MemoLine: Evaluating long-term UX with children

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ABSTRACT
Recently, there has been an increased interest in long-term user experience. This paper reports an explorative study concerning the MemoLine instrument, a child-friendly adaptation of the UX Curve method to study long-term user experience concerning games in a retrospective way. The results suggest that children aged 9 -11 years were able to use this instrument for recalling and relocating memories on a timeline in a dedicated and consistent way. Furthermore the results also indicate that the children heavily relied upon the visual recognition points, which were added to support recalling and relocating experiences in time.

Categories and Subject Descriptors
H.5.1 [**Information interfaces and presentation**]: Multimedia Information Systems – *evaluation/methodology*

K.8.0 [**Personal computing**]: General – *games*

General Terms
Measurement, Design, Human Factors.

Keywords
User experience, UX, Long-term, Longitudinal, Children, UX Curve, MemoLine, Games.

1. INTRODUCTION
Traditionally, methods for studying user experience (UX) focus on the momentary experiences users have while interacting with a product or application for the first time [12]. Consequently, the results of these studies often consist of problems concerning discoverability or learnability Recently however, there has been a growing interest in the aspect of temporality when studying user experience [9]. As Kujala et al. [10] indicate: "Because evaluating a momentary user experience is in most cases not very reliable for predicting user experience in real life or for assessing the success of a product, we need information about long-term user experience". Previous research has suggested that important differences may occur when comparing momentary user experience and user experience over a prolonged period of time. For instance, Karapanos et al. have revealed that while pragmatic aspects (i.e. utility and usability) seem to be dominant for the initial experience with a product, hedonic aspects (i.e. novelty, originality, innovativeness or beauty) become more important over time [4].

However, despite the increased interest in long-term user experience, research in this domain is rather limited [15]. Additionally, the investigated time periods in existing longitudinal research tend to be fairly short and limited, at best covering a period of several weeks [9]. Karapanos et al. provide a possible explanation for this lack of 'truly' longitudinal research. They argue that extended field studies "are often seen as too cumbersome, expensive and labor-intensive" [6].

Most of the current longitudinal user experience research focuses on adult users [9]. Research describing long-term UX research with children is rather rare. This can be due to the fact that researchers are still looking for appropriate methods to collect data with children directly. In the past, researchers have often turned themselves to the childrens' proxies (i.e. parents, teachers, health workers, etc.) to gain insight in the perspectives and opinions of children [3].

The aim of this paper is to contribute to the development of appropriate long-term user experience methods that are adapted to children. More particularly, we will describe an explorative study in which the UX Curve has been adapted for its use with children for game experience evaluations. First, related work with regard to long-term UX evaluation and the UX Curve is described. Then, the method of our study is elaborated upon. Finally, after describing the findings of the study, conclusions regarding the adapted method are presented.

2. RELATED WORK
2.1 Long-term UX Evaluation
There are two different types of methods for evaluating long-term UX: repeated evaluation and retrospective evaluation [11].

Repeated evaluation methods traditionally involve longitudinal field studies, in which individual experiences are measured on several occasions throughout the study. However, as mentioned above, these kinds of studies are rare, because of their expense and the amount of effort that is required both from researchers and participants [6].

Contrary to repeated evaluation methods, retrospective evaluations do not require such a substantial effort. Retrospective methods ask participants within a single contact to recall past experiences concerning the use of a particular product or application [7]. The problem with retrospective methods is that

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memory biases may occur. However, the relevance of memories cannot be underestimated when studying user experience over a prolonged period of time. As people reflect on memories of past experiences, and report them to others, these memories have the power to guide their future behavior [13]. A number of retrospective methods have been developed (i.e. *iScale* [8], *Day Reconstructing Method* [5], *CORPUS* [16]). However, a discussion of all these methods does not fall within the scope of this paper. Rather, in this study we chose to adapt the UX Curve method [10] in order to make it appropriate for evaluating long-term UX with children.

2.2 UX Curve: retrospective evaluation of long-term UX

The UX Curve [7] aims to support users in reporting when and why their experiences with a specific product changed within a predefined timespan. This method can be used for two reasons: to detect meaningful qualities of a product that users perceive as important when using it on a long term; and to identify the underlying reasons why the perception may have changed [10].

Figure 1 is an example of a completed UX Curve. The horizontal axis represents the time dimension, starting from the beginning of use to the current moment. The vertical axis represents the nature and intensity of the users' experience. [10].

