Nellodee 2.0: A Quantified Self Reading App for Tracking Reading Goals

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Abstract. Many readers nowadays struggle with finishing the books that they set out to read. To find a solution to this issue, we performed a design exercise which resulted in the development of a reading app that uses a quantified self (QS) approach to track reading goals, called Nellodee. This app allows readers to estimate the number of pages they would have to read to reach a daily reading goal and tracks their progress over time enabling them to reflect on their reading performance. In this paper, we present the design and implementation of our system and the results of an early pilot test are discussed.

Keywords: Reading · Quantified self · Self-monitoring · Self-tracking · Goal-setting · Personal informatics · Digital reading app · Reading goals

1 Introduction

In the digital era, there are boundless possibilities for using computational interfaces and ubiquitous computing to enhance reading practices. E-readers such as the Kindle, Nook, Kobo, and iBook allow readers to read e-books across different platforms. Additionally, many readers these days perform their reading sessions in digital devices due to their abundance and availability [3, 20], enabling the use of digital reading strategies, especially self-regulation and self-monitoring [1].

Self-knowledge through numbers or Quantified Self (QS) is a movement that is based on incorporating technology and data acquisition on different aspects of a person's daily life. QS promotes self-tracking of various kinds of personal information, ranging from physical activities to environmental information [11, 12]. Commonly, QS users utilize their tracked data to see how they are or are not reaching the goals they set for themselves [9] and this type of systems also help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge [8].

Studies have shown that when readers set goals for themselves they tend to positively change their behavior [10, 21], and when they meet their reading goals their confidence and sense of achievement increases [17]. Thus this work in progress presents a study which is an attempt to have insights into how reading habits can be improved through a quantified approach, by allowing participants to set reading goals for themselves, while at the same time allowing them to track their reading performance to reflect upon it.

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The goal of this study is to investigate if providing readers with access to their progress data makes them more likely to reach reading goals. The design of a prototype quantified-self reading app called Nellodee will be presented, and the pilot study that was carried out to try to answer our research questions will be described.

2 Related Work

Recent developments in the field of ambient sensors and wearable tracking devices have led to an interest in self-tracking and self-monitoring. Effectiveness on increased awareness and behavior change has led to the development of various quantified tools for daily life and work [2]. Health and physical activities are the most tracked events in QS interventions. Within the health domain, researchers and companies have designed technologies for tracking physical fitness, sleep, diet, and stress [12].

Several attempts have been made to integrate self-monitoring and QS into the design of learning environments. Rivera-Pelayo et al.'s research shows how QS approaches can support evaluating past experiences in order to promote continuous learning [15]. Other studies have found that frameworks for the application of QS applications to support reflective learning have a potential higher impact on self-awareness and student learning [7, 16]. The act of reading has also become more quantified with the development of e-readers and self-tracking technologies. Mobile eye tracking technology has also been used to determine how much people read, what type of documents they read, and how much they understand of what they are reading [4, 5]. Systems such as the Wordometer, estimate the number of words a person reads which is similar to the counting of steps using a pedometer [6].

Although reading metrics have already been used to analyze reading performance, few attempts to allow deep self-reflection in digital reading have been made. Thus, we see an opportunity to help readers who struggle with finishing their assigned book readings to achieve their reading goals by providing them with a mobile application that allows them to track their reading performance and reflect upon it.

The following section of this paper presents Nellodee, which is a digital reading app that uses QS techniques to track the reading progress of its users. The readers can set reading goals for themselves and reflect on their performance. It constitutes an initial approach to test if digital readers can benefit from a QS approach.

3 Nellodee

Nellodee started as a design fiction exercise inspired by some of the features found in the Primer device from Neal Stephenson's sci-fi novel "The Diamond Age" [19] and it is named after one of its characters. The result of this design exercise is a digital reading app which uses QS techniques to track the reading progress of its users. The prototype is a standalone application for iOS that enables readers to set personal reading goals and reflect on their performance. It aims at providing a unique reading experience of providing reading metrics to audiences of all age groups who are enthusiastic about reading.

