

Evaluating Engagement in Reading: Comparing Children and Adult Assessors

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ABSTRACT

This paper describes the findings of a study into how children engage with and enjoy reading digital stories. We considered stories created by children with an application called Fiabot! that we designed to support the creation of multimedia fairy tales in school. We asked a group of 25 volunteers, aged 9 to 12, to act as assessors and read the multimedia fairy tales with the aim of uncovering the key factors that contribute to making stories more engaging for young readers. The same stories were also previously evaluated by teachers who looked at specific quality indicators derived from the educational goals of the fairy tale making exercise. Here we report on how children and adults had very different views on what makes a story engaging. By looking at their contrasting opinions we could get a deeper understanding of the factors and dimensions of engagement that influence the overall enjoyment of a story. This paper ends by discussing how we could use these findings to design more engaging multimedia stories and enhanced eBooks that would be both educational and fun to read.

Author Keywords

Children; Reading; Engagement; Enjoyment; Stories; Assessment; Evaluation.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Our study focuses on children reading multimedia stories for leisure and specifically on how we can measure their level of engagement with each story while linking different dimensions of engagement to specific features of the story being read. There is limited literature dealing with how children enjoy reading digital content as in the past researchers have focused on the use of digital material for educational purposes and only recently started exploring the reading for fun side of it. Nonetheless, when considering young readers, reading for pleasure has a clear value for education and the correlation between children being keen readers and having a successful future career has been spelled out clearly in PISA's findings as "Enjoyment of reading is one of the motivating aspects of learning" [19, 20]. Thus, we should explore further how to design reading experiences that are more fun for more children. Besides, while children have been already involved successfully as co-designers in designing enhanced eBooks [8, 9] they have yet to play a similar role in assessing the overall experience

and to put forward their own perspective on it. Often, we refer to adult experts in order to assess the quality of a story, a narrative or an eBook in terms of readability and educational impact on children [3, 10, 23].

In our study we involved young readers with well-established reading, writing and speaking skills. We gave them a set of 20 multimedia stories (specifically fairy tales—throughout the paper we will use these two terms as synonyms), written by other children of similar age, to read and evaluate. Children were encouraged to reflect on how the various elements of the story contributed to the quality of the overall reading experience. Then, we compared children's feedback with the assessments previously made on the same stories by adult experts, primary school teachers. These were guided by educational related criteria. By spotting similarities and differences in terms of the necessary ingredients of a successful story and their impact on the overall reading experience we hoped to get a better understanding of how to produce stories that are at the same time attractive to children and with a good educational value. This study contributes to the debate on how technology can support the design of fulfilling, educational and fun reading experiences for children through the understanding of the most relevant factors and dimensions for young readers' engagement.

THE THEORETICAL FRAMEWORK

In order to gather and analyze data about the different facets of engagement that children encounter while reading we needed a rich theoretical framework. As a side requirement, the framework had to provide us with data easily comparable, at least partially, with the assessments provided by our adult experts. We started by distilling from the very rich literature on the evaluation of engagement in reading narratives the most salient factors and facets relevant to our study.

Given that our stories had a strong narrative component, supported by the use of multimedia material, we felt that the three main factors as presented by Zagalo et al [27] (*narrative*, *formal* and *decision*) were ideally suited to guide the design of our framework. For the *Narrative* factor we decided to include all four dimensions as described by Busselle and Biladzic [5] and tailor them to the specific genre of our stories. *Narrative Understanding* describes how easy it is for readers to make sense of the story. Among its sub-dimensions we chose *Comprehension of the Narrative* as a

sign of readers easily locating themselves in the mental model of the story and, specifically, *Character Identification* [7] as well-defined characters are essential ingredients of a good quality fairy tale. Finally, we included *Adherence to Story Structure* as additional dimension specific to our study and targeting how the story belonged to the fairy tale genre. *Attentional Focus* is about how involved or distracted readers are. *Emotional Engagement* encompasses both empathic and sympathetic reactions to story. *Narrative Presence* deals with how much readers feel like living in the world depicted in the story by means of three sub-dimensions: *Additional Transportation*, *Story-World* and *Perception of realism* [2].

Under the *Formal* factor we considered elements linked to the different multimedia elements used in the story: image, sound, text and video. The *Decision* factor, given our study scenario, was simply the consideration of whether a child after finishing one was keen on keep reading another story as an indicator of *Continuous Desire* [24]. We were also keen to gather data on how children chose the story to read among the 20 available, in order to understand whether the choice was influenced by *Curiosity*, *Narrative Presence* or simply by the *Social Context* reading took place in. Finally as Busselle and Biladzic [4] confirmed a direct link between overall *Engagement* and *Enjoyment*, we added that criterion to our theoretical framework.

