed one television episode per day for 40 days. A total of 30 episodes were selected for each viewing condition, with 10 randomly selected episodes repeated one time due to a lack of unique episodes for one of the stimuli (i.e. embedded story). All viewing stimuli were edited to 11 min in length. Due to the location and nature of the viewing experience (e.g. preschoolers’ typical attention to video begins to wane after roughly 15 min of viewing), children watched in small groups in their child care classrooms. Stimuli for each of the manipulations were chosen to fit the style of programming needed to evaluate the hypotheses and research question described above.

**Expository stimuli**

The stimulus (i.e. *Zoboomafoo*) was chosen based on its primary purpose of explaining, describing, or providing the audience with information about a particular topic (i.e. definition of expository, Ball, Cook, & Pettigrew, 2007) without using a narrative format. This stimulus combines live action and claymation vignettes to introduce a preschool audience to the animal world. Each episode features two brothers and a lemur puppet who present a variety of vignettes about a particular animal and that animal’s habitat. Typically, the vignettes are filmed across several locations including Animal Junction (the main set of the show) and the animal’s typical habitat (e.g. African desert, Arctic Ocean; *Zoboomafoo: Family fun*, 2008).

**Embedded narrative stimuli**

This stimulus (i.e. *Pinky Dinky Doo*) was chosen because it incorporated a story within a story. Specifically, the initial story presents the main characters (i.e. big sister, little brother) and sets up a particular problem. Then, the big sister presents a fictionalized story to her brother to provide a parallel story where the original problem is solved (*Pinky Dinky Doo: Grown-up’s guide*, 2008). At the conclusion of the embedded story, viewers return to the original problem/story and discuss the solution offered by the embedded story. The program uses flash animation over photo collage backgrounds.

**Traditional narrative stimuli**

This stimulus (i.e. *Clifford the Big Red Dog*) used a prototypical storybook format with dialogue and recurring characters to present prosocial messages to preschoolers (*Clifford the Big Red Dog: Program summary*, 2008). The story follows a simple linear story with a problem and a solution that unfolds over the episode. The program is animated.
Clifford the Big Red Dog and Pinky Dinky Doo use a split-episode framework composed of two 11-min episodes separated by a bumper or interstitial. By separating the episodes, we were able to create 11-min episodes without disrupting the narrative structure. Because Zoboomafoo is 27 min long and is not composed of a split-episode framework, each episode had to be shortened to conform to the same 11 min length as the two narrative stimuli. This was accomplished in two ways. First, in order to reduce any narrative structure that may have occurred within each Zoboomafoo episode, we edited out linear streams of action (e.g. the two hosts speaking to a character puppet after jumping to and from various vignettes leaving only vignettes loosely connected by topic with no host bringing the connections together). Following this step, we continued to remove vignettes as necessary until the total episode length was reduced to 11 min. Thus, each Zoboomafoo episode was edited both for structure and length.

Children in the non-viewing condition went about their typical child care day and did not view any programming in their classrooms. As viewing classrooms tended to incorporate the television viewing during scheduled free play times, children in the non-viewing condition likely experienced slightly greater free play time than their viewing peers. While it is possible that children in the non-viewing group participated in alternate literacy-enriching activities during this free play time, classroom observations suggest that free play time consisted primarily of outdoor activities (e.g. bicycling, jungle gym).

Procedure
After classroom and parental consent were received, children were pre-tested using the researcher-developed and standardized instruments described below. Once pre-testing was completed, children in viewing conditions began viewing the stimuli. After viewing 20 episodes and after viewing 40 episodes, all children were tested again using alternate forms of the assessment. We included the mid-point assessments because we were interested in exploring the amount of exposure necessary to produce change. In previous research, significant effects were detected after viewing 4 and 8 h 30 min of programming (Linebarger et al., 2004). Viewing groups watched the episodes at the same time each day and teachers were instructed not to discuss any elements of the program prior to, during, or after viewing the episodes. Additionally, weekly viewing logs were collected from teachers in viewing classrooms in order to assess both stimuli exposure as well as to ensure that viewings remained on schedule.

