Initial Validation of "Listening" Behavior Typologies for Online Discussions Using Microanalytic Case Studies

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Abstract: Collaborative participation in online discussions requires interacting with the ideas posted by others, yet many students do so ineffectually. This study conceptualizes these actions as online "listening" behaviors and proposes six prototypical behavioral patterns. To test these prototypes, microanalytic case studies were conducted. Five cases with distinct listening profiles are described: "Gigi", showed a *content coverage* approach, viewing all her classmates' posts but not drawing on them in her own; "Stephanie", showed an *interactive* approach, focusing on a smaller number of posts, but building on them in her contributions. "Ron" showed a *targeted* approach, focusing on particular kinds of posts in the discussion and disregarding the rest; "Darren" showed a *social coverage* approach to listening, briefly scanning many posts and acknowledging his classmate's contributions in a conversational tone; and "Julie", showed a *disregard* for listening, ignoring the majority of the posts in the discussion. Theoretical and practical implications of the findings are discussed.

Introduction

In previous work we have argued for the importance of students' "listening" in online discussions and the need for research to understand different listening approaches (Wise, Marbouti et al., 2011). For the context of online discussions, we define listening behaviors as the ways learners engage with others' posts (e.g. which posts they attend to, at what point(s) in time, and in what ways). It is through these behaviors that learners become aware of others' ideas, a pre-requisite for taking-up these ideas and creating comments that respond to them (Suthers, 2006). As attending to others' ideas is necessary as a first step towards interactivity, a thorough notion of discussion participation must include not only the activity of making posts (i.e. "speaking"), but also that of viewing posts of others (i.e. "listening").

Prior work has suggested that in general learners in online discussions attend to each other's ideas superficially (e.g. Hewitt, 2003; Palmer et al., 2008; Thomas, 2002) and that there is a relationship between the amount of engagement with other's posts and course performance (Hamann et al., 2009; Morris et al., 2005). However, this work is based on examinations of student behaviors in aggregate. As we have argued previously, there is no reason to assume that students all listen in similar ways; in fact, initial evidence suggests the contrary (Wise, Perera et al., 2012). Even for individual students, participation is unlikely to be uniform over time; such temporal variations are artificially smoothed (and thus analytically eliminated) in the creation of aggregate measures. Thus, patterns of student listening in online discussions and their relationships to learning may be much more complex than previously suggested. To take full advantage of the analytical opportunities afforded by rich log-file data we need methods that unpack both the individual (Peters & Hewitt, 2010) and temporal (Dringus & Ellis, 2010) aspects of discussion participation.

In past work, we found that different students interacted with prior messages in distinct ways (Wise, Perera et al., 2012) and documented three particular approaches to online listening (Wise, Marbouti et al., 2011). While our initial work on listening behaviors focused on empirically-derived patterns across multiple students, the current study moves this line of research forward by generating a set of theoretical listening typologies and comparing them with in-depth case studies of a small number of students' individual behaviors. In this way we work towards a taxonomy of online listening behaviors that can be used to analyze and support online discussions.

Conceptualizing Online Listening Behaviors as Part of Discussion Participation

To conceptualize listening as an aspect of participation in online discussions, we draw on Knowlton's (2005) taxonomy of five online discussion participation types characterized in terms of their perspectives on collaborative knowledge construction and its enactment in online discussions. Knowlton argues that based on different conceptualization of the meaning and purpose of online discussions, learners can participate differently and advance to more sophisticated participation types over time. Expanding on this general theorization of participation types, we propose specific listening behaviors that correspond with each category in the taxonomy (see Table 1).

Knowlton's (2005) model begins with the category of passive participation: those students who do not actively contribute posts. He suggests two explanations for this behavior. First, students' inactivity may be due to a lack of interest in learning, a lack of knowledge in engaging in a collaborative learning environment, or a

poor ability to manage their time. We would expect these students to view few posts and spend little time on them. Second, these students may be engaging in initial "legitimate peripheral participation" (Lave & Wenger, 1991) as they familiarize themselves with the discussion. This second class of students would be expected to actively listen to the discussion as they prepare to eventually contribute, thus we consider them as a separate listening type.

