ABSTRACT
This project studied the influence of kinesthetic intelligences on creativity in young children. To understand this relationship preschoolers were observed in their daycare setting during story-time over a period of four sessions. During the sessions observations focused on the children’s ability to propose narratives when the teacher used different storytelling methods. The children’s responses were videotaped and coded later for analysis. The coding was used to calculate the baseline Ideational Fluency of the children. Total fluency was calculated by adding the number of popular and original responses. Behavior patterns also emerged from the study. Children generated not only more responses, but a greater variation in narratives when they were allowed to interact with tangible characters and act out behaviors. This is part of larger project to design a toy that fosters children’s creativity using tangible objects and gestures.

Author Keywords
Creativity, children, storytelling, gestures, interactive environments for children, tangible interfaces.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation]: User Interfaces – User-centered design, Interaction styles

General Terms
Experimentation, Measurement, Performance, Design

INTRODUCTION
All children have the potential for creative thinking. Creativity, which involves adaptability and flexibility of thought is essential in producing innovative ways to solve problems. Our societies need creative thinking more now than ever before. Daniel Pink suggests that we are entering a Conceptual Age in which a person’s success will depend on their ability to work across diverse disciplines that are seemingly separate to create something new [3]. Most measures of children’s creativity have focused on Ideational Fluency. Ideational Fluency tasks require children to generate as many responses as they can to a particular stimulus, as is done in brainstorming [2]. Storytelling is ubiquitous in early childhood development and fosters creativity. Traditionally storytelling in the classroom follows a call and response method, weighing heavily on children’s verbal skills. Howard Gardner’s work concerning the Theory of Multiple Intelligence has had a profound impact in education [1]. Kinesthetic intelligence entails the potential of using one's whole body or parts of the body to solve problems and is prominent in children’s interaction. Following this school of thought, we see great opportunity to incorporate gross motor skills into storytelling in preschool children’s activities. This study set out to compare children’s ability to produce narratives using gestures against other methods.

RESULTS
Session 1 which utilized speech only, scored the second highest for total fluency and had the highest number of popular responses (Figure 1). This is probably due to the fact that no visual stimuli were presented to the children for the purpose of generating narratives. The second session (with
book) scored the lowest on ideational fluency. The children seemed to have the most difficulty generating narratives in this session. There was some anxiety evidenced over unfamiliar scenes in the book. Also, the pictures kept the children focused on the page’s content and reduced the variety of the responses. Session 3 scored third highest in ideational fluency and yielded the least amount of popular responses. The puppet provided a visual stimulus which got the children off to a great start and held their attention longer than Session one. However, without the continuous varied visual stimuli the children’s attention span was shortened. One child became the dominant producer of narratives. Interestingly, the fourth session (with felt board) had the highest participation numbers. Not surprisingly, it had the highest Ideational Fluency score. The children had the highest number of original responses as well as greater variation in their responses. They also had a high number of popular responses. The most popular responses were concerning the characters’ travel to the tunnel. This indicates the strong relation to the visual stimulus of the felt board which depicted a tunnel. The children enjoyed acting out the behaviors of the characters using the felt pieces. Many children created narratives in which the characters interacted with each other (e.g. the pig bites the fox).

**DISCUSSION**

The results indicate some correlation between creativity and kinesthetic movement. It also shows that different stimuli and familiarity provoke different Ideational Fluency. When the children were familiar with the stimuli, more original responses were given, indicating the need for familiarity with any type of stimuli. It’s interesting to note that the tangible artifacts coupled with the ability to act out the behaviors generated more original responses. In future work we would investigate opportunities to enable children’s manipulation of characters in the story in a more natural manner. The study showed that the teachers’ involvement is instrumental in keeping the story going. They were successful in augmenting the children’s memory by reiterating the entire story before prompting the next piece of narrative. The teachers were also instrumental in assisting the children to overcome mental blocks. This indicates the need to design for teacher or caregiver involvement in any future tangible storytelling environment (or tools) for the preschoolers.

**CONCLUSIONS AND FUTURE WORK**

Move It! is a work in progress. It will be composed of a tabletop stage embedded with a double-sided screen, a cpu, and characters and props embedded with sensors. Move It! is designed so that children become not only actors, but also dramatists, directors, set designers and audiences while creating a puppet show for their audience. Children may select props to customize the basic scene in addition to selecting puppets. As they place these props behind the screen, the cpu identifies and tracks the placement of elements added. The element’s image is generated from a databank of pre-built images and placed on the viewing side of the screen for the audience to watch. The screen is designed to minimize children’s awareness of the technology. Therefore, as the child enacts the story with their puppet behind the screen, they cannot see these interactions and must therefore rely on their imagination as with traditional puppet shows, encouraging a more natural form of play (Figure 1). The preliminary prototype will be built and tested with users between the ages of 3 and 5. The responses will be measured using the Ideational Fluency measure and compared to other storytelling techniques currently used.

<table>
<thead>
<tr>
<th>Coding</th>
<th>Session 1 Speech Only</th>
<th>Session 2 w/ Book</th>
<th>Session 3 w/ Puppet</th>
<th>Session 4 w/ Felt Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>14</td>
<td>9</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Popular</td>
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<td>4</td>
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</tr>
<tr>
<td>Total Fluency</td>
<td>23</td>
<td>13</td>
<td>17</td>
<td>29</td>
</tr>
</tbody>
</table>

**Table 1 Ideational Fluency Scores**

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**REFERENCES**

2. Moran, J.D., III. Creativity in Young Children ERIC Digest, 1988, 1-5.