Measures
The measurement strategy selected was based on sensitivity to immediate effects of the intervention, the ability to generalize improvements beyond the program content, and the need to evaluate and control for the current classroom early literacy environment. Child outcome measures were chosen or created to evaluate story knowledge and narrative skills.

Story knowledge
Story knowledge is knowledge about story structure and the relations among these structures. General story knowledge was assessed via a task that we created based on our review of prior literature (Dickinson & Tabors, 2001; Meadowcroft & Reeves, 1989). Children were given a set of three pictures unrelated to any videos seen and were asked
to put the pictures in the correct order (i.e. sequencing) and then asked to tell a story with these pictures once they had arranged them. This task was repeated three times at each wave of assessment, using alternate forms at each time point (i.e. there were a total of nine sets of images). Points were given for correctly sequencing the pictures and adequately generating stories. Images for this assessment were selected from sequencing tasks found in literacy workbooks.

Sequencing was coded using a 3-point scale: 0 = no images in correct order; 1 = 2 images in correct order; 2 = all 3 images in the correct order. Stories were coded using a 3-point scale: 0 = irrelevant story/no answer; 1 = child’s story does not evidence use of connective language or story order language; 2 = the child provides a story that correctly matches their picture order, and the story illustrates knowledge of connection between the pictures and/or uses ordering language. All story responses were independently coded by two trained coders, and inter-rater reliability was assessed via percent agreement. Percent agreement was calculated by taking the total number of agreements and dividing by the total of agreements plus disagreements. Inter-rater reliability was good (i.e. percent agreement = 96.0%). Scores on the sequencing and story generating subparts were summed to create one overall score. Thus, a maximum score per image set was a score of 4 with a maximum total per wave of 12.

Narrative involvement, recall, & comprehension was measured using the Narrative comprehension of picture books task (Paris & Paris, 2001), a measure of young children’s comprehension of wordless picture books designed to assess thinking and comprehension of narrative sequences independent of any decoding skills (an essential feature for preschool children who would not be expected to be reading). The measure is comprised of three separate tasks (i.e. storybook picture walk; retelling; and prompted comprehension) that yield four different composite scores including narrative involvement with the story; narrative retelling of the story; narrative comprehension of explicit story information; and narrative comprehension of implicit story information. Alternate forms of the assessment were used at each assessment time point. Specifically, we selected three wordless picture books that are part of a larger book series, authored by Mercer Mayer, that have been used in previous research assessing narrative skills with children (Berman & Slobin, 1994).

Narrative involvement is measured by observing and recording five characteristics of the child during the assessment (book handling, engagement, picture comments, storytelling comments, comprehension strategies). Each characteristic is scored on a 0 through 2 scale resulting in a maximum score per wave of 10. Similarly, narrative retelling is measured by coding children’s responses for six story dimensions (setting, character, goal, problem, solution, and resolution). Each dimension is scored 0 through 2 and summed to create a total retelling score with a maximum of 12. Finally, explicit

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1 Children were shown three images (in a predetermined order) and were then told: ‘Here are three pictures (data collector points to pictures): in this picture we see a boy inside the bus, in this picture we see a boy waiting for the bus, and in this picture we see a boy getting on the bus. I want you to put these pictures in order. What do you think happens first? (pause for response) What happens next? (pause for response) What happens last? (pause for response). After sequencing the images, data collectors asked the child to tell a story with the pictures – ‘Now, tell me a story with these pictures’ and, if necessary, offered a standard prompt by asking ‘What do you think is happening in these pictures?’

2 An example of a story that received a score of 1 on the story score would be: ‘the boy waits for the bus to come when the sun is out’. An example of a story that received a 2 is: ‘the boy was waiting for bus for school, and then bus was driving by and the kid waited for a long time at yellow pole and the bus came and took him to school.’