The second level of participation is developmental, in which students regard discussions as a social space for building community (rather than a place for learning the course material). Consequently, they are responsive in acknowledging their peers and their efforts in a conversational tone but the content of their comments lacks depth of thinking. In terms of listening, we would expect them to orient socially based on relationships, reading posts made by their friends and those that reply directly to them. The third level of participation is generative. Students at this level consider discussions as an individual channel to demonstrate their understanding and thus are more likely to contribute lecture-like posts in an academic writing style. Concentrating on articulating their own ideas to the instructor, we would expect them to listen primarily to the posts of the instructor rather than those of their peers.

The two highest levels of participation are dialogical and metacognitive. At these levels learners participate with a collaborative mindset. While focused on their peers, they craft their comments with the goal of more than just community-building, recognizing a need to connect with others in a collective process of building ideas. For example, learners exhibiting dialogical participation are expected to be interactive in their listening, attending in depth to the contents' of others posts. This enables them to build on other's ideas in their own posts, and even synthesize disparate viewpoints to pull the group's conversation together. Learners at the metacognitive level exhibit dialogical participation plus have the additional characteristic of reflecting on their own thinking. Their goal of participation is not only to understand the topic discussed, but also recognize the influence of others' ideas in changes in their own thinking. As metacognition often occurs internally, it can be difficult to detect (Knowlton, 2005); in terms of listening behaviors it might be reflected in substantial time spent re-reading posts made by others and oneself.

Table 1. Knowlton's (2005) participation types and proposed listening behaviors

(Knowlton, 2005)		Proposed Listening Behaviors
Participation Type	Description	
Passive	Sees the discussion as a channel to receive information; does not contribute posts	*Disregardful.* Minimal attention to others' ideas. OR *Preparatory*. Listens to others' ideas in preparation to contribute
Developmental	Sees the discussion as a social space; posts to acknowledge classmates	*Social*. Attends to peers' posts in a social sense, superficially based on reciprocity
Generative	Posts to construct their own ideas and report them to the instructor	*Targeted.* Attends primarily to the instructor's posts, not those of their peers
Dialogical	Posts to clarify their understanding through interacting with others	*Interactive*. Actively attends to content of peers' posts (draws on them to contribute)
Metacognitive	Dialogical participation plus reflects on the process of knowledge development	*Reflective*. Dialogical plus reviews own and others' posts throughout the discussion

Purpose of the Research

As a first step to empirically ground the proposed typologies of listening behaviors, we constructed a series of microanalytic case studies of student interactions in online discussions as part of a university class. Extreme case sampling (Patton, 2002) was used to identify patterns of interaction that were clearly distinct and would thus allow for well-defined characterization and potential alignment with the theoretical-generated typologies. Specifically, we attempted to answer two research questions:

1. What distinct listening patterns do individual students enact over time as they participate in asynchronous discussions as part of an online course?
2. How do these patterns align with theoretically-predicted typologies of listening behaviors?

Methods

Learning Environment and Discussion Task

Students in a fully-online undergraduate course on Educational Psychology participated in six week-long discussions, in groups of 10-13 students, worth 20% of their grade. Discussions were conducted in Phorum, a basic asynchronous threaded discussion forum. Students were required to discuss contrasting perspectives on authentic, contested questions in educational psychology. Discussions ran from Monday to Friday and required

students to contribute three posts on different days. Each week two students were assigned roles: Synthesizer (summarize the group's early ideas) and Wrapper (pull the conversation together at the end).

Data Extraction and Processing

Thirty-three consenting students' log-file data was collected based on their activity in the discussion forum. The system automatically logged every action students performed in the discussions, noting the identity of the post read or created and applying a time-date stamp. Three types of actions were processed: view, post, and review (for details see Wise, Marbouti et al., 2011). Views were subdivided into reads or scans based on a threshold reading speed of 6.5 words per second (see Hewitt et al., 2007). Action duration was calculated by subtracting the time between actions for each student. One limitation of this calculation is that it does not account for the fact that students may engage in off-task activities during some portion of this time. Adjustments were made for unlogged system exits and actions were divided into sessions (a series of consecutive actions in the discussions) following the procedure described in Wise, Perera et al. (2012). Sixteen interaction variables (e.g. number and duration of sessions, total time spent reading, percentage of total posts viewed) were calculated for all students based on the log-file data.