4 Design and Implementation

4.1 Reading Page

The landing page of the app is similar to other reading apps for the iPad, such as Kobo, Nook, Kindle, and iBooks (See Fig. 1). The unique feature of the design of Nellodee's reading page, is that it shows the page the reader started reading on a given day and the target page that was set as the daily reading goal for that day. The bottom bar shows the page the user is reading at the moment, and the "running silhouette" icon also indicates the current page. The bar is used to show how far the user is from completing the daily goal. The completion rate of the goal is also shown to allow the reader to be self-aware of her performance.

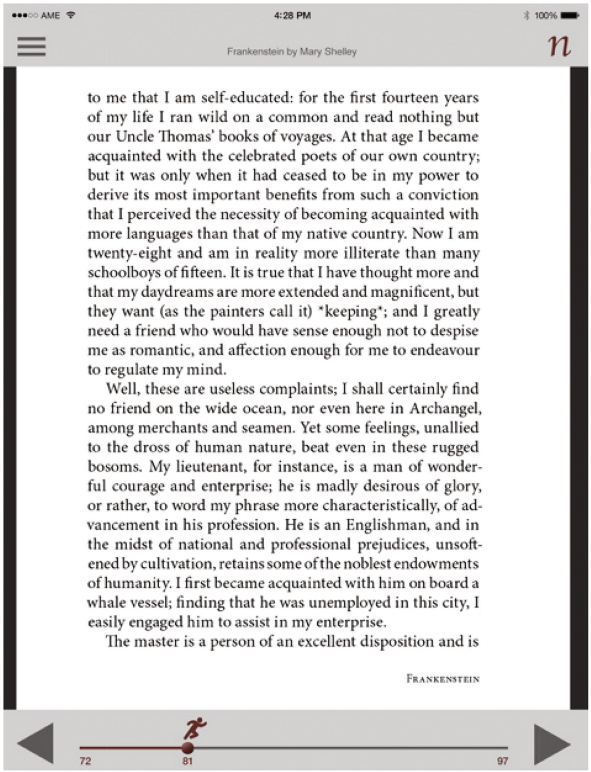

Fig. 1. Reading page. The reader started her daily reading session from page 72, and the target daily goal is page 97

4.2 Goals Page and Trends Page

Nellodee has a 'goals page' where readers can monitor their daily reading metrics. Readers can set daily goals for how many pages they want to read each day. They can

choose to set their personal goal by pages per day or by the date they want to finish reading the book by (See Fig. 2). Based on the reader's goal-setting, the 'daily goal' graph shows the goal of each day in grey bars. Readers can also compare their daily goal (grey bar) and the number of pages they have actually read each day (brown bar).

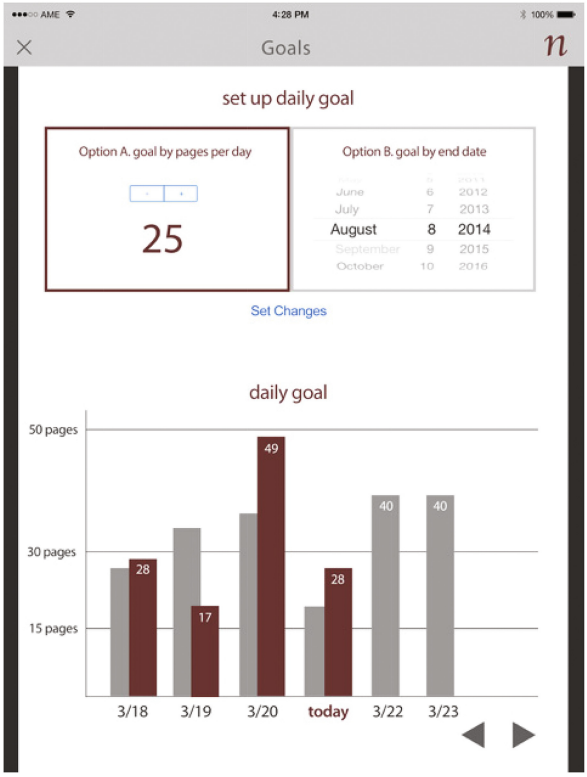

Fig. 2. Goals page (Color figure online)