3 The three books used for this assessment were: (1) A boy, a dog and a frog, (2) Frog, where are you?, and (3) One frog too many all by Mercer Mayer. One frog too many was jointly authored by Marianna Mayer.
and implicit narrative comprehension are each assessed through five comprehension questions. Responses to each question are coded on a 0 through 2 scale and summed to create a total score, with a maximum score of 10. Measurement of narrative involvement and retelling were identical across assessment time points while questions assessing explicit and implicit content were adjusted to the content of the specific picture book.

The measure has sound psychometric properties. Predictive validity with the Iowa-Test of Basic Skills - Comprehension scale ranged from .30 to .52 across subscales of the narrative task. Concurrent validity estimates with the Michigan Literacy Progress Profile ranged from .33 to .44 across subscales of the narrative task. The measure was sensitive to differences in both reading ability and developmental status. Two raters independently coded the retelling and prompted comprehension subtests with acceptable reliability (i.e. retelling = 80.7% agreement; prompted comprehension = 80.0% agreement).

Classroom literacy environment

The classroom literacy environment was examined using the Early Literacy and Language Classroom Observation Tool (ELLCO). There are three components: the Literacy Environment Checklist, the Classroom Observation and Teacher Interview, and the Literacy Activities Rating Scale. For this study, we use the literacy environment checklist as our statistical classroom control variable as it relied on classroom observations and it was most highly related to the reported outcomes in this paper (i.e. zero-order correlations were significant, or marginally significant, between this checklist and all our outcomes, averaging 0.16, ranging from .10 to .23, p-values from .0001 to .07). This checklist involves conducting a brief examination of the classroom’s layout and contents via 25 items that measure availability, content, and diversity of reading, writing, and listening materials. The average checklist score across the 32 classrooms was 18.55 (i.e. out of 40; SD = 4.51). Two raters independently conducted more than half of the classroom observations to establish reliability. Percent agreement was acceptable (i.e. 25 classrooms were double-rated with 83% agreement).

Classroom viewing logs

All teachers whose classrooms were viewing classrooms were asked to complete weekly viewing logs for all parentally-consented children in their classes. Research staff collected these viewing logs weekly. There was no significant difference in the numbers of viewings by condition, F(2, 231) = .42, p = .66, partial η² = .00. On average, children viewed slightly more than 25 of the possible 40 episodes in each viewing group (i.e. 4 h 35 min; Mexpository = 25.93 views, SD = 12.98; Membedded_narrative = 25.39 views, SD = 13.08; Mtraditional_narrative = 24.13 views, SD = 11.55). As the number of viewing exposures increased, scores on all outcome variables increased (see Table 1). Total number of episodes viewed was not included in further analyses.

Analytic approach

Analyses of the effects of viewing were completed using repeated measures Analysis of Covariance (ANCOVA) models. Because assignment to condition was based on a stratified sampling strategy at the classroom level and in order to maximize the likelihood that the effects of the manipulation were the ones reflected in our outcome measures, we included controls for what the child already knew or did at the pre-test for
each outcome. Next, it was important to separate out the cumulative contributions of the classroom language and literacy environment from those associated with viewing. We included the literacy environment checklist from the ELLCO as an index of the classroom environment. We also reviewed the literature to determine if there were other variables that would be important to control in our analyses. Two variables were identified: gender and age. Boys and girls have been found to differentially benefit from exposure to educational television (e.g. Anderson, Huston, Schmitt, Linebarger, & Wright, 2001; Linebarger, 2001). Additional research documents increasingly sophisticated narrative skills over time for young children (Dickinson & Tabors, 2001; Fivush & Haden, 1997; Hudson & Shapiro, 1991; Riley, Freer, Lorch, & Milich, 2007); therefore, age was also included as a covariate.