RELATED WORK: TOOLS AND METHODS

As we were aiming at gathering data about children in a reading for pleasure setting we consulted the relevant literature in terms of existing tools and most suitable methods for their administration. We have found mostly comparative studies looking at paper versus electronic books in terms of readers' engagement or at the level of engagement when parents read with children versus children alone [18]. As different research tries different approaches, eye tracking has been used to gather evidence of different levels of attention paid to parts of the page as an indicator of engagement [1]. Maynard [16] in her work is instead looking at different reading habits of children and how technology can support better different types of readers. Jones and Brown [11] compare electronic versus paper in terms of comprehension and enjoyment. Theirs is probably the first study that systematically investigated children's engagement with eBooks, even if engagement was not measured directly and the study took place in a school, a not natural setting for pleasure reading. On a similar line was the study by Miranda et al [17] looking at how reluctant adolescents would be more engaged if presented with electronic books. Only recently we find studies looking at pleasure reading of electronic books with Massimi et al [15] using a diary approach to explore children's partnered reading (or co-reading) practices while reading for pleasure at home. However it is clear how the body of research on children's engagement with electronic books is rather limited [22] and e-reading for pleasure more generally, remain underexplored in the HCI literature [15]. An original approach is that by Huang et al [13] looking at Brain Computer Interface (BCI) as a mean to

measure the level of reading engagement in children. While Kaplan et al [12] have run a relevant investigation reporting on how important the social side of reading is for children. One of the most complete and interesting study was conducted in a project called HEBE [9]. The level of engagement with reading was measured by using a diary approach and asking children aged 9-11 to borrow the same enhanced book to be read on a tablet for as long as they needed to complete their leisure reading. During the full time children were reading the eBook they were regularly prompted by an application running in the background to answer a few questions in order to judge their level of engagement with the reading experience (using a *smileyometer* scale [26]). Children were also interviewed before and after the reading experience in order to gather extra information about likes and dislikes and extra comments on overall satisfaction. The data collected in this study enabled researchers to show how the guidelines they followed in the production of enhanced eBooks had succeeded in providing children with more engaging reading experiences when compared with plain non-enhanced eBooks.

Unfortunately, while the above described studies were promising and relevant to ours they were dealing with only one eBook/story at a time made available to the children so not only was the first stage of the reading process, the selection, not included in the investigation but also children were not free to choose what they wanted to read, an essential step for positively engaging with reading. On the contrary, when considering work by Hutchinson et al [14] selection was the focus. Children could browse and search a digital library for selecting books but it was the reading element of the process to be lacking. Besides, in all these studies each reader was engaged with the book individually or with their parents but not including their peers. Thus, there was little or no opportunity for the sharing stage of the reading process, i.e. its social side, that for children contributes significantly to the quality of the overall reading experience.

THE STUDY

The study was conducted in a local primary school, in an urban area, during the summer break when they run a summer camp. There, children for 8 weeks engaged in a number of activities such as swimming, hiking, drawing, school homework, etc. Two teachers and two tutors were in charge of these. Among all the children attending the summer camp, we involved a group of 25 young readers who volunteered as participants. We selected them by considering their school level (from the 3rd grade up) and age (9-12 the same age of the story writers). None of them were authors of the stories, neither had read or seen any of these stories before taking part in the study. Besides, considering their school curriculum, these children had already studied the main features of narrative genres and they had linguistic competence appropriate for taking part in the planned study.

The multimedia fairy tales

The multimedia fairy tales were produced using Fiabot! installed in a tablet. The students worked in groups to create the stories, their plots and the related multimedia contents. Each group had one tablet. Over the study period children developed 20 multimedia fairy tales. Each story had text, images, audio clips, and videos produced and/or composed by children (Fig.1).



Figure 1 Two examples of the multimedia stories.

Those elements were harmonically integrated in order to allow readers to easily interact with the narrative. Each story was unique and used a different combination of text and multimedia content, varying both in terms of quality and quantity. Some of the groups really put lot of effort and creativity [23] in order to embellish their plot. Hand drawn pictures, spoken dialogues acted by children and even original songs purposely composed and interpreted by them were all used to enrich stories. Others had a strong textual component, while some favoured the use of visual elements and a few used sounds and speech extensively. All stories were then stored in a folder, that later, was made accessible to parents and families.

METHODOLOGICAL FRAMEWORK

We used a mixed approach based on direct observations, a questionnaire with multiple choice and open questions, and encouraged children to provide free comments both in written and spoken form. In this way we obtained a rich overview of the reading experience and built a picture of how each of the engagement dimensions contributed to the overall enjoyment. As mentioned under RELATED WORKS we could not find in literature suitable tools to serve our evaluation purposes as those listed there could only be deployed for gathering data about individual reading and/or excluded the selection stage of the reading process. Grids developed specifically for storytelling were designed for adult expert evaluators [3, 11] and the plethora of rubrics available online¹ had an educational flavor and was to be administered by adult assessors too. Finally, we stepped outside formal educational scenarios and turned to grids designed for the evaluation of narratives for video games where fun, enjoyment and engagement were considered too. The questionnaire we used was the result of combining dimensions of our theoretical framework with the rubric used by Carbonaro et al [6] for assessing the quality of narratives for video games made by high school students. This was

chosen as it covered all the necessary dimensions of engagement and provided an easy fit with the aims of our study. Starting from the results emerged from these studies we designed and developed our research. First of all, with the help of the teachers we adapted the methodological tools. We changed the questionnaire according to our context in order to be used by our children assessors. Table 1 depicts how all factors dimensions and their sub-dimensions were mapped on the questionnaire.

