

Giving and Receiving: Reciprocal Review Exchange in Online Fanfiction Communities

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ABSTRACT

Online fanfiction communities enable young people to make connections through their shared interests. Prior research has found that informal learning takes place in fanfiction platforms through distributed mentoring, which includes the writing and receiving of story reviews to one another that have significant effects on young authors' literacy skill development. The pandemic lockdown has limited young people's access to forming social connections, and it also stimulated engagement in online informal learning. Therefore, it is crucial to study online fanfiction communities as a prototype for designing future informal learning platforms. This study focuses on reviewing, one of the main components of distributed mentoring, to explore whether reciprocal patterns exist in the sending and receiving of reviews among fanfiction authors. We used a social network analysis approach by modeling users' interactions through reviews as directed graphs and performed correlation analysis to test the proposed hypotheses. The results provided significant evidence that supports the existence of reciprocal patterns among users' interactions through reviews.

CCS CONCEPTS

• **Human-centered computing** → *Web-based interaction*.

KEYWORDS

Online fanfiction communities; Informal learning; Reciprocity

ACM Reference Format:

Ruoxi Shang, Zile Xiao, Jenna Frens, and Cecilia Aragon. 2021. Giving and Receiving: Reciprocal Review Exchange in Online Fanfiction Communities. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing (CSCW '21 Companion)*, October 23–27, 2021, Virtual Event, USA. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/3462204.3481758>

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CSCW '21 Companion, October 23–27, 2021, Virtual Event, USA

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ACM ISBN 978-1-4503-8479-7/21/10...\$15.00

<https://doi.org/10.1145/3462204.3481758>

1 INTRODUCTION AND BACKGROUND

Online informal learning has been made possible and increasingly convenient with the emergence of networked technologies. In particular, informal learning takes place in online fanfiction sites such as Fanfiction.net through distributed mentoring [1], a type of network-enabled mentoring that allows fanfiction authors to asynchronously interact with one another by sending and receiving reviews [4]. Distributed mentoring decentralizes the traditional one-to-many teaching, acting as a powerful model for large-scale informal teaching and learning. The communities that arise in fanfiction sites bring young people together around a shared passion for various fandoms (e.g., Harry Potter, Twilight), for which amateur fanfiction authors write fanfiction stories. Under this shared passion, members in the communities spontaneously offer reviews and detailed feedback to authors.

The pandemic lockdown has limited young people's access to forming social connections, calling for researchers to understand how to better engage users in healthy online interactions. Built to support social bonding and distributed mentoring, online fanfiction platforms are essential prototypes that can inform the design of better online informal learning systems. Reviewing is an indispensable component of distributed mentoring in online fanfiction communities, as interviews with fanfiction authors reveal that the sheer abundance of reviews motivates the writers by giving them an overall direction and offering them valuable learning experience [4]. Previous research has also found that the reviewing process in the fanfiction communities creates measurable impacts on young people's lexical diversity in language development [16]. In order to encourage reviewing behaviors and promote a long-term sustainable distributed mentoring ecosystem, we need to have a better understanding of factors that affect users' voluntary action of reviewing. This study seeks to find underlying patterns in fanfiction community members' reviewing behaviors.

In the Fanfiction.net site, we observed that receiving reviews sometimes prompts the author to send a review back in turn. This behavior can be studied under the norm of reciprocity, which creates the expectation that an individual who receives a favor should feel obliged to pass it on to the original sources or to someone else [14]. Prior work has demonstrated that that individuals' participation in the interactions promotes reciprocal engagement from other members of the online community [10]. In an anonymous platform like the online fanfiction community, researchers have also shown that perceived anonymity actually has a positive effect on the intention to reciprocate [5]. In the context of online mental health support forums, results show that members of a social group

are more likely to help those who have provided them benefits before [13]. These theoretical and empirical evidence motivates us to explore reciprocity in online fanfiction community review interactions. Prior work has found a relatively low correlation between the overall quality of reviews given and received by authors in fanfiction communities [6]. By looking for reciprocal patterns among all community members, their method overlooks that stronger reciprocal patterns may occur among members in the subgroups of the community. Davis et al. [3] used Dunbar's network analysis methods to reveal the relationship structures within a distributed mentoring network, showing that the most substantive reviews with targeted feedback most likely come from inner-layer relationships where reviews are exchanged most frequently. Therefore, we want to further stratify the analysis by looking separately at interactions within individual fandom communities and under particular time frames.

Our work extends on these findings by exploring the nature of frequently exchanged reviews and answering the following research question:

Do reciprocal patterns exist among active authors' reviewing interactions within the online fanfiction fandom subgroup communities?

Through hypothesis testing, we found strong evidence for consistent reciprocal patterns based on the significantly positive correlations in authors' receiving and sending reviews. By using a large-scale data-driven and network analysis approach, this study contributes to the prior study on fanfiction communities by focusing on fandom-based subgroups and adding a time-dependency to explore reciprocity. The results can be applied to the fanfiction communities and beyond through exploiting reciprocity to facilitate the construction of a better distributed mentoring system.

