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Exploring the relationship of learners' extensive reading behavior transitions via reflections

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Abstract: While extensive reading (ER) is known to support language development, maintaining learners' intrinsic motivation over time remains a persistent challenge that has been insufficiently examined through behavioral data. This study investigates the relationship between learners' self-reflections, which reveal their evaluations of the material, and their subsequent actions in ER. By analyzing behavioral transitions—such as reopening the same book, switching to a new one, or discontinuing reading—we infer relation to intrinsic motivation. Through self-reported reflections on perceived difficulty and interest, we explored how these judgments relate to learners' subsequent behaviors in an ER activity using e-books, conducted at a junior high school in Japan. The results show that while easy and interesting books were often completed, they did not always lead to further reading, suggesting that books offering an appropriate level of challenge, rather than simply comfort, are more likely to sustain motivation over time. These insights suggest that interventions in ER should focus on providing an appropriate challenge to maintain learners' motivation. Future research should incorporate continuous variables, such as pages read and reading time, to further understand how motivation unfolds during ER activities.

Keywords: Extensive reading, Reading motivation, Behavioral transitions, Self-reflection

1. Introduction

Extensive reading (ER) is widely recognized for its role in fostering language development by encouraging learners to read large amounts of easy and enjoyable materials (Day & Bamford, 2002). However, one of the enduring challenges in ER is sustaining learner motivation over time (Mori, 2002; Tanaka, 2017). Previous studies have emphasized the importance of intrinsic motivation in successful ER engagement but have paid less attention to how learners' actual reading behavior reflect their motivational states (Mori, 2002, 2004; Takase, 2007).

The growing use of e-books in ER enables the collection of reading log data, allowing for closer examination of learners' behaviors and motivational states (Schumacher & Ifenthaler, 2018). This study focuses on learners' behavior transitions: whether they choose to re-read a book, switch to a new one, or discontinue reading. These behaviors are influenced by learners' evaluations of the material, such as perceived difficulty or interest. For instance, continuing a book may indicate sustained interest, while inactivity might signal demotivation. Although these evaluations do not directly measure motivation, they may reflect underlying motivational states and influence subsequent reading decisions. This study highlights the role of learners' self-reflections in revealing their evaluations of the material, such as perceived difficulty or interest (Zimmerman, 2002).

In this study, we conceptualize intrinsic motivation not only as an internal state but as a dynamic process inferred through learners' reading experiences, as reflected in their self-reflections and subsequent behaviors. By examining the relationship between self-reflections

and behavior transitions, we aim to offer insights into how feedback and support mechanisms can be designed to help learners stay engaged in ER over time. Specifically, this study seeks to answer the following question: To what extent do learners' self-reflections on reading contents, relate to their subsequent actions, such as reopening the same book, switching to a different one, or becoming inactive in ER?

2. Method

2.1 Dataset and Data Processing

This study analyzes extensive reading (ER) behavior of 360 junior high school students in Japan. The data were collected between October 2024 and February 2025, during which the students engaged in ER as out-of-class activity. The participants used LEAF, a learning analytics platform, to read e-books through BookRoll (Ogata et al., 2018). It is a system that automatically records learners' interactions with digital texts, including timestamps, page transitions, quiz responses, and other operations. To investigate reflection, a short questionnaire was presented whenever a learner closed a book on BookRoll. The questionnaire asked about perceived difficulty and interest in the book.

Reading sessions were segmented when a learner switched to a different book or had no operations for more than five minutes as illustrated in Figure 1. Each segment was defined as a sequence representing a single, uninterrupted reading activity. A total of 1,055 valid reading sequences were identified across the 78 participants who answered post-reading questionnaire more than once. Post-reading questionnaire were conducted after each reading session. Table 1 summarizes the statistics of these sequences, including the number of sequences per learner, the average duration of a reading sequences, and the days intervals between sequences.

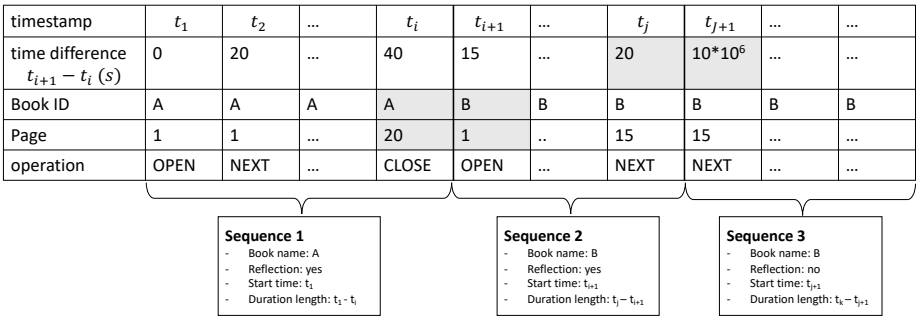

Figure 1. the description of sequence

Table 1. *summarized statistics of leaner's sequences (N=78)*

	mean	SD	median	IQR
the number of sequences	13.53	17.84	8.50	10.0
the average duration of a reading sequences (minutes)	3.56	4.90	2.20	2.20
the day intervals between sequences (days)	9.81	14.95	1.00	10.0