Procedure

We conducted the study in 5 sessions over a three-week period, each lasting approximately 60 minutes. The sessions featured as activities of the summer camp under the label “digital story reading”. All 5 sessions ran in the morning, the researchers (two) gathered the first group of 10 children, took them to a big room with chairs and tables, and gave them one tablet each.

Table 1 The items of the questionnaire and the related theoretical dimensions.

Items	Dimensions
Story choice: Friend/s suggestion	Social Influence
Story choice: Interesting titles	Curiosity
Story choice: Attracted by the	Narrative Presence
Characters	Character identification and Attentional Focus
Characters recall of other fairy tales and/or movies and/or cartoons	Additional transportation and Story-World
Settings	Perception of realism
Plot	Comprehension of the Narrative
Story structure	Adherence to Story Structure
Theme	Narrative presence
Style	Comprehension of the Narrative
General comment about the story	Emotional Engagement
Media in the story	Formal
Overall mark of the story	Enjoyment
Number of stories read.	Continuous Desire
Preferences	Overall Enjoyment

Children were free to choose their favourite spot for reading including benches in the courtyard; they were also free to exchange opinions with nearby peers. Researchers observed and took notes of children’s activities directly in the various stages of the reading process: selection, reading and sharing of short stories, and then filling in the questionnaire. Notes were also used to account for the *Attentional Focus*

¹ For examples consult: <http://courseweb.lis.illinois.edu/~jevogel2/lis506/evaluation.html>

dimension of engagement, as researchers commented on how much attention children were putting in their reading as opposed to how distracted they were. Observational notes were also precious at analysis time in order to find out how and how much children interacted with each other during the different stages of the reading process.

At the beginning of each session one researcher explained to the children how to access a story: all 20 available stories were available on the tablets (iPad) and could be selected by clicking on their cover/first page that shows also the title. In addition, the researchers showed the children how to interact with the story: flip the pages, listen to the audio and watch the videos. Furthermore, the researchers explained children how to fill the questionnaire and the rules of the activity, such as:

- Read as many stories as you can,
- Fill one questionnaire for each story,
- You can talk and move around the room and also outside,
- Don't hesitate to ask help from the two people in the room (the researchers).

Each child did complete the questionnaire after s/he had read one story. Thus we had one questionnaire for each story: 77 surveys in total.



Figure 2 Children reading the multimedia fairy tales.

The questionnaire

1. **How children chose a story.** We wanted to understand the criteria used by the young readers in selecting the story. Three options were presented: friend/s suggestion, interesting titles, or attracted by the cover. These mapped to the following items in our theoretical framework: Social Influence, Curiosity and Narrative Presence.
2. **Characters.** We asked children to give an evaluation of how well-developed characters were. Children could select one from four options: all are developed just a little, a few characters are developed adequately, many of them are developed adequately, or they are all fully developed. This question linked to a sub-dimension of *Narrative Understanding* that of *Character Identification* as a mean to get readers closer to the story and get more engrossed into it, with an impact on the overall *Attentional Focus*.
3. **Character recall of other stories.** We asked children if the characters reminded them of other fairy tales and/or movies and/or cartoons. This was an open question. This information would fit under two sub-dimensions of Narrative Presence: Additional Transportation and Story-world making it easier for children to grasp the sense of the story and feeling transported in the world it depicted.
4. **Settings.** We asked how the setting was connected to the plot and characters. Children could select from 4 options: not connected, difficult to make a connection, somewhat connected, closely fitted with the story. This finding would elicit the perception of realism that the story generated in children, a sub-dimension of Narrative Presence.
5. **Plot.** We aimed to investigate how children perceived the plot. They had to select among four options: it is unclear, barely developed, somewhat developed, or fully developed. This answer would provide insight into the Narrative Understanding dimension, and specifically its Narrative Comprehension sub-dimension.
6. **Story structure.** We asked if the story has all the elements of a fairy tale. They had four options: no element is present - it's not a fairy tale -, there are some elements of a fairy tale but hardly recognizable, there are some elements but these are not fully developed or all the fairy tale elements are present. This feeds into the Adherence to Story Structure dimension we added to our framework specifically to account for the story being truly a fairy tale.
7. **Theme.** A story has to be developed around a central theme, idea or belief. Children could choose from four options: the story is missing a central theme, the central idea and belief is barely developed or understood, it is somewhat developed, or is fully developed. This question would elicit information about Narrative Presence and the sense of realism children will get when reading it.
8. **Style.** We asked children to give an evaluation regarding the syntax, style and grammatical flaws of each story. They had four options: poor, basic, good and finally sophisticated use of vocabulary, style and grammar. All these elements would contribute to the Comprehension of the Narrative.
9. **Media in the story** (images, sound, text, video). We asked children to give a mark (from 1 to 5) to each of the 4 multimedia categories used in the story. If one was not represented, children were instructed to leave that score empty. We use the funometer [26] technique with a five-faced scale from smiling to sad. These answers account for the formal factor of the story and enable us to get feedback on the contribution each of the multimedia elements bring to the narrative.
10. **General comments about the story.** We asked children to provide comments on the overall story and how they liked or disliked it.