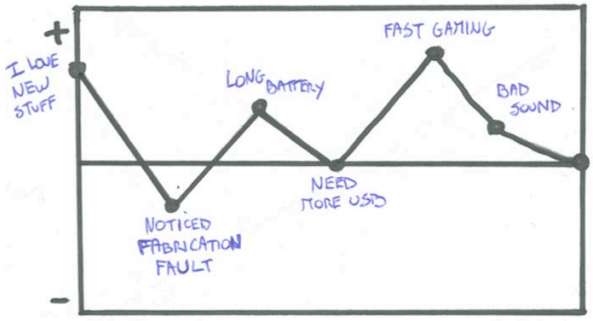

Figure 1: Example of a completed UX Curve

Users are asked to recall the moment when they began to use a product, and draw a curve reflecting how their relationship towards the product has changed from the first time it was used until today. Additionally, users could write some words or sentences to explain underlying reasons of changes in the curve and describe memorable experiences.

3. METHOD

This section will first describe how the original adult-oriented UX Curve was adapted to a more child friendly version that can be used for the evaluation of game experiences over time, hereafter referred to as the MemoLine. Afterwards, the methodological approach used to evaluate this new instrument will be elaborated upon in more detail.

3.1 Development of the MemoLine

In total, three important adjustments were made to the adult-oriented UX Curve to increase its appropriateness for long-term game experience evaluations with children.

3.1.1 Adjustment 1: One dimensional timeline

First, we replaced the curve format by a timeline format. This timeline visualizes the timespan starting from the moment that the child received the product until the day of the evaluation session. Since we abandoned the curve format, we needed an alternative for the Y-axis. The alternative opted for was the use of three colors: green (i.e. periods of positive experiences), red (i.e. periods of negative experiences) and grey (i.e. periods of non-usage). The children received a pencil for each color, by which they could mark periods on the timeline, with the color that resembled their experience at that moment in time.

As the study focused on children aged 9-11, we took into account the specific capabilities of that age group. Therefore, the first adjustment was based on the Belgian school curriculum, showing that children who finished primary school lack the necessary knowledge to be able to draw a mathematical curve with negative values [16]. Additionally, children tend to start at the bottom-left with an upward movement [1], and as such would be less likely to consider the lower half of the Y-axis. This could influence the results of the analysis of a curve drawn by these children.

3.1.2 Adjustment 2: Temporal recognition cues

Before starting the actual session, the researcher asked the child about its activities in the evaluation period, in order to add some visual recognition points to the timeline. Examples are the childrens' birthdays, holidays or the start of the new school year. So instead of giving them a blank drawing area, which they had to divide themselves according to their insight in time, they were given a drawing area that was already visually divided according to the elapsed time.

We believe that these recognition cues can support children in recalling experiences and orientating in time. The importance of recognition points in time has been stressed by Kujala, et al. [10], who have found that even when using the UX curve with adults, difficulties arise when users have to describe the exact timeframe of memorable events.

3.1.3 Adjustment 3: Game experience constructs

Researchers that utilize the UX Curve can ask participants to draw multiple curves, depending on the UX constructs they want to examine. However, as the constructs in traditional UX evaluation methods are generally used for evaluating productivity software, they cannot simply be applied to evaluate game experiences [2]. Although several researchers have tried to identify different constructs for measuring user experience regarding games, no consensus has been found to date [2]. For this study we opted for the following four UX constructs, which in literature (e.g. [14],[10],[2]) were often referred to as contributing to a successful and enjoyable game experience: Usability, Challenge, Quantity of play and General Impression.

For each of the four constructs, participants received a timeline. These timelines were accompanied by a question explaining the construct, and a legend, explaining the colors to be used. We made sure that, for each given construct, the question and color legend were formulated in a balanced way in order to avoid possible bias.

3.2 Evaluation of the MemoLine

For this study, we asked four boys and two girls, all between nine and eleven years old, to evaluate the long-term user experience of an educational video game, using the MemoLine method.

First, the purpose of the study was explained to the parent and child. Then, in a second phase, a short training of the instrument was given, to make sure that the children understood the purpose of the timelines. During this training they were asked to fill in the timeline based on the experiences they had with a personal toy/game in the past few months. Each session, the facilitator gave