Case Selection and Framing

Potential cases were selected for analysis by ranking students based on each interaction variable. Extreme sampling was enacted by identifying students who appeared most frequently in the top or bottom 10% for each variable (indicating extremely high or low participation on that indicator). Eight cases were selected for further examination of listening patterns. Preliminary investigation compared these cases with respect to the selection criteria of being extreme and unique; three cases were eliminated and five were retained (three high-volume and two low-volume participants). The fourth discussion week (on the topic of critical thinking) was chosen as the focus week for case study; none of the students studied had assigned discussion roles this week. The analytic frame included all actions performed by a student during this week; to capture related early/late activity, any actions in the critical thinking discussion up to two days before or after were also included.

Microanalytic Case Analysis Process

To conduct the case studies, temporal microanalysis of log-file data (Wise, Perera et al., 2012) was employed. This is an analytic approach that provides a methodology for constructing a meaningful account of students' participation in an online discussion by providing a detailed on-the-ground account of student behaviors. The first analytic step was to get a broad sense of each student's behaviors in the discussions globally by looking at their overall data patterns (see Table 2). The number and duration of each kind of action were also represented with pie charts to examine their relative fraction of total activity (see Figure 1). The second analytic step narrowed in on the focal discussion. A session-by-session table of activity was built for each student (see Tables 3-7) and this data was used to make a preliminary characterization of the student's participation and listening behaviors. This interpretation would be tested and further developed in the third stage of the analysis.

The third analytic step was to reconstruct learners' experiences participating in the discussion during the focus week, with a focus on their listening behaviors. To do this, we created a dynamic discussion map: a spreadsheet of all posts organized by date, time and threading structure that could be filtered to reproduce the state of the forum at any point in the discussion. The log-file data for each case was examined using this map to provide context; this allowed us to make sense of the actions students performed within the historical setting of the discussion as it appeared at that time. (For example, we could distinguish when a student read posts scattered across a discussion versus those in sequence, even if by the end of the discussion the posts were no longer adjacent due to interspersed replies.) Analyzing students' behaviors action-by-action in this way, we produced a narrative for each student reconstructing their participation in the discussion. Reference to the content of the student's posts was used to contextualize actions in the discussion as needed.

Results

The five students studied were Gigi, Stephanie, Ron, Darren, and Julie (pseudonyms). The first three were high participation students; all spent relatively long time in the discussions, though activity patterns were distinct (see Table 2 and Figure 1). The latter two were low participation students; specific activity patterns also differed.

Gigi: A content coverage approach to listening

Gigi visited the discussions often, logging-in for 80 sessions over 23 hours (see Table 2). A large percentage of her sessions involved only reading actions (no posts made). Gigi viewed all posts in each discussion; however, many of these views were superficial scans. She made 24 posts in total, six more than required, and reviewed them multiple times during the discussions.

In the Critical Thinking discussion, Gigi visited the forum every day, for a total of 13 sessions (see Table 3). She began early Monday morning, quickly viewing several posts from the preceding discussion. She

Table 2. Aggregate measures of listening and speaking behaviors in the discussions