11. **Overall mark of the story.** We used the same scale as for item 9. Media in the story. We added this question in order to get children thinking about the overall reading experience. This score contributed to the overall Enjoyment.
12. **Preferences.** Young readers had to choose their favourite story by indicating in each questionnaire their preference among all the fairy tales they had already read. This feedback together with the overall score given to the story (see above) goes into the Enjoyment criterion. Besides, knowing the top favourite stories allows us to extract and understand what are the elements that make these special and to compare children's and teachers' opinions.

Data Analysis

For each story we extracted scores from the different items of the questionnaire and computed averages across each factor (e.g. quality of images, style, plot). As scores in general were very high we only considered them in relative terms. Additionally, when possible we looked for explicit comments provided by children as to give us insights into their assessments. We also calculated preferences on the basis of those expressed by children by applying a simple formula, explained later in this session. This enabled us to reward the loyalty of a child towards the same story. Once preferences were computed, we could easily cluster stories into 4 groups ranked from top to bottom and when discussing our findings we will focus on the top 5 best stories. Observational notes were transcribed and analysed in order to support findings emerging from the questionnaires. Comments and observations provided by children were also carefully scrutinized and accounted for. We used the thematic analysis technique for data coding and analysis, standing mid-way between an inductive and deductive coding approach.

In the following we present the results from our analysis.

Given the exploratory nature of our study it would not make sense to apply sophisticated statistical analysis in order to extract conclusive evidence from gathered data. Instead in the following we carefully present, interpret and highlight trends and insights worth further investigation.

FINDINGS

How children chose a story

Covers played a relevant role by driving 52% of the young readers in their choice. Thus the *Narrative presence* dimension, and specifically the ability of the cover page to attract readers into the narrative world overwhelm the others considered factors. However, also the *social influence* dimension proved quite relevant: children reacted promptly to other children's suggestions and 30% of stories were selected on the basis of peers' suggestion. Here it is important to consider that during the first sessions the stories were new to all children thus none of them could give any

real suggestions to the others. As children were free to talk with each other during the reading time, the selection soon became a social activity.

18% choose the story because they were intrigued by the title, thus *curiosity* seems to be the least relevant option. We also discovered from the written comments included in the questionnaires that children liked, for each story, to look at the photo of its authors, usually available on the last page. This made them feel closer both to the authors and the authoring process. In fact a child (Id05) kept commenting on how good the authors had been in producing these amazing stories, something she could have never done by herself.

Popularity was also very visible as few stories soon established themselves as favourite across children, especially when suggested by recognised keen readers, i.e. children that have proved to read more and faster than others. This is in line with findings in the area of book recommenders [21] focusing on reputation and friendship as one of the forces behind successful recommendations.

Characters

The majority (52%) of the children found all characters of the stories fully developed, 32% wrote that many were adequately developed, just 13% judged that a few characters were developed adequately and 3% found only little development. Children who found all characters to be fully developed and deeply engaged with the story from different dimensions: emotional (via empathy and sympathy with characters), and cognitive (sharing their perspectives and understanding their motivation and goals) and their scores proved that. We could also observe a higher level of *Attentional focus* as children were absorbed and lost the sensation of self during the reading. The overall score given by these children to the stories confirms this.

Characters recall.

Some children recognized in the stories other fairy tales (21%), movies (3%), cartoons (10%), but that was not so common as (49%) didn't find any reference. However, it is interesting to notice that for the top 5 preferred stories, 70% of the children recalled a connection between the story and their past reading, watching, and gaming experiences. We label this finding under *Additional Transportation* and *Story-World*, both sub-dimensions of *Narrative Presence* [5]. Familiarity with characters enables children to develop a better sense of the story world that impact on its comprehension and plays a crucial role in determining children's preferences. Thus, we could deduce that including familiar features in a new story encourages children to get engaged in the reading.

Settings

46% of children perceived the background as somewhat integrated within the story, 39% as perfectly fit the narrative, just 10% and 4% considered the setting as, respectively, difficult or not connected. The setting is considered an important element for children's *Perception of realism* such

as how the setting allow children to conceptualize “the probability that the shown events could happen in real life or to the user, even though they're fantastic” [24, 2]. Thus, the familiarity of the settings not only improves overall narrative comprehension but also children’s sense of immersion and engagement in the story.

Plot

The majority of the children (55%) found the plots fully developed and original. Indeed, just a small selection of the pupils found them partially (28%) and barely (17%) developed. Considering the top 5 preferred stories, the majority of the plots (64%) were judged as fully developed. The *Comprehension of the Narrative* [4] is a fundamental dimension to engage children. Indeed, the stories that have well developed narrative elements are the most appreciated by the children.

Story structure

More than half of the young readers found the stories fully compliant with fairy tale structure (59%). In some stories these elements were not fully developed (32%), a small group hardly recognized the elements (14%) and just a minority, 3%, couldn’t recognize these at all. Overall across all the stories, this factor was not discriminant in terms of preference. The *Adherence to Story Structure* sub-dimension was introduced by us as we wanted to understand whether children could recognize the structure of the story and assign it to the right genre. Besides, as this proved a discriminant factor for adult assessors we were curious to see how children dealt with it.