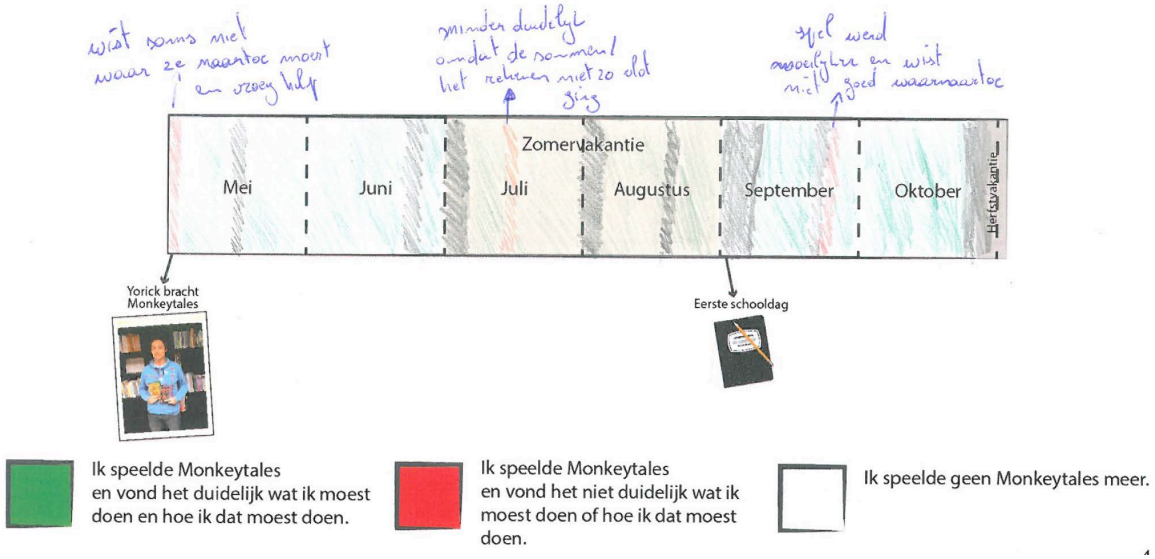

Figure 2: Example of a completed MemoLine

an example of how to indicate a period on the timeline, by marking when the child went on holiday during summer vacation. We only moved on to the next phase, when we noticed that the children fully understood the usage and purpose of the timeline. In the next phase, the children were asked to color four different timelines. After every timeline, time was provided for discussion to uncover the reasoning for the changes in the child's experience over time. More specifically, we wanted to get an understanding of the transitions between colors on the timeline. Figure 2 shows an example of a completed MemoLine.

4. RESULTS

All children finished coloring the 4 timelines and expressed a great level of dedication in using the instrument. For instance, all of the children were very concentrated while coloring the timelines and some even asked for an eraser to adjust their errors. In general, the phase of the completion of the 4 timelines took about 20 minutes.

The visual recognition points, which were added to the timeline to support in orientating in time and recalling experiences, were noticed and heavily relied upon. Children started each timeline with remarking when they went on holiday in summer vacation, as was done for them during the training to show how periods can be marked. Children made notable use of these visual recognition points to recall and locate memories on the timeline. Instead of recalling experiences within months for example, they asked themselves: "Did I play the game at the beginning of the school year?" or "Did I play after we returned from our holiday? Moreover, the fact that the timeline was visually divided and scaled in months clearly guided the children in marking specific periods. Five out of six children colored the timelines with great precision. When they wanted to indicate a period of 2 weeks, they colored just under half of a square (one square represented a month). Two of the children even commented that the researcher was coloring too much when he was marking their holiday period at the beginning of the session.

The process of completing a timeline was similar for all of the children. They started with coloring the entire timeline in silence, before explaining their reasoning for changes in colors. From this we derive that the children colored the timelines with premeditation, because all of them were able to give a relatively detailed explanation for the transitions they made between good (green) and bad (red) experiences.

In order to evaluate how consistent the children were in coloring the timelines, a comparison was made of the position of grey periods (non-usage) within the four timelines colored by the child. Three out of six children were consistent, meaning that the (grey) periods of non-usage were positioned similarly across their four timelines. Two out of six children were rather consistent (only minor deviations) and one child was not consistent.

Finally, a short training proved necessary for the correct use of the instrument. We noticed that the children needed a short explanation before they were able to start coloring. After the training, none of the children had further questions concerning the timeline and no further guidance was needed.

5. CONCLUSION & DISCUSSION

This paper presented an explorative study describing Memoline, an adapted version of the UX Curve method that aims to increase its usefulness for studying childrens' long-term experience. By means of a case study on the long-term evaluation of games with children aged 9 to 11 years old, MemoLine's appropriateness was investigated. The preliminary results suggested that children were capable of using this instrument for recalling and relocating memories on a timeline in a dedicated and consistent way. Furthermore, results showed that the children relied heavily on the visual recognition points that were added to the timeline, as these supported the children in recalling their experiences and relocating them more precisely in time. However, training proved necessary in order to guarantee the appropriate use of the instrument.

As this was an explorative study, we encourage further research to contribute to the development of a child-friendly longitudinal retrospective instrument. To this end, it may be interesting to validate the MemoLine instrument's appropriateness, complexity and reliability, by conducting further evaluation studies. Furthermore, testing this instrument in different contexts (e.g. with a broader age group or for the evaluation of a broader variety of applications), could lead to better or even new insights.

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