Repeated-measures ANCOVAs were developed to evaluate all hypotheses. First, each of the five outcomes were subjected to repeated measures ANCOVAs with viewing group (4-levels; non-viewers, expository viewer, embedded viewer, traditional viewer) as the between subjects factor and wave (2-levels; after viewing 20 episodes, after viewing 40 episodes) as the within subjects factor. Child’s age, gender, pre-test scores, and child’s classroom ELLCO scores were included as covariates. Next, a planned contrast was computed comparing all narrative program viewers (i.e. traditional and embedded) with all non-narrative program viewers (i.e. non-viewers and expository). Finally, to disentangle the effects of narrative type, another planned contrast that compared traditional narrative viewers to embedded narrative viewers was computed across each of the five outcomes. To estimate the practical significance of the outcomes, we reported SPSS-generated (v. 15.0) partial eta-squared effect sizes (Cohen, 1988). All means reported in the text reflect covariate-adjusted group means.

### Results

Repeated measures ANCOVA results, including between-subject covariate effects and covariate-adjusted means, are presented in Tables 2 and 3. Interactions among covariates and wave for each outcome were all non-significant and were not reported in the tables. Tables 4 and 5 present results from the planned contrast analyses.

### Table 1. Zero-order correlations among post-test outcomes, covariates, and episodes viewed

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<td>4. Episodes viewed</td>
<td>.11</td>
<td>.00</td>
<td>.26**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Story knowledge (post)</td>
<td>.41**</td>
<td>.08</td>
<td>.21**</td>
<td>.20**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Involvement (post)</td>
<td>.47**</td>
<td>.10†</td>
<td>.11†</td>
<td>.12*</td>
<td>.57**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Retelling (post)</td>
<td>.39**</td>
<td>.10†</td>
<td>.10†</td>
<td>.11*</td>
<td>.45**</td>
<td>.51**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Explicit (post)</td>
<td>.50**</td>
<td>.11†</td>
<td>.11†</td>
<td>.12*</td>
<td>.58**</td>
<td>.58**</td>
<td>.57**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Implicit (Post)</td>
<td>.45**</td>
<td>.17**</td>
<td>.17**</td>
<td>.16*</td>
<td>.52**</td>
<td>.59**</td>
<td>.49**</td>
<td>.67**</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001; †p < .10.
To evaluate H1, we computed a 4 (group) × 2 (wave) repeated measures ANCOVA with repeated measures on the last factor for scores on the story knowledge assessment. H1 was supported as evidenced by a significant group main effect. Both types of narrative viewers, traditional and embedded, obtained the highest story knowledge scores, respectively, while expository and non-viewers obtained lower scores. The planned contrast between narrative and non-narrative groups was significant, $F(1, 300) = 6.94$, $p < .01$, partial $\eta^2 = .02$, with children in the narrative groups significantly outperforming children in the non-narrative groups.

RQ1 for general story knowledge was probed via the second planned contrast between narrative types. Traditional viewers obtained marginally higher scores when compared with embedded viewers, but these results were not statistically significant, $F(1, 300) = 2.23$, $p = .14$, partial $\eta^2 = .01$.

### Narrative skills

To evaluate H2, we computed four repeated measures models for each narrative outcome: involvement, retelling, explicit comprehension, and implicit comprehension.

#### Narrative involvement

H2 for narrative involvement was not supported. All children obtained similar scores on this task (i.e. $M = 4.90$ out of 10-points; $SD = 0.08$). The planned contrast between narrative and non-narrative groups was also non-significant, $F(1, 300) = .14$, $p = .71$, partial $\eta^2 = .00$. 

\[ \text{Table 2. Covariate adjusted means for all outcomes by wave and group} \]