Behavior	Gigi	Stephanie	Ron	Darren	Julie
Time in the system (hrs)	22.8	30.7	24.1	5.5	6.6
Number of sessions	80	62	28	33	17
Percent of sessions with posts made	28%	29%	68%	61%	82%
Percent of time spent reading	64%	97%	71%	48%	47%
Number of posts viewed	413	330	217	304	158
Percent of views that were reads (not scans)	56%	55%	65%	33%	25%
Av. time reading a post (min)	3.8	9.8	7.2	1.6	4.7
Percent of posts viewed at least once	100%	100%	38%	89%	39%
Percent of posts read at least once	80%	62%	31%	36%	14%
Number posts made	24	18	19	26	14
Av. length of post (words)	258	247	174	134	288
Av. time making a post (min)	18.0	0.8	18.2	4.9	12.4
Av. number of reads before posting	2.6	4.8	5.7	2.2	1.6
Av. number of reads after posting	1	0.4	0.5	0.6	0
Number of reviews	30	5	9	2	3
Final course grade	92	87	72	67	87

then read the current week's discussion prompt before returning to the previous forum to review her final post and the last post in the discussion. Later Monday, she viewed 11 classmates' posts in a linear sequence of scans and quick reads. Prior to making a reply, Gigi reviewed her final post from the previous discussion (about 'overlearning' in math) one more time. She then contributed her first post, building on this concept and its relationship to transfer, while integrating academic language from the textbook. Finally, she quickly viewed three posts and logged-off.

The next day, Gigi worked through the forum methodically and efficiently: she quickly read all four new posts in order, scanning the discussion prompt a couple of times between reads. She also reviewed her post from the previous evening. Later that night, she logged-in again and replied to the final post in the discussion, picking up on the notion of transfer she mentioned earlier. She then read one post and left. On Wednesday, Gigi had two quick sessions checking the discussion for new posts. In two subsequent sessions, she viewed a small number of new posts in a distinctive pattern, toggling between them and the one she had made. Very late that night (1am Thursday morning), Gigi read one new post, created her third post for the week (emphasizing the importance of overlearning), and left. Although she had met her posting requirement for the week, Gigi returned to the discussion daily, engaging in short sessions to briefly view all new posts linearly.

Table 3. Gigi's activities in the critical thinking discussion by session

Session	1†	2	3	4	5	6	7	8	9	10	11	12	13	Total Time
Day	Mon	Mon	Tue	Tue	Wed	Wed	Wed	Wed	Thur	Thur	Fri	Sat	Sun	
Time Started	2:32	21:59	19:55	22:31	1:30	17:13	18:27	21:42	1:41	21:19	1:02	2:35	4:30	
Length (min)	17	42	10	22	2	2	6	27	28	3	3	6	1	167 min
Scans (# of)	3	7	2	1	0	0	2	5	1	2	1	4	1	5 min
Reads (# of)	4	4	5	1	1	1	3	5	0	1	4	7	1	71 min
Posts (# of)	0	1	0	1	0	0	0	0	1	0	0	0	0	83 min
Reviews (# of)	2	1	1	0	0	0	2	2	0	0	0	0	0	8 min

† Several actions in this session took place in the forum for the previous discussion, see text for details.

Stephanie: An interactive approach to listening

Stephanie spent the most time in the discussions overall, logging in 62 times for a total of 31 hours (see Table 2). Her primary activity in the forum was reading (see Figure 1) and she spent more time per post than each of the other four students. However, she only spent 15 minutes to make her 18 required posts, thus it is likely that she composed her posts in an outside tool during some of her long reading times.