Theme

Regarding the themes, the majority of young readers evaluated these as fully (53%) and just 33% somewhat developed, while 11% found that the central idea and belief is barely developed and 3% considered the narrative as missing of a central theme. Our stories are rich of multimedia elements that augment and enrich the narrative. However, even if the use of multimedia can engage more the reader “...sensory stimulation cannot explain feeling present in a novel” (quote from [5]). Indeed, the feeling of being in the story (*Narrative presence*) is mainly given by the comprehension of the story processes explained by the theme. Thus, a well-developed theme allows the reader to shift from his/her reality to the *Story-World* and create the sense of *Narrative presence*.

Style

Children considered 51% of the fairy tales as sophisticated in style, 31% with good language and use of vocabulary, while 14% and 4% of the stories are thought to be, respectively, basic and poor in the use of language. Considering the teachers’ evaluation, the 5 most preferred stories were given a low grade. They all had grammatical flaws and a basic syntax. Thus, it looks as if young readers don’t pay attention to these shortcomings. Among the meaningful aspects that make the reader engaged with the story grammar correctness seems to be the least relevant.

Indeed, flaws in spelling and grammar did not impede children to achieve a good level of *comprehension of the narrative*. Overall, for young readers, style is not so important in a story if the plot is consistent and the story elements meaningful.

Media in the story (image, sound, text, and video).

The majority of stories used a rich combination of multimedia elements: populated by images, audio, text and video, these fit into the *formal* factor of the narrative [27]. The top 5 preferred digital stories included different kinds of media and the average mark given by children was quite high: 4.3 for images, 3.9 for sound, 4 for text, and 4 for video, with 5 being the top possible score. Indeed, from the observation, we noticed that children highly valued the presence of dialogue especially in case of audio recorded by children of similar age. Some of the sounds in the stories were used to express emotional states and this was particularly engaging for our young readers. Besides, across stories, high scores for the formal factor implied overall equally high score for that story. This indicates that stories with a rich and creative use of multimedia offer children high level of emotional engagement and overall enjoyment.

General comment about the story.

The majority of the children’s appreciation (42%) goes to *specific parts of the plot*, 17% to the *use of images*, 14% to the *characters*, and 13% to the *plot*. The most appreciated stories were also those that received the most positive comments. For instance, the story entitled “Jonny and the giants” was the most commented on by children (for its plot, images and characters), and was preferred by most children. In addition, a small percentage of children (9%) mentioned the *authors’ creativity and imagination*. The plot, the characters, and the sensory stimulation through images created in children a high level of emotional engagement while reading the story.

Overall mark of the story.

We map this mark to overall enjoyment. In line with the enthusiastic attitude children have towards technology in general and multimedia stories in particular, we found that 65% of the stories got the maximum mark (5) for overall evaluation, the rest of the stories were evaluated quite highly. Thus, we would focus on the fact that these values are indicators that the overall reading experience went well and children enjoyed the majority of the stories they encountered.

Number of stories read.

Each child read 3 stories on average, but a small group of kids, 32%, read more than 4 stories (16% from 7 up to 9). Indeed, this is due to the desire to keep reading stories (*Continuation Desire*) and can be due to many different factors. From children’s comments it emerges that a common element of these stories is the quality of the plot, the presence of well-defined characters, and the creative use of rich multimedia elements. Thus, children were able to understand the narrative and feel like being transferred in the story world. In addition, among those who read more stories (from

7 to 9) a high percentage (45%) were trend-setters, i. e. passed suggestions to their peers. Indeed, as highlighted by Schoenau-Fog [24] *socializing or social influence* is a relevant factor for stimulating the *continuation desire*.

Preferences.

We summed up all preferences organised by story across children, then added the sum of all preferences expressed by each child more than once for that story, implying that if a story held as favourite against few others being read in the same reading session that needed to be rewarded by a small loyalty coefficient. Finally we normalised the result by the number of times that story was read in total. This was to take into account the fact that some stories were more popular than others but not necessarily equally liked and that some children were more constant about preferences than others. In particular we tried to address the fact that some children kept changing their mind marking as favourite each story they read in each reading session.

The top 5 preferred stories were:

1. Jonny and the giants
2. Rebecca around the world
3. The dragons and the family stone
4. The king and the cricket
5. The Magic Sword

Following this we summarized the main reasons expressed by the children in favor of each of these 5 by looking mainly at the comments they provided, both in writing when completing the questionnaire and verbally during the sharing phase. These gave us a spontaneous and valuable account of the rational behind their assessments.

Jonny and the giants. The plot was extremely engaging as well as the theme (adventure and discovery) highly appreciated by children. In addition, they commented that the characters felt familiar to them.

Rebecca around the world. For half of the kids a few elements of the story recalled of others books and movies. Moreover, they really liked a few parts of the plot and the theme of the story.

The dragons and the family stone. Children appreciated very specific parts of the story, for instance, some kids expressed their enjoyment of the part when “Melissa threw the balls to the dragon, and he started dancing”. Besides, children appreciated the graphical dimension: background and images were drawn by the authors and added a very personal and unique flavor.