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Wave</th>
<th>Control</th>
<th>Expository</th>
<th>Embedded</th>
<th>Traditional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>5.25</td>
<td>5.98</td>
<td>5.69</td>
<td>4.97</td>
</tr>
<tr>
<td>Story knowledge</td>
<td>Middle</td>
<td>4.51$^{aA}$</td>
<td>4.47$^{aA}$</td>
<td>4.66$^{aA}$</td>
<td>5.38$^{aA}$</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>5.47$^{aA}$</td>
<td>5.60$^{aA}$</td>
<td>5.94$^{aA}$</td>
<td>5.99$^{aA}$</td>
</tr>
<tr>
<td>Involvement</td>
<td>Pre</td>
<td>4.88</td>
<td>5.03</td>
<td>5.19</td>
<td>4.82</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>4.99</td>
<td>4.82</td>
<td>4.92</td>
<td>4.99</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>4.72</td>
<td>4.95</td>
<td>4.78</td>
<td>5.05</td>
</tr>
<tr>
<td>Retelling</td>
<td>Pre</td>
<td>3.42</td>
<td>3.97</td>
<td>3.70</td>
<td>2.82</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>2.75$^{aA}$</td>
<td>3.07$^{aA}$</td>
<td>3.74$^{aA}$</td>
<td>2.56$^{bA}$</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>2.47</td>
<td>2.49$^{aA}$</td>
<td>2.94$^{aA}$</td>
<td>2.38</td>
</tr>
<tr>
<td>Explicit</td>
<td>Pre</td>
<td>2.91</td>
<td>3.56</td>
<td>3.34</td>
<td>2.92</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>2.37$^{aA}$</td>
<td>2.61</td>
<td>3.02$^{ab}$</td>
<td>2.35$^{aA}$</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>2.98$^{aA}$</td>
<td>2.79</td>
<td>3.20</td>
<td>2.84$^{aA}$</td>
</tr>
<tr>
<td>Implicit</td>
<td>Pre</td>
<td>2.96</td>
<td>3.45</td>
<td>3.77</td>
<td>3.06</td>
</tr>
<tr>
<td></td>
<td>Middle</td>
<td>2.50</td>
<td>2.54</td>
<td>2.73$^{aA}$</td>
<td>2.33$^{aA}$</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>2.36</td>
<td>2.33</td>
<td>2.19$^{aA}$</td>
<td>2.82$^{aA}$</td>
</tr>
</tbody>
</table>

Note. For each row, condition means that were significantly different from each other share the same lower case superscript. For each column, Wave means from middle to post-test that were significantly different share the same upper case superscript. The wave by Condition interaction was significant only for Implicit outcomes.
Table 3. Repeated-measures ANCOVA results for wave and group across all outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Condition (C) F(3, 300) =</th>
<th>Wave (W) F(1, 300) =</th>
<th>G × W F(3, 300) =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story knowledge</td>
<td>164.14***(.354)</td>
<td>164.14***(.354)</td>
<td></td>
</tr>
<tr>
<td>Involvement</td>
<td>79.45***(.209)</td>
<td>79.45***(.209)</td>
<td></td>
</tr>
<tr>
<td>Retelling</td>
<td>79.77***(.210)</td>
<td>79.77***(.210)</td>
<td></td>
</tr>
<tr>
<td>Explicit</td>
<td>103.80***(.257)</td>
<td>103.80***(.257)</td>
<td></td>
</tr>
<tr>
<td>Implicit</td>
<td>179.18***(.374)</td>
<td>179.18***(.374)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Effect sizes are reported in parentheses under F-statistic.

*p < .05; **p < .01; ***p < .001; †p < .10.
RQ1 for narrative involvement was probed with the second planned contrast between narrative types. There were no significant differences, $F(1,300) = 5.50$, $p = .018$, partial $\eta^2 = 0.00$.

Narrative retelling

H2 was partially supported as evidenced by a significant group main effect. Embedded viewers obtained the highest Retelling scores, followed by expository viewers and non-viewers. Traditional narrative viewers obtained the lowest scores. The planned contrast between narrative and non-narrative viewers was not significant, $F(1,300) = 1.16$, $p = .28$, partial $\eta^2 = 0.00$.