2 METHODOLOGY

2.1 Data Collection

Among all the online fanfiction communities, Fanfiction.net has the largest repository that contains over 13.7 million stories written by over 12 million authors as of May 2021. In this study, we worked with data gathered by Yin et al. [17], who collected more than 176 million reviews from 8.5 million users over the course of 16 years since 2000 from this site. This dataset contains all of the information about the reviewing interactions (e.g. reviewer identifier, author identifier, review date, review content).

As we are interested in if receiving reviews will incur a reciprocal behavior to write a review back for other authors, we target users who can both send and receive reviews. Our studied users are those who are primarily fanfiction authors, who engage in both story-writing and reviewing. Since authors interact with others more frequently in the same fandom based on their shared interests, we separately looked at three most popular fandoms selected by the total number of reviews.

We observed that in each of the three fandoms, more than 20% of the registered authors on the site have only sent or received one review over the entire 16 years. We also found gaps in users' activity over time and many are inactive for most of the time in a year. Including interactions in authors' inactive periods would add noise to the hypothesis testing and make the possible reciprocal

patterns among the active authors less observable. To address this, we strictly include only the review interactions from authors who are consistently active (i.e. sent or received at least one review in more than 10 months in a given year). This is selected based on the right-skewed distribution of the number of active months in each year. Eventually, we ended up with a total of 5275, 1684 and 2980 active authors and 2001, 2003 and 2007 as the starting years for Harry Potter, Twilight and Naruto fandom respectively.

2.2 Network Analysis

In the online fanfiction communities, members are linked in a networked system in which giving and receiving advice generates positive affect [4]. Network analysis approaches have been used to study informal learning on online networked sites [7, 12]. In order to capture the complex structure of those interpersonal interactions, we will adopt social network analysis methods that conceptualize the reviewing interactions as a graph of networked authors connected by their interactions based on reviews.

In this graph, a node represents an author and a tie goes from node A to node B represents a review sent from author A to author B's story. We define *in-reviews* to be all reviews an author received from other authors, while *out-reviews* refer to all reviews an author sends out to other authors' stories. Another interesting factor of this graph is the diversity of different authors with whom one author has interacted. Hence, *in-degree* is defined as the number of unique authors from whom an author has received reviews, and *out-degree* is defined as the number of unique authors to whom an author has sent reviews.

2.3 Hypotheses

The existence of reciprocal patterns can be assessed through frequency of reviews, diversity of interacted users and quality of reviews [13], based on which we constructed our hypotheses. Authors' reviewing behavior on the Fanfiction.net site revealed that active authors who give reviews to others often receive many reviews on their writings. This gives rise to the first hypothesis: **H1: Authors' number of in-reviews will be positively correlated with their number of out-reviews.** By looking at the number of unique users authors have interacted with, we also found that the diversity of users they receive reviews from might have a correlation with the diversity of users they leave reviews for. This leads to the second hypothesis: **H2: Authors' in-degree will be positively correlated with their out-degree.** In addition, as the length of reviews can "act as a proxy for amount of communication" [15], we will use it as an indicator for review quality. We want to explore if authors who receive high-quality reviews tend to send high-quality reviews. Hence, we hypothesized that: **H3: Authors' average length of in-reviews will be positively correlated with their average length of out-reviews.**

3 ANALYSIS AND FINDINGS

We computed the total number of in-reviews and out-reviews, in-degree and out-degree, and average length of in-review and out-review for all the active authors in across all three fandoms, and tested the hypotheses with regression analysis both across all years and for each year separately. Summary statistics including mean,

standard deviation and range for those computed measures will be available in *Auxiliary Material*.

3.1 Results 1 - Overall correlation across all years

Based on the Spearman correlation results in Table 1, we determined the strength of the Spearman correlation coefficients by thresholds proposed in [9]. Across all years, correlations are significantly positive and moderate for **H1** and **H2** in the Twilight fandom and **H3** for all three fandoms, while correlations are significantly positive and weak for **H1** and **H2** in the Harry Potter and Naruto fandoms. Despite the strength of the correlation, these results still give supportive evidence to the three hypotheses by showing that a significantly positive correlation is observable in all cases across the years.

Table 1: Correlation results for each pair of measurements across the three Fandoms

Fandom	Measure	Spearman-Correlation	P-value
Harry Potter	In&Out reviews	0.336	<0.001
Twilight	In&Out reviews	0.452	<0.001
Naruto	In&Out reviews	0.240	<0.001
Harry Potter	In&Out degree	0.329	<0.001
Twilight	In&Out degree	0.415	<0.001
Naruto	In&Out degree	0.242	<0.001
Harry Potter	In&Out average length	0.511	<0.001
Twilight	In&Out average length	0.508	<0.001
Naruto	In&Out average length	0.472	<0.001

3.2 Results 2 - Temporal changes in correlation strength

Each subplot in Figure 1 shows three lines that represent the time series of correlation coefficients for all three fandoms under one hypothesis testing across years. The plots start from the earliest year when review data are available in the Twilight fandom for aligned comparison. The correlation coefficients in earlier years for the other two fandoms are either insignificant (p value > 0.05) or relatively weak (< 0.4), and they will not be presented here due to space limitation. Aside from some short-term fluctuations, an overall increasing trend is evident for each set of correlations. The results from Mann-Kendall trend test show that 6 out of the 9 correlation time series (corresponds to each of the nine lines in Figure 1) have significantly and consistently increasing trends. While there is no significant upward trend found in the others, the correlation coefficients are still moderately high across the years for those trends.