The king and the cricket. Our young readers appreciated mainly the fact that “characters are so brave and good in what they do”. Appreciation went also to the authors of the story that were judged as very creative as the plot was very original. Sounds and the images used also got very high scores.

The Magic Sword. Children mentioned in their evaluation that they liked how authors used the media and in particular the images. In addition, they found the story style very original and the characters very well developed.

TEACHERS’ ASSESSMENT VERSUS CHILDREN’S EVALUATION OF THE STORIES.

In a previous study we asked three primary school teachers to evaluate the same stories from an educational perspective. Taking inspiration from the school curriculum the researchers together with these teachers defined four criteria: Creativity, Collaboration, Media Literacy, and Consistency within the narrative genres [23]. Each story was evaluated as well as each child was assessed for his/her performance in contributing to the story creation. Thus the final quality of the story - in terms of the use of media, the style, the compliance with the fairy tale model, etc. – was just one of the aspects of the overall teachers’ assessment as teachers considered the whole process of creation. That evaluation revealed that *Fiabot!* helped children meet the curriculum requirements and improved the teaching and learning of literary genres and other abilities connected to this activity (i.e. media literacy, social skills, and creativity). From the teachers’ perspective, *Fiabot!* improved children’s awareness of the possibility of using the tablet in other educational scenarios and had a positive effect on their self-esteem.

Even if the purpose of the two assessments was different, by combining the data we gathered in both we got some interesting insights into what makes a story engaging and interesting to read. By leaving to one side Collaboration that was used to evaluate the process of making stories, Creativity, Media Literacy and Consistency were all directly to crucial dimensions of engagement as described in our framework. **Creativity** maps to *Narrative Presence* as the ability to make readers feel as if they have moved on to a different world, the *Story-world*, and its direct effect of losing awareness of them is linked to the *Emotional Engagement* dimension. **Media Literacy** maps directly to the *Formal* factor of our engagement model as it accounts for all the multimedia elements that are used to enrich the narrative. Finally, **Consistency** is related to *Narrative Understanding* and with how easy it is to make sense of the story by referring to existing and realistic mental models.

Fairy tales teachers’ ranking

The teachers’ ranking of the stories is calculated as the mean of the preferences expressed by the three teachers who were pretty much in agreement with each other. Fairy tales were ranked as follow:

1. In search of the gold and silver tree
2. In search of the magic crown
3. The discovery of the sweet world
4. Into the night
5. The adventure of two friends

For each we summarised the main reasons given by the teachers for the overall mark.

In search of the gold and silver tree. Teachers remarked very positively on the consistency of the use of media within the fairy tale. The plot was judged as very original and the drawings expressed the crucial aspects of the story very well.

In search of the magic crown. The protagonist of this story is a crown, not a person, but a magic object. This choice demonstrates a complete understanding of the fairy tale structure as well as the children ability of being original.

The discovery of the sweet world. The originality of the plot and the characters were highly praised. The story was judged as very original as the authors made a very good job in building a unique and imaginative world.

Into the night. Teachers valued it very highly to use and also rated highly the quality of the multimedia elements within this fairy tale. Authors had composed and sung an originally created blues song to present the characters. In addition, the association of images with the text and other audio of the story was very well done and created a great impact. The multimedia elements were overall judged as very original, pertinent and very well integrated within the story and really contributing to its *Narrative Understanding* dimension.

The adventure of two friends. The plot was judged as creative, intriguing and original. The structure perfectly matches with the fairy tale structure and even if there were just a few multimedia elements, the story deserved a high overall score.

It is immediate to spot how the stories that got the highest marks from the teachers were **not** those that obtained the highest scores from the children. Indeed, there is a clear contrast between the two sets of “top 5 best stories”. This is not only due to the two different perspectives taken by the assessors towards the stories, with teachers focussing on educational elements, such as *Adherence to Structure* and the overall *Narrative Understanding* dimension, and children to look at how much they enjoyed them in terms of the *Narrative Presence* dimension. By looking into some representative examples we can see how great the contrast in opinions is. It reflects how differently children and adults valued the quality and role each element played in the story and how emotionally engaged they were with each story.

Teachers' evaluation discriminant aspects.

Three main aspects emerged as discriminant: adherence to structure plus free from error in writing, originality, and the use of media.

The fairy tales' adherence to structure and free from error in writing. Teachers gave a low mark to those stories that had grammatical flaws or/and didn't respect the fairy tales structure e. g. *The king and the cricket*. This story got a very high score from kids who demonstrated a high appreciation: (Id 06), “*the characters are great but most of all, the authors have opened up the imagination and were*

really good”. Children clearly felt the plot was engaging and the characters original. They were not bothered by the grammatical flaws or poor structure that, instead, played a more prominent role in the decision taken by adults. In fact, as a counter example, the 5 least preferred stories by children all, according to the teachers' evaluation, fully conformed to the fairy tale structure, meaning that for children this element does not contribute at all to the overall engagement.