According to Steel's research [14], procrastination is defined as a "prevalent and pernicious form of self-regulatory failure". Often when readers want to reduce procrastination, they make short-term or long-term plans to meet their goals later [18]. We designed two different ways to update the goals of upcoming days based on the missed pages. For the long-term option, the system adapts the goals to spread the missed pages over the remaining days. For example, if the daily goal is 25 pages and the user only read 20 pages, the updated daily goal will be "(25 − 20)/(days left) + 25". In the short-term option, the missed pages will be carried forward to the next day. So the updated goal for the next day is "25 + 5", and the goal of the rest of the days is still "25".

Li et al. found that if a user has been tracking an activity for a long period of time, they are more likely to allow themselves to miss the goals [9]. When designing Nellodee, we saw that a long-term plan may fail to stimulate readers to achieve daily goals

in the early days and end up adding too many pages to updated daily goals when the end date is getting close. Thus, we decided to apply the short-term plan and allow readers to change their goals at any time. Readers can self-monitor their achievement rate and reset the goal to an achievable level, especially when they see the next day goal is too high. The target page on the reading page will also be changed based on the revised daily goal.

Finally, the trends page shows the time spent reading the book per day and per page (See Fig. 3). These additional metrics help readers to keep in pace with time, contributing enabling self-reflection. We also hope this data could be used to inform book authors, publishers, and teachers who give reading assignments.

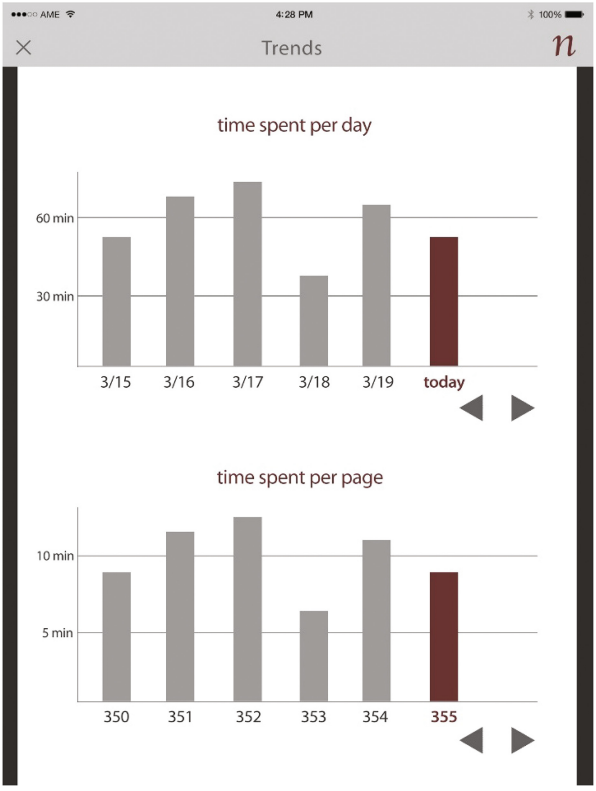

Fig. 3. Trends page

5 Study Design Overview

This project aims to answer the following research question: "Does providing readers with access to their reading data makes them more self-aware of their reading performance and more likely to reach daily reading goals?"

The working hypothesis of this research is that quantified-self features in a digital reading app will support students to achieve their reading goals. To increase our understanding of the way self-reflection affects reading performance, the following goals were to be reached:

- Identify the context where the digital reading sessions occur.
- Identify the way readers perceive quantified-self features as useful.

5.1 Procedure

Four graduate student participants (N = 4, 3 = female, 1 = male) pilot tested the Nellodee app installed in four iPad Air2 devices over the course of a two-week period while reading a book of their choice. There were two conditions: (1) NLD-Experiment: The Nellodee app which contained reading metrics that the participants could see and, (2) NLD-Control: The Nellodee app with a control condition without these metrics. Participants were randomly assigned to two groups of two students in each group. In the first week (session 1), group A read the book with NLD-Experiment, while group B read the same book with NLD-Control. In the second week (session 2), groups A and B switched roles. The reason why we had two different groups was to minimize the possibility of the two conditions variating over the two time periods, independent of the use of Nellodee.