RQ1 for Retelling was probed via the second planned contrast between narrative types. Embedded viewers significantly outperformed their traditional narrative viewing counterparts on the narrative retelling assessment, $F(1,300) = 9.88$, $p < .01$, partial $\eta^2 = 0.03$.

Narrative comprehension – explicit

H2 was partially supported as indicated by a marginally significant main effect of group. Embedded narrative viewers obtained the highest scores, followed by expository viewers and non-viewers. Traditional narrative viewers obtained the lowest scores. The planned contrast between narrative and non-narrative groups was not significant, $F(1,300) = 1.32$, $p = .25$, partial $\eta^2 = 0.00$.

Table 4. Planned contrast results for narrative versus non-narrative groups

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Narrative</th>
<th>Non-narrative</th>
<th>$F(1, 300)$</th>
<th>Partial $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story knowledge</td>
<td>5.50</td>
<td>5.01</td>
<td>6.94***</td>
<td>0.023</td>
</tr>
<tr>
<td>Involvement</td>
<td>4.94</td>
<td>4.87</td>
<td>0.14</td>
<td>0.000</td>
</tr>
<tr>
<td>Retelling</td>
<td>2.91</td>
<td>2.70</td>
<td>1.16</td>
<td>0.004</td>
</tr>
<tr>
<td>Explicit</td>
<td>2.85</td>
<td>2.69</td>
<td>1.32</td>
<td>0.004</td>
</tr>
<tr>
<td>Implicit</td>
<td>2.52</td>
<td>2.43</td>
<td>0.48</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Table 5. Planned contrast results for embedded versus traditional narrative groups

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Embedded</th>
<th>Traditional</th>
<th>$F(1,300)$</th>
<th>Partial $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story knowledge</td>
<td>5.30</td>
<td>5.69</td>
<td>2.23</td>
<td>0.007</td>
</tr>
<tr>
<td>Involvement</td>
<td>4.85</td>
<td>5.02</td>
<td>0.50</td>
<td>0.002</td>
</tr>
<tr>
<td>Retelling</td>
<td>3.34</td>
<td>2.47</td>
<td>9.88***</td>
<td>0.032</td>
</tr>
<tr>
<td>Explicit</td>
<td>3.11</td>
<td>2.59</td>
<td>6.26***</td>
<td>0.020</td>
</tr>
<tr>
<td>Implicit</td>
<td>2.46</td>
<td>2.58</td>
<td>0.40</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001; *p < .10.
RQ1 for Explicit Comprehension was probed using the second planned contrast between narrative types. Embedded viewers’ explicit comprehension scores were significantly higher when compared with their traditional narrative viewing peers, $F(1, 300) = 6.26, p < .05$, partial $\eta^2 = .02$.

Narrative comprehension – implicit
H2 was partially supported as indicated by the significant wave by group interaction. Traditional narrative viewers’ implicit scores improved from mid-test to post-test while the performance of children in the remaining three groups declined over the same time period. The planned contrast between narrative and non-narrative groups was not significant, $F(1, 300) = .48, p = .49$, partial $\eta^2 = .00$.

RQ1 for implicit comprehension was probed using the second planned contrast between narrative types. Traditional and embedded viewers’ implicit scores did not significantly differ, $F(1, 300) = .40, p = .53$, partial $\eta^2 = .00$.

Discussion
Both story knowledge skills and narrative skills were helped by repeatedly viewing narrative-style programs. In all cases, children in one, the other, or both narrative conditions outperformed those in the expository condition and non-viewers on story knowledge skills and aspects of overall narrative competence. Specifically, story knowledge skills (i.e. the ability to sequence story events and then tell stories around those events) were higher for children who viewed narratives, regardless of type. Conversely, performance associated with repeat viewing of each narrative type differentially related to narrative skill development (e.g. involvement, implicit). Each hypothesis and research question is reviewed below.

