A Comparison of Children's Narrative Expressions in Enactment and Writing

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Abstract. This paper aims to explore how children use body-based enactment as a scaffold to compose written stories. We conducted a study where 17 children use a digital story authoring tool to enact and record stories as videos, then write the stories on paper while viewing their acting videos. We compared narrative structure and coherence in story enactment videos and writings and found that the structure of children's narratives in the enacted and written forms varies significantly in terms of the idea units count. Coherence is generally higher in the enactment as well, especially for younger children. Our results imply that while story enactment scaffolds children's imaginative narrative creation, further support in interactive authoring systems might be needed for them to translate their enacted story successfully into writing.

Keywords: Storytelling · Children · Design · Human-computer interaction · Narrative writing · Enactment · Pretend play

1 Introduction

Free-form pretend play activities are common ways for creative expression in children. Variations of such activities have been referred to in previous literature by terms such as *make-believe play* [8], *drama/dramatic play* [20] or *imaginative enactment* [5]. With minor differences, these terms tend to be used interchangeably for a broad range of embodied activities that involve the use of one's body and manipulation of physical objects to externalize thoughts [16]. Due to the extensive benefits and importance of pretend play for children, various approaches have been proposed in HCI research to nurture these activities [15,23], use them to support children with special needs and abilities [6], or apply them as a scaffold for learning [12]. The type of enactment in these systems range from use of tabletop toy setups [17], to puppet-based systems [1] to full-body enactment [4]. Many of these applications focus specifically on enacting stories because stories are a common mode of expression, reflection, and learning for children [10].

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In this paper, we investigate body-based enactment as a facilitator for children's story writing. Writing is a complex task and involves the mastery of several underlying skills [11]. Activities such as storyboarding [14] can scaffold children's learning process for writing and are sometimes referred to as *prewriting* activities. Therefore our approach can be described as using body-based enactment as a pre-writing activity for narrative writing. This approach has been explored in the past in the context of language arts classrooms [9]. However, there is limited knowledge with respect to the design of interactive technology to support children's narrative writing through enactment.

2 Background and Related Work

Previous work has extensively investigated the use of different drama types in the classroom to support young children's reading and writing. Regarding the strategies to include drama in classroom activities, Cremin et al. [7] investigate two methods of integration: the *genre-specific method* and the *seize-the-moment method* and found that the latter engages the children more and can result in a more complex story writing outcome. McNaughton [18] also investigated the benefits of drama versus group discussion for imaginative writing in a controlled experiment. They found that the children in the drama group wrote richer and longer stories. These examples and other similar works demonstrate that enactment can be a successful pre-writing activity.

Previous work has investigated children's thought processes and interaction changes when using an interactive storytelling system. Theune et al. [24] show that children's communication style during the activity changes over time with their attention. Brown et al. [2] investigate children's thinking process in a solo enactment-based storytelling activity and found that thinking in micro-steps rather than the macrostructure results in richer stories. The body of work on children-specific writing tools are limited, and most systems are designed for higher-level students or adults. For instance, intelligent tutoring systems such as the *Writing Pal* [22] and *ICICLE* [19] are examples of these works. Given the differences in the design of educational tools for children and adults, there is a need for research focused on designing tools to support children's writing activities.

3 Research Questions and Approach

In his book *Toward a Theory of Instruction* [3], Jerome Bruner theorizes that humans represent knowledge in three ways in the learning process: through actions (*Enactive* representations), through images or graphical summaries (*Iconic* representations), and through symbolic or logical systems such as language (*Symbolic* representations). Following this theory, we investigate the use of story enactment, an enactive representation of narrative, as a way to support the child to progress towards written expression, which is a symbolic representation of the narrative. Our research question is: *When using body-based enactment as* *a pre-writing strategy, is there a significant difference in the structure, coherence of children's imaginative narratives in the pre-writing and the final written outcome?*

4 Interactive Story Authoring System

Our story authoring system was designed to allow children to express stories through full-body enactment, record their story enactment as videos, and play them back as desired. Each story is created as a collection of scenes that are organized in a timeline view. Details like title, background, character, and object for the scene can be added to each scene. Once a scene has these details added and filled out, the child can act it out and record their video. The acting area is a 10 ft by 10 ft space with a green backdrop set up so that in the video recording, the child appears to be in the virtual story environment with the background of their choice appearing in the video. During the act, the child uses a generically-shaped prop representing the object interacted with within that scene. For example, a stick can represent a pickaxe. Once all the scenes in a story are recorded, the interface allows for playback of the scenes in the order they are organized as a continuous story. A more detailed description of the system can be found in [25].