2.2 Behavioral Labeling and Reflection

Reflection data were obtained for each reading sequence, using a two-item questionnaire regarding interest and difficulty on a 5-point scale (as shown in Table 2). In total, 78 students submitted responses covering 206 reading sequences.

In this study, we categorized learner behavior into previous behavior, which describes the timing of the reflection within the reading experience, and next behavior, which describes the learner's action after closing the book. Sequences with questionnaire responses were

used to define previous behavior, while next behavior labels were assigned to the following sequences.

The operational definitions of these categories are presented in Table 2. The threshold for inactive behavior was based on the upper quartile plus Interquartile Range (IQR) of time gaps, approximately 19 days. These behavioral categories were informed by prior research in self-regulated learning and extensive reading, which emphasize the role of engagement and affective feedback in shaping future learning behaviors (Liu et al., 2022).

2.3 Analysis Method

We first computed the frequencies of each behavior type. To investigate associations between reflection and subsequent behavior, Pearson's chi-squared tests were conducted, focusing on differences in next behavior and previous behavior based on learners' questionnaire responses (Pearson, 1900).

Table 2. *Categories of each label.*

Category	Label	Definition	Example / Threshold
Reflection	interest	High: 4-5 Middle: 3 Low: 1-2	How interesting the book was (5-point Likert scale questionnaire)
	difficulty	High: 4-5 Middle: 3 Low: 1-2	How difficult the vocabulary was (5- point Likert scale questionnaire)
Previous Behavior	midway	Questionnaire answered before 80% of the book	$a \leq 0.8 * n$ (a: answering page number. n: total pages of the book.)
	Last part	Questionnaire answered after 80% of the book	$a > 0.8 * n$ (a: answering page number. n: total pages of the book.)
Next behavior	reopen	Re open the same book in the next sequence	Same book ID
	switch	Read another book in the next sequence	Different book ID
	inactive	No book opened for a certain period	$\geq (75th\ percentile + IQR)\ of\ delays$

3. Result and Discussion

Figure 2 presents the cross-tabulation results, and Table 3 shows the outcomes of the chi-squared tests, highlighting only the combinations with statistically significant associations. In Figure 2, the color map indicates the frequencies of each behavior type. Specifically, it visualizes how frequently the behavior on the horizontal axis occurred under the condition represented by the behavior on the vertical axis. Darker colors indicate higher frequencies, while lighter colors represent lower frequencies. Significant relationships were found between Previous Behavior × Next Behavior and Difficulty × Next Behavior. Standardized residuals were determined to determine which label combinations were significantly different for these. Other combinations did not yield statistically significant results ($p > .1$). For the combinations involving both interest and difficulty in relation to either previous or next behavior, chi-squared tests could not be performed due to insufficient expected frequencies.

No significant association was found between previous behavior and the two self-reflection indicators: interest and difficulty. However, trends in Figure 2 (b) indicate that books perceived as easy were more likely to be read until the last part (.71 of low-difficulty books), suggesting a potential link between perceived ease and reading completion. Continuous variables such as pages read or time spent may help clarify this further.

■ *Previous Behavior × Next Behavior*

Learners who stopped *midway* were more likely to *reopen* the same book, while those who reached the *last part* were significantly less likely to do so ($|\text{residual}| > 2$). This indicates that

greater prior engagement reduces the need for rereading. In contrast, inactive behavior showed no clear relationship with previous behavior, implying that other factors such as content or satisfaction may influence disengagement.