Originality. Here the two assessments were diametrically opposed. Adult experts gave very low scores to stories that strongly reminded them of other fairy tales, famous movies or cartoons. While children selected as their top 5 favorite stories those that reminded them of past reading, watching, and gaming experiences. One child (Id 09) commented positively on the fact that *Rebecca around the world* “*reminds me of Alice in wonderland*”, another (Id 11) “*the story reminds me of the Wizard of Oz*”. Teachers looked negatively at the use of familiar characters or elements of the plot and discarded these as sign of poor quality and lack of originality. On the contrary, the introduction of familiar elements supported children in comprehending the story world and made reading more engaging and overall enjoyable. A good example of this is *The discovery of the sweet world* that received the highest score for creativity from the teachers, while the children gave it the lowest overall mark because of the complexity of its plot that interfered with *Comprehension of the Narrative*, an important dimension for the engagement.

The use of media. Teachers took a critical approach to the evaluation of the use of media and carefully considered how these contributed to the overall understanding of the story. Thus, for instance, a story full of visual effects, sounds and videos not related to the story got a low score. On the contrary, fairy tales with a lot of media coherent with the plot or even just a few of them (in *The adventure of two friends* they use just three drawings in the entire story) but consistently with the plot received a high score. Children, instead, were much less critical and very enthusiastic when the story was rich with sounds and videos. Especially when they noticed how children of similar age were giving voices to dialogues or being the main actors in the videos. Children greatly enjoyed the opportunity to see photos of the young authors when these were available.

DISCUSSION

During the reading phase, we noticed how stories with a strong *Emotional engagement* dimension kept children hooked and not distracted by what happened around them. High scores assigned to multimedia elements, the *Formal* factor, contributed to high *Attentional Focus* too. Besides, presence and quality of videos, audios and images were the triggers of conversations during the sharing phase. Nonetheless, even when sensational, multimedia elements alone were not sufficient to motivate children to read a specific story and could not compensate for poor overall *Narrative Understanding*. We observed a very fluid and

social reading environment where many elements influenced the level of engagement with the story but Narrative Understanding was still the dominant dimension.

Children were overall enthusiastic about the full experience: having a tablet to use for reading was for them an extra bonus and some commented explicitly on the correlation between tablet and having fun that somehow brushed over to the stories they were offered. Besides, as in general they tended to give high scores all the time, we concentrated more on trends and hints coming from their comments and their choices in reading. Our theoretical framework enabled us to run an in depth analysis of how different assessors produced their evaluations. By comparing children's versus adults' opinions we went a bit further into understanding what are the most important factors to influence the quality of a reading experience. Not only we could explore what are the features that make a story more engaging but also observe objective differences in reading style among children of the same age and educational level and see their impact on predominant dimensions of engagement.

From our data analysis it emerged that the selection was mainly driven by **social influence** and that children who read more had a leading role in suggesting their peers which story to read next. We also clustered our children according to the way they expressed their preferences. In particular, we tried to address the fact that some children kept changing their mind marking as favorite each story they read in each reading session:

- Independent and consistent children (11) choose as favorite the same story over many questionnaires and they changed their mind only when they found a more interesting one and kept mentioning this as the favorite for a while. These children showed a constant attitude about their preferences.
- Inconsistent children (6) changed their mind each time they filled a new questionnaire.
- Neutral (7) did not express any preference.
- Copycats (1) took a kind of mimic approach just following likes and dislikes of her best friend.

Another interesting indication was that girls on average read more stories than boys: 4 stories per girl versus 1.8 per boy. We also noticed how girls were more confident in expressing preferences: 14 out of 16 gave preferences in their questionnaires while just 5 boys over 9 did that. It would be interesting to investigate these issues further by involving a larger sample of young readers.

We believe that these are promising insights and that more work is needed in order to get a deeper understanding of how different types of readers behave during selection and reading. In general, we found a noticeable dissimilarity between children that read 6-9 stories and those who read fewer than 4. The first group gave more articulated comments and their preferences are more in line with those of the adult experts. We could infer that the level of

experience in reading affected their expectation and impacted on their judgments. Nonetheless, by looking across all our assessors it is clear that a good story needs to be supported by a rich set of multimedia elements that impact on how readers make sense of it, empathize and sympathize with its characters and concentrate during reading. While adults greatly value structure and grammar, children do not see these as adding value to their reading experience. Besides, as mentioned in the previous section, the two assessor groups had a diametrical opinion regarding originality and creativity. Interestingly, our analysis points out that this is not an age related effect but it seems to be linked to how well read a child already is.

Therefore, when designing tools to support engaging reading experiences we need to remember that age and education are not sufficient to define a meaningful reader's profile. As reading has a strong social connotation we noticed how children with more experience in reading, and more refined tastes, were considered as experts by their peers who followed their footsteps.

CONCLUSIONS: LIMITATIONS AND FUTURE WORK

Our study enabled us to involve and observe young readers in all the phases of the reading process. We used a mixed method approach supported by a theoretical framework with the purpose of uncovering the different facets of engagement children experience when reading multimedia stories.

Limitations.

Our study had some limitations that have to be considered when interpreting our findings.