Story knowledge
Story knowledge consists of knowledge about the structure, or story grammar, associated with a child's understanding of stories. This knowledge contributes to the formation of a mental schema that helps children organize, encode, and later retrieve externally-presented stories as well as generate novel stories (Low & Durkin, 1998; Meadowcroft & Reeves, 1989). We hypothesized that repeated exposure to programs that both model the prototypical story format (i.e. traditional narratives) and explicitly identify components of the story grammar (i.e. embedded narratives) would facilitate young children’s developing story schema. Our hypothesis was supported. The narrative groups’ story knowledge skills were higher than their non-narrative counterparts’ story knowledge after viewing approximately 4 h 30 min of narrative programming over 8 weeks.

Narrative skills
Strong narrative skills were conceptualized as the ability to construct meaning from visual stimuli (i.e. televised or pictorial) by integrating information across the stimuli in an effort to understand the actual or literal content; link this understanding to one’s own background knowledge and experiences; and then make inferences beyond the actual content. As with story knowledge, we hypothesized that children who were exposed to
repeated televised narratives would develop stronger story schemas which should then contribute to greater narrative involvement that, in turn, contributes to greater efficiency in storing and interpreting narrative content. Greater efficiency in understanding narratives should then help children become more proficient in both retelling an encoded narrative and in comprehending explicitly-presented content. Finally, because fewer cognitive resources would be needed to understand the more explicit components of narrative, more cognitive resources would be available to direct towards the most difficult aspect of understanding narrative, generating implicit story content or inferring the motives, feelings, and dialogue of characters in the presented story.

While our narrative group contrasts (narrative vs. non-narrative groups) did not reveal significant differences by condition for the narrative skills assessments, our results did show that, for all skills except narrative involvement, viewers of one of the two narrative types outperformed children in the remaining three conditions (i.e. no viewing, expository, and other narrative type). Narrative involvement is comprised of five different skills: book handling; emotional engagement with the text; comments or labels about pictures; comments integrating pictures across pages to tell a connected story; and the use of metacognitive strategies (e.g. self-monitoring of previously discussed content, paging back or forward in the story to correct story inaccuracies) while telling a story using a wordless picture book. The maximum score for this measure is 10 points while the average score for the children in this sample was approximately 5 points. Because this measure was designed for slightly older children, it is likely that the more sophisticated elements of the involvement score were too difficult for the preschoolers in this study to master (e.g. to receive a high score for storytelling, children needed to integrate components of the story across the events portrayed; to receive a high score for comprehension, the child needed to demonstrate evidence of metacognitive abilities like self-monitoring). Means reported by Paris and Paris (2001) averaged 6.9 for kindergarten, 1st grade, and non-reading children. In earlier research, 8 h 30 min of programming exposure was needed to detect changes on code-related skills (e.g. phonemic awareness, letter-sound correspondence, alphabet names; Linebarger et al., 2004). It is likely that preschoolers need even more exposure to demonstrate growth on this particularly sophisticated set of narrative skills. Alternatively, programs may need to possess certain features for them to be effective in supporting this skill set.

**Program type – embedded narratives and traditional narratives**

Story knowledge and implicit narrative skills were strongest for traditional narrative viewers while embedded narratives were more beneficial for both the narrative retelling and the explicit comprehension tasks. Story knowledge is based on the child’s ability to correctly sequence stories and then provide a narrative about that story. The traditional televised narrative is most like a storybook and is most straightforward in its presentation of story events. Further, traditional narrative viewers were also better able to generate inferences about program content. Generating inferences about characters’ feelings and potential causal story events; making predictions about what would happen next after the last page of the book; and identifying the overriding theme of the story comprise implicit comprehension skills. Embedded stories, which focused more overtly on explicit or concretely-presented story parts (e.g. characters, setting, problems, goals, outcomes), helped children recognize and recall these components in both print-based
retelling and prompted comprehension tasks. There are two potential mechanisms for these differential relations. Because children are more familiar with traditional narratives (e.g. over 90% of the books that children read in kindergarten are traditional narratives, Stein & Trabasso, 1982), they were able to devote fewer cognitive resources to the explicit story components and more resources to generating inferences about implicit story elements. When viewing an embedded story, a child must focus on dual stories: the primary (i.e. the main narrative) and the embedded story (i.e. the story within the story). Shifting between the two stories diminishes the available cognitive resources necessary to generate more difficult implicit connections. Second, the embedded story narratives labelled explicit story components in each episode. By directing a child’s attention to these explicit components, the program reinforced this content at the expense of other content not relevant to interpreting the literal story events but potentially vital to generating implicit connections.