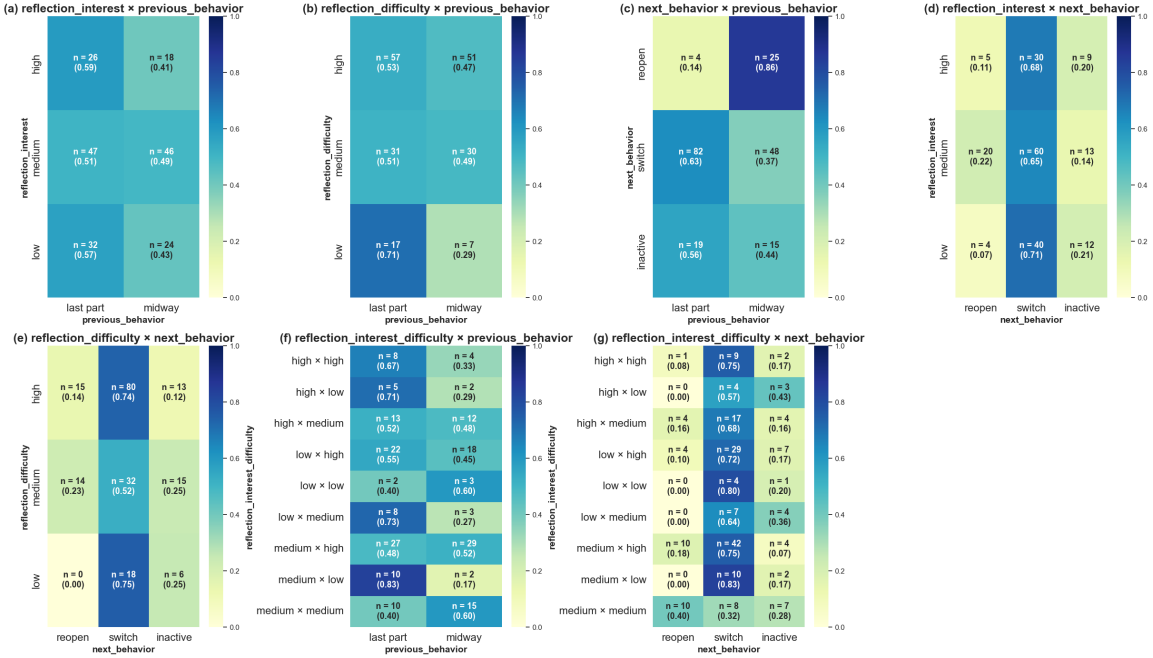

Figure 2. The cross-tabulation of previous behavior, next behavior, reflection.

Table 3. *The results of chi-squared tests*

Variable 1	Variable 2	χ^2 (df)	Significant Cells (Standardized Residuals)
interest	Previous behavior	1.1184 (2)	-
difficulty	Previous behavior	3.0426(2)	-
interest	Next behavior	6.9227(4)	-
difficulty	Next behavior	13.5255** (4)	-
Previous behavior	Next behavior	23.2528** (2)	Midway - reopen (3.24) Last part - reopen (-2.97)

** $p < .01$.

■ *Difficulty × Next Behavior*

Although no standardized residuals exceeded the threshold for significance, several tendencies were noted in Figure 2. *Low-difficulty* books were often closed *last part* (.71) but rarely *reopened* (.00). *Medium-difficulty* books showed fewer *switch* (.52) compared to others, suggesting they may foster sustained engagement. *High-difficulty* books were slightly less associated with *inactivity* (.12), hinting that such texts might encourage learners to reattempt or switch rather than quit, despite this trend not reaching significance ($|\text{residual}| = 1.9$).

These findings align with Self-Determination Theory and Flow Theory (Deci & Ryan, 1985; Csikszentmihalyi, 1990). Books that offer optimal challenge, either moderate or slightly high, appear to enhance perceived competence and promote intrinsic motivation. In addition, Figure 2 (f, g) suggests that when *high-interest* and *low-difficulty*, learners tended to read *last part* the book (.71) but often became *inactive* afterward (.43). While such books commonly recommended in ER for their accessibility and enjoyment enhance satisfaction, they may reduce motivation to continue the activity, possibly due to once goals perceived as achieved. This should be discussed in terms of sustaining motivation in ER, considering not just immediate behavior but also previous sequences and accumulated reading quantity.

Thus, post-reading interventions should avoid over-satisfaction. Both recognizing learners' accomplishments and presenting them with new, manageable challenges like

suggesting more difficult or new genre material are essential for sustaining intrinsic motivation and forward momentum (Hill et al., 2015). Reflective prompts such as “What would you like to read next?” or “What do you want to achieve through your next book?” could also maintain intrinsic motivation by fostering anticipation (Moon, 2004).

4. Conclusion

This study explored how learners’ self-reflections relate to their subsequent actions in extensive reading (ER). The results show while easy and interesting books were often completed, they did not always lead to further reading, suggesting that satisfaction alone is not sufficient for continued engagement. By examining behavioral patterns following reflective judgments, we highlighted those books offering appropriate challenge, not just comfort, may better sustain motivation over time.

To deepen these insights, future research should consider continuous variables such as pages read and reading time and examine longer behavioral sequences to better capture how motivation unfolds across ER activities.

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