A limited sample of young readers. First of all, the study was based on qualitative research, thus we selected just a small group of participants in order to run an in depth exploration. The trends emerged can be considered as initial interesting results and could be further explored by involving a larger sample of users. *A broader sample would enable us to investigate some gender issues as mentioned under Discussion.*

A limited sample of stories. We chose to offer children this set of stories for a number of reasons: they came already with adult assessments, were short and thus quick to read. Besides, they were written with a language suitable for the age and linguistic skills of our readers. Still the limited size of the sample had an impact on the selection and the reading stages. Besides, the fact that these stories were all written by children had to be kept into consideration. Below we discuss this issue further in terms of direction for future work.

A limited sample of teachers. Our stories' evaluations were produced by three teachers during a previous study [23]. Then, we had decided to work with a limited number of teachers in order to conduct an in-depth analysis. In addition, working closely with a small sample allowed us to improve their confidence and trust. Even if our three teachers were remarkably in agreement when assessing the quality and level of engagement stories produced, still we believe that

the inclusion of more teachers as evaluators will add depth to our findings and are planning for this to happen in our next user study.

The grid was too complex and long, as well as the questionnaire. As reported in [27] using self-completion questionnaire with children has some limitations. We also feel that the questionnaire was not the best tool to elicit valuable and critical feedback from our children assessors. It also became clear as the adapted grid we adopted for our evaluation still had limitations in terms of children's understanding and the time taken for completing it. We noticed that children were not always engaging with the questions regarding the quality of the various elements in the stories even if researchers acted as facilitators and provide explanations when needed. Answers to open questions, comments and observational notes helped us a lot in better understanding the children's assessments. However, *simplifying the grid and adding techniques that helped children to articulate better their feedback would improve the overall methodological approach.*

Future work

Considering the results achieved within this study we can envision future developments in order to improve our understanding of this research topic. Following a few examples of the possible future directions.

Ask children to assess more stories including some written by adults. Given the limitation reported above and having noticed how readers empathized with young authors, we think *it would be worth expanding our study and provide readers with a wider choice of short stories including some written by adults too.* This would enable us to better understand the elements that contribute to emotional engagement, including loyalty and/or empathy with authors.

Designing engaging stories and eBooks. Colombo et al [9] already pointed out how multimedia elements in enhanced eBooks contributed to the overall level of engagement children had with reading. This study went a step further by finely assessing how the quality of each of these elements - Characters, Settings, Plot, Story Structure, Theme, Style, and the Media - had an impact on the dimensions of the overall reading engagement. We were also able to explore how children value some more than others and to appreciate the different importance each had on the selection, reading and sharing phases of the reading process. *A future direction of research would be to investigate how available guidelines for the design of enhanced eBooks could be applied to the creation of multimedia short stories.* Perhaps more interestingly, we would like to keep exploring the many dimensions of engagement and their links with readability and usability at large. We feel this area is very promising and needs more attention.

Explore more in depth the link between media use and emotional engagement. We observed how audio elements had a prominent role in creating empathy during reading.

Children reacted very positively when listening to other children's voices in dialogues inserted in the story. This could be an indication that some media could stimulate a higher level of emotional engagement than others. Authors and designers could choose to focus on using highly emotionally engaging media only. Thus, *it would be worth exploring further the power of specific media, audio and specifically speech being promising candidates, on increasing levels of emotional engagement.*

Balancing text with multimedia. The contrast in opinion and perspective between children and adult experts needs also to be accounted for when planning co-design and evaluation activities. This is particularly crucial when designing digital stories or eBooks for children, especially, in the case of being in an educational context. Finding the right balance between text and other multimedia elements is a fine art. Getting it right means to have the chance to improve emotional engagement and create an enjoyable reading experience. Going over the top will result in readers being distracted and having a poor reading experience as much as they would if presented with a very conservative, text only version. According to our finding we would expect children co-designers to naturally be inclined to include more multimedia elements as these are more fun for them, while adults experts will be trying to avoid young readers being distracted by them. Besides, as mentioned under the previous point, we need to look more thoroughly into the different power each media has to emotionally engage children in reading. *We would like to develop a system to help designers and co-designers of digital reading experiences for children find the right balance between text and multimedia elements.* By taking into account how young readers value and respond to different dimensions of engagement, and what content is more suitable to them in educational terms, the system could predict how design decisions would impact on the overall reading experience.

Selecting and sharing. Our study also indicates how the overall reading experience was influenced by its social connotation. Thus, we should design new environments and tools to enable young readers to feel part of a community and exchange opinions and suggestions while sharing their positive and negative reading experiences. The status of those members who are more widely read should be made visible and they should be encouraged to exchange their likes and dislikes with the rest of the subscribers. *The design of tools to support social reading could lead to more children choosing more educational material to read and having more engaging and fun reading experiences.*

SELECTION AND PARTICIPATION OF CHILDREN

In this study 25 children aged 9 -10, from one private school in a small city in the Ticino were recruited. Prior to the study faculty ethical approval was obtained. Selection was by virtue of them attending the summer camp organised by the school. The head-teacher and tutors running the summer camp consented for the parents but children were told about

the aims of the research, asked for voluntary participation and whether their data could be used. As the main activity under study was reading for leisure it was essential for children to be free to choose whether they were willing to engage with it as much as to select what they wanted to read.

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