We conducted a study using our enactment-based storytelling system with 17 children participants (13 males, 4 females) in the age range of 8–12. Each participant attended a 90-min study session, consisting of a 20-min practice and introductory story creation task, 45 min of story creation, enactment, and revision based on a one-sentence story starter prompt, and about 20 min of viewing their recorded story enactments and writing their story on paper.

5 Data Coding and Measures

The qualitative coding of our data was performed by two coders, who were not part of the study conceptualization or study conduct. For each data point (participant), we had a written version and an enacted version (in the form of a video) of the same story. Two coders extracted the structure in both formats of the stories and graded them for coherence. The agreement between the coders was established based on a 33% subset of the data. They had about 87% percent agreement on the structure codes, and a substantial agreement for the coherence grades with a Cohen's Kappa value of $\kappa = .695$. The rest of the data was divided between the coders so that each coder only received one format of a particular participant's story to code - to ensure that a coder will not induce structure and context from one format to another. The comparison of the structure and coherence was made a posteriori by the researchers.

Our coding method for story structures was adapted from the Purpose Hierarchy method by Grosz and Sidner [13]. *Structure Matching Scores* were calculated for each participant based on the level of matching between the story structures in the written and enacted formats. We analyzed the structure codes generated for each story's formats and divided ideas into two categories: common ideas and mismatching ideas. Common ideas are those that have been conveyed in both formats, and mismatching ideas are those present only in one of the formats. The ideas in each category were then counted and normalized by the total count of ideas present in both formats. This procedure resulted in two different scores for each format of a story to quantify the level of similarity between the structures: the number of ideas and the number of mismatched ideas.

Our coding method for the coherence of stories was adapted from the Narrative Coherence Coding Scheme by Reese et al. [21]. *Story Coherence Scores* were assigned by the coders based on an adapted version of the rubric in [21] that has three sub-measures: (1) Context (time and place), (2) Chronology (order of events), and (3) Theme (topic development). A total grade was also calculated by summing up these three scores.

6 Results

The results show a significant difference in terms of the number of ideas between the two formats of stories: $F(1,16) = 12.688, p = 0.003$. The enacted version of the stories contained a significantly higher number of ideas ($M = 33.82$) compared to the written version of the stories ($M = 17.53$) over all participants. The percentage of mismatched ideas in the enacted format ($M = 0.49$) was significantly higher than the percentage of mismatched ideas in the writing ($M = 0.12$); $F(1,16) = 30.128, p < 0.001$). These results suggest that the structure in the written and enacted stories are significantly different when comparing the number of ideas expressed in each format.

We did not observe any significant differences in coherence scores over the whole dataset. However, we observed that in participants who were 10 years old or younger (N = 13), the estimated marginal means of all the coherence sub-scores and the overall coherence grade were higher in the enactment format. This pattern was reversed for participants who were 11 or 12 years old (N = 3) - meaning they had higher estimated marginal means in the written stories. ANOVA tests on the coherence scores on the participant sample excluding the 11–12 year-olds showed a significant difference effect in theme sub-scores ($F(1,13) = 5.692, P = 0.033$) as well as a marginally significant difference for the total coherence grade ($F(1,13) = 4.339, p = 0.058$). The theme scores were significantly higher in the enacted stories (M = 1.79), and the total coherence grades were also higher in the enacted stories (M = 5.71).

7 Conclusion and Future Work

In this paper, we investigated children's use of body-based enactment as a way to support narrative writing. We aimed to understand how children's expression of the story changes when they act or write them. We found that there is a more complex level of imagination present in the enacted videos in terms of the structure, and they are generally graded higher in terms of coherence. Future work should explore interaction design in narrative authoring systems to support children in successfully translating enactive imagination into writing.

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