5.2 Measures

The main source of data was the information collected through the app from each reading session. This data contained the number of pages, time and log information of each participant. The following are the metrics that were collected:

- Achievement rate of reading goals
- Number of pages read per day
- Number of pages read per week
- Time spent per page
- Frequency of looking at the Trends Page
- Frequency of looking at the Goals page
- Frequency of changing daily goals

The effectiveness of the app in helping users meet their goals was also assessed by gathering data from a post-study interview, which surveyed the perceived usefulness of its features and its context of use.

5.3 Interviews

After completing the two weeks of reading sessions, participants were asked to come to our lab for a short interview to acquire better insights on how the participants were using the app. Every interview lasted on average 15 min including questions about the

features of the app, about how useful it was in helping them or not to meet the reading goals they set for themselves and about potential future uses.

6 Early Findings

During the two-week pilot study, we collected data from the reading sessions and found out that the app is robust and user-friendly. However, there were no significant differences between the two groups of readers. Since our study sample was relatively small, we focused more on the qualitative feedback from the participants at this stage.

The most interesting feature about Nellodee for the participants was goal tracking. P1 said "when I reached my goal, I was motivated to read more". P3 said "I think the goals and the history of your reading with the number of pages is a good feature to have". Some readers suggested notifications upon goal completion, P1 said "when someone completes a goal, giving notifications such as 'congratulations' or 'you reached your goal' can motivate the reader".

When asked about their reading behavior some participants felt that reflecting on their performance was useful, P1 said: "when I reached my goal, I was motivated to read more", the user also said "if you see your performance, you feel like you are engaged with the book and you want to improve more". On the other hand, other readers did not find it necessary to set goals for themselves, P2 said "if I read more pages is because I am interested in the content". By reflecting upon the types of readers who would set goals for themselves, P4 said: "the whole concept of having feedback on performance and setting goals for yourself depends on the personality of the participant".

The interviewees also let us know that the app had good usability. P2 said "I think it was easy to use." Some of the readers wanted to have features that are present in other e-readers. If some of these features are to be implemented, for example P1 suggested push notifications to remind readers to continue their reading sessions; we would need to perform further tests to assess their efficacy.

Indeed, the collected data shows that all the participants lost interest in the app after one week. We found that app usage was significantly lower for week two than for week one. It is certainly plausible that in addition to self-tracking and self-monitoring, there are plenty of other general factors which affects user's reading performance. P4 said "I was traveling this week, so I didn't have much time to read", and P2 said "the book isn't interesting enough for me". Another potential explanation is that quantified self features may encourage and motivate the existing readers to read more, but are less interesting for occasional readers to resume reading. For future iterations, we are considering adding features to keep readers interested in using it. Adding additional features such as rewards, feedback messages about their performance and notifications are also considered.

When participants were asked about the possibility of using Nellodee to read for leisure purposes, P1 said "I would, since it as the features that other PDF readers have.". However, some did not find it appealing, P2 said "I don't think it would help me to read for pleasure (…) it kind of makes me feel pressure not pleasure". From these responses, we infer that different types of reading goals [13] might influence the way participants perceive our app.

7 Conclusion

In this paper, we presented the first iteration of the development process of the Nellodee reading app. We developed this system to have more insights into reading habits and see how allowing readers to set reading goals for themselves and track their reading performance can support them in the completion of readings tasks. This early pilot test helped us refine our approach to use QS features in reading apps that are gear towards motivating users to read more and complete reading assignments.

In the pilot test, we found that even for a small group of testers, there were different motivations towards their chosen reading materials, some chose their books to read for leisure others for learning purposes. Taking into account these motivations might inform us better in selecting the population that could benefit more from the use of our system, college students for example.

In the future, we plan to conduct a field study in a classroom with participants from courses where there are books that are assigned throughout a long period such as an entire semester. One of our future goals will be to compare how they perform against digital readers that do not track their reading progress. We argue that by providing readers with QS features such as goal-setting and goal-tracking, we can help them improve their reading performance.