Expository viewers’ performance varied across outcome type although it was never stronger than the dominant narrative type for a particular outcome. Specifically, expository viewers’ scores were lower than both narrative types for story knowledge but higher than the weaker narrative for the narrative skills. Expository programs have, at best, limited stories tying the vignettes together around a common theme or topic. This focus on world knowledge at the expense of narrative structure inhibited the child’s ability to adequately sequence and produce stories. However, expository programs did not appear to inhibit the child’s ability to retell print-based stories and answer both explicit and implicit questions about those stories. Expository programs typically repeat content using multiple vignettes thereby highlighting program features that may be worth encoding and later recalling although not at the same level as the dominant narrative. Identification of the narrative features in each of these genres is needed to determine if expository programs do have typical narrative features or potentially other features that support the narrative skills measured in this study.

**Limitations & conclusions**

Overall, these findings suggest that exposure to well developed educational programming can enhance early story knowledge skills as well as narrative skills for economically-disadvantaged preschoolers. Children from ethnic minority subgroups and socioeconomically disadvantaged students are at particular risk for literacy difficulties (Chatterji, 2006; Dee Nichols *et al.*, 2004; Juel *et al.*, 1986). Research has shown that narrative skills are a critical component to the development of literacy and that these skills are both developed and enhanced through exposure to well-structured stories (in multiple media formats). Televisions are ubiquitous in the homes of young children and represent a nearly universal, sustainable, and scalable intervention that, when used appropriately, has the power to positively shape these children’s developmental trajectories from 6 months to 16 years (Anderson *et al.*, 2001; Linebarger & Walker, 2005; Wright *et al.*, 2001). By combining a preferred activity with strong stories, children have an opportunity to practice their narrative skills while viewing. Televised narratives, as a whole, were more beneficial for preschoolers compared with expository programs; however, media synergy suggests that a balanced diet of each of the 3 genre types would differentially contribute to skills development in a print-based medium including skills not examined in this study (e.g. oral language and vocabulary, code-related skills). In fact, Kendeou *et al.* (2008) have found that early
comprehension of televised stories (at age 6) predicted comprehension of print-based stories at age eight.

The research presented here is an important step in understanding how television can enhance a child’s literacy skills. Our ability to demonstrate significant literacy improvement after a relatively short amount of exposure underscores the impact that television has on young children’s development; however, additional work is necessary. First, a replication of this study is needed in which the average viewing exposure is closer to the planned intervention. This may be achieved through an extended intervention period that anticipates a specific percentage of completed viewings or, alternatively, through an intervention that utilizes longer viewing sessions. Second, future work must take into account a child’s home environment. In our study, we attempted to collect detailed surveys from parents to identify home literacy behaviours as well as home television habits. Despite multiple attempts (i.e. mailed surveys, in-person interviewing, phone interviewing) to elicit this information, our response rate was quite low and we were unable to include these data in our analyses. In addition to incorporating the family environment in analyses, future work would benefit from incorporating more realistic home viewing into the research design. Moreover, researchers should work to create and incorporate theoretically-driven appeal assessments in order to assess what role stimuli appeal is playing in the viewer retention process. Finally, based on the results we have reported in this paper, it is evident that not all TV genres are alike. We are currently devising a method to more closely evaluate the format of TV genres including the structures embedded in these programs that might be contributing to outcomes. It is our hope that this micro-level analysis will more fully elucidate the relationships we have found in this study.

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References


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