4 DISCUSSION

In order to further understand the dynamics of distributed mentoring and how users participate in a highly beneficial yet voluntary process of writing reviews, this study looked for reciprocal patterns in the reviewing interactions of an online fanfiction site. Our work built on prior researchers' findings that moderate correlation is found among reviews sent and received by fanfiction users [6].

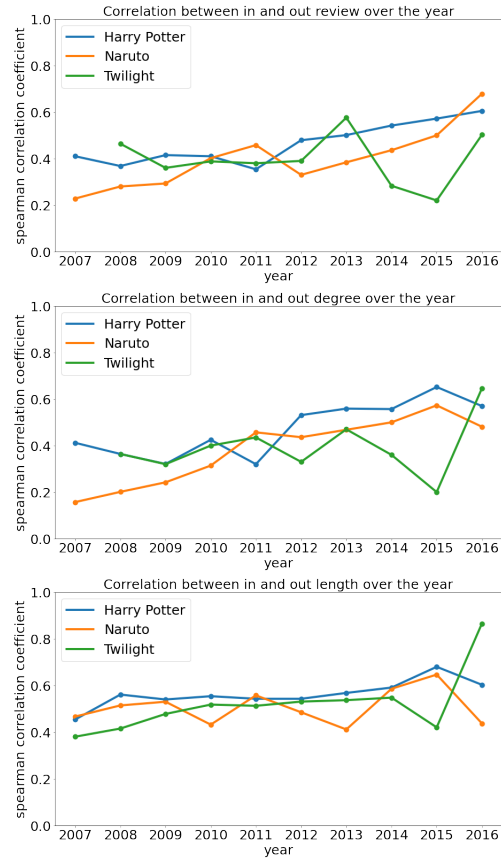


Figure 1: From 2007-2016, there is an overall increasing trend in reciprocity between giving and receiving reviews

We used a more granular approach, expanding on prior work's finding that the most substantive reviewing activities take place in inner-layer relationships [3]. The results give supporting evidence that fanfiction authors' interactions through sending and receiving reviews are reciprocal within each of the fandom subgroups.

The first key finding is that among the three hypotheses, the reciprocal behavior is most strongly supported in H3, which tests if the average length of reviews received by an author is correlated with the average length of reviews sent out by that author. As opposed to frequency and diversity of interactions, average length of reviews measures the reviewer's intensity of involvement [11]. A further question arise from this result: Do authors tend to reciprocate more with deeper involvement with others through higher quality reviews (e.g. longer sentences, higher proportion of constructive suggestions)? This question should be explored using more granular measures of review quality and qualitative interviews.

Another interesting finding shows that reciprocal patterns are more evident when we looked at the correlation coefficients within each of the recent years, despite the relatively weaker overall correlation. While there is clear evidence showing that the effect of reciprocity is time-dependent, it is unclear how the time factor

contributes to each user's reviewing behavior. We speculated that authors become less active on the platform over a longer period of time, and shallow relationships tend to fall apart over time. At the same time, the upward trend of by-year reciprocal effect over time is correlated with the increase in user participation on the platform. We speculated that an overall more engaging environment might lead to a virtuous circle of reviewing and amplify the effect of reciprocity.

5 FUTURE WORK

Theory of reciprocity suggests that feedback from other users should predict long-term participation for newcomers of the online community, leading to a positive feedback loop of receiving and giving [2, 8]. Further research in this direction may lead to more translational guidance for similar platforms or systems that afford distributed mentoring, exploiting the potential of short-term reciprocal effects that may contribute to long-term user activeness and designing for a more sustainable environment for informal learning. This study is focused on author-to-author reviewing interactions, and future research should also explore author-to-reader and reader-to-reader interactions. The various forms of user interactions need different definitions of reciprocal behaviors, and thus they might lead to different conclusions of the existence of reciprocal patterns. We acknowledge that there might be other external factors influencing authors' reviewing behaviors, and we are limited by the observational nature of the data to draw causal conclusions. We encourage future work to sample a group of users and examine the reciprocal effect in a small-scale study with more depth. Furthermore, future research can apply machine learning and natural language processing tools to extract more content-related measures such as sentiment, intensity, interest, etc. Exploration of the review content might reveal more layers of dynamics among fandom community members, stepping towards a comprehensive understanding of reciprocal behaviors in story reviewing supported by distributed mentoring. Moreover, this analysis is built upon the data collected in prior work that covered years up until 2016. Future work should update and expand the dataset to explore more recent activities in this community and encompass the effects of the pandemic.

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