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References

1. ChanLin, L.J.: Reading strategy and the need of e-book features. Electron. Libr. **31**(3), 329–344 (2013)
2. Choe, E.K., Lee, N.B., Lee, B., Pratt, W., Kientz, J.A.: Understanding quantified-selfers' practices in collecting and exploring personal data. In: Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems, pp. 1143–1152 (2014)
3. Hupfeld, A., Sellen, A., O'Hara, K., Rodden, T.: Leisure-Based Reading and the Place of E-Books in Everyday Life. In: Kotzé, P., Marsden, G., Lindgaard, G., Wesson, J., Winckler, M. (eds.) INTERACT 2013. LNCS, vol. 8118, pp. 1–18. Springer, Heidelberg (2013). doi:10.1007/978-3-642-40480-1_1
4. Kunze, K., Masai, K., Inami, M., Sacakli, Ö., Liwicki, M., Dengel, A., Ishimaru, S., Kise, K.: Quantifying reading habits: counting how many words you read. In: Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing, pp. 87–96 (2015)
5. Kunze, K., Iwamura, M., Kise, K., Uchida, S., Omachi, S.: Activity recognition for the mind: toward a cognitive "quantified self". Comput. **46**(10), 105–108 (2013)
6. Kunze, K., Kawaichi, H., Yoshimura, K., Kise, K.: The wordometer–estimating the number of words read using document image retrieval and mobile eye tracking. In: 12th International Conference on Document Analysis and Recognition, pp. 25–29 (2013)
7. Lee, V.R: "What's happening in the "quantified self" movement?". In: ICLS 2014 Proceedings, pp. 1032–1036 (2014)

8. Li, I., Dey, A., Forlizzi, J.: A stage-based model of personal informatics systems. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 557–566 (2010)
9. Li, I., Dey, A., Forlizzi, J.: Understanding my data, myself: supporting self-reflection with ubicomp technologies. In: Proceedings of the 13th International Conference on Ubiquitous Computing, pp. 405–414 (2011)
10. Locke, E.A., Latham, G.P.: Building a practically useful theory of goal setting and task motivation: a 35-year odyssey. Am. Psychol. **57**(9), 705 (2002)
11. Mathur, A., Van den Broeck, M., Vanderhulst, G., Mashhadi, A., Kawsar, F.: Tiny habits in the giant enterprise: understanding the dynamics of a quantified workplace. In: Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing, pp. 577–588 (2015)
12. Oh, J., Lee, U.: Exploring user experience issues in quantified self technologies. Eighth International Conference on Mobile Computing and Ubiquitous Networking (ICMU), pp. 53–59 (2015)
13. O'Hara, K.: Towards a Typology of Reading Goals (1996)
14. Steel, P.: The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure. Psychol. Bull. **133**(1), 65 (2007)
15. Rivera-Pelayo, V., Zacharias, V., Müller, L., Braun, S.: Applying quantified self approaches to support reflective learning. In: Proceedings of the 2nd International Conference on Learning Analytics and Knowledge, pp. 111–114 (2012)
16. Santos, J.L, Verbert, K., Govaerts, S., Duval, E.: Addressing learner issues with StepUp!: an evaluation. In: Proceedings of the Third International Conference on Learning Analytics and Knowledge, pp. 14–22 (2013)
17. Schoep, M., Wood, E.: Motivating Students to Read Extensively. ISSN 1756-509X 1: 16 (2015)
18. Sjöklint, M., Constantiou, I.D., Trier, M.: The Complexities of Self-Tracking-An Inquiry into User Reactions and Goal Attainment (2015). Available at SSRN 2611193
19. Stephenson, N.: The Diamond Age, Or, A Young Lady's Illustrated Primer. Bantam-Random, New York (1995)
20. Thayer, A., Lee, C.P, Hwang L.H., Sales, H., Sen, P., Dalal, N.: The imposition and superimposition of digital reading technology: the academic potential of e-readers. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 2917–2926 (2011)
21. Zimmerman, B.J., Bandura, A., Martinez-Pons, M.: Self-motivation for academic attainment: the role of self-efficacy beliefs and personal goal setting. Am. Educ. Res. J. **29**(3), 663–676 (1992)