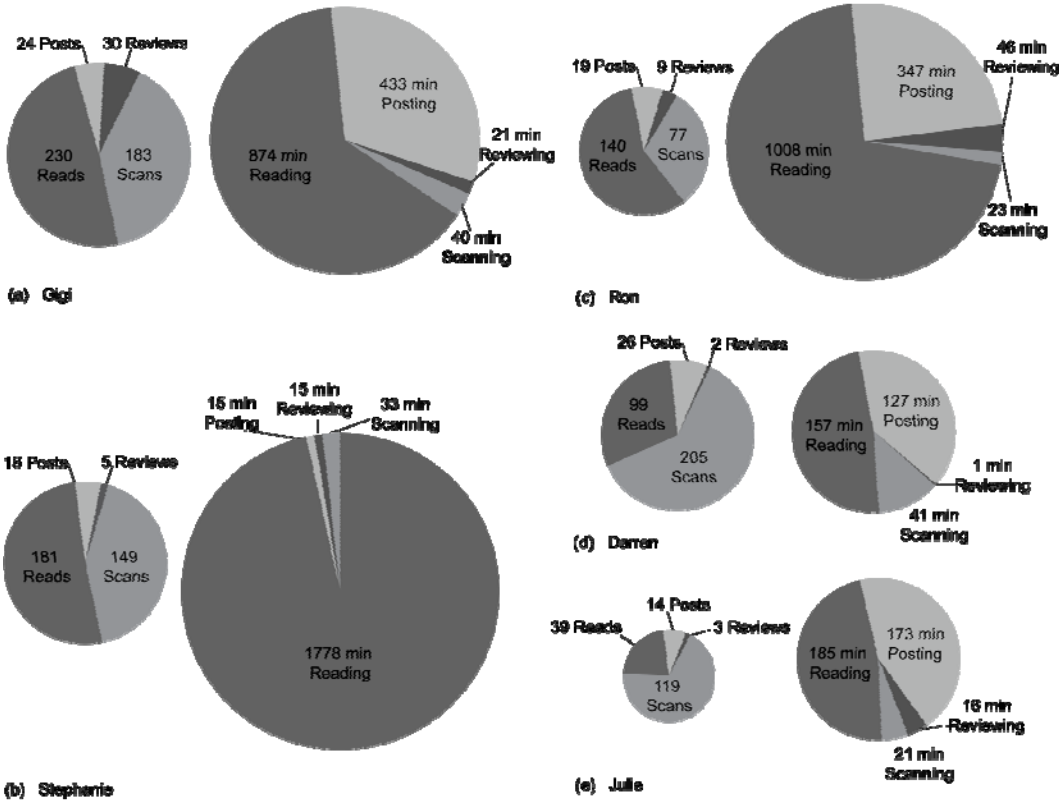

Figure 1. Proportion of total number of events and amount of time reading, scanning, reviewing and posting for (a) Gigi (b) Stephanie (c) Ron (d) Darren and (e) Julie. Pie size is proportional to total amount of activity.

In the Critical Thinking discussion, Stephanie visited the discussion seven times on three different days, with most of her time spent on reading (see Table 4). She viewed the entire discussion, though she focused her attention on a small number of posts. On Monday afternoon, she began by scanning the discussion prompt and several posts from the prior discussion. She then spent a few minutes reading the Critical Thinking prompt and one of the existing replies. A few hours later, she logged in again and read another reply. That evening she spent a long time on the discussion prompt and the two posts she viewed earlier; she then viewed the rest of the posts in the forum. After, she replied to the prompt stating her position that critical thinking should be taught as part of a coordinated approach with other subjects. She then scanned the remaining two posts and logged-out.

Stephanie returned to the discussion on Thursday evening for another session. During this time, she read two posts for almost an hour and then viewed other posts in a linear fashion. At last she made her second post trying to present a group position and respond to a question posed by a classmate. On Friday, Stephanie briefly viewed the discussion prompt again, but did not read any new posts. Later that evening, she spent almost two hours viewing all of the posts, three of which she spent substantial time on. She then made her final post, which built on the wrapper's conclusion post, drawing on her own relevant personal experiences.

Table 4. Stephanie's activities in the critical thinking discussion by session

Session	**1**[†]	**2**	**3**	**4**	**5**	**6**	**7**	**Total Time**
Day	Mon	Mon	Mon	Thur	Fri	Fri	Mon	
Time Started	14:07	16:15	21:05	20:38	15:52	19:53	20:38	
Length (min)	6	3	129	125	4	164	<1	430 min
Scans (# of)	2	1	6	2	0	3	1	4 min
Reads (# of)	2	1	6	11	1	11	1	425 min
Posts (# of)	0	0	1	1	0	1	0	1 min
Reviews (# of)	0	0	0	0	0	0	0	0 min

[†] Several actions in this session took place in the forum for the previous discussion, see text for details.

Ron: A targeted approach to listening

Ron spent a similarly long amount of time in the discussions as Gigi (see Table 2), with 24 hours across 28 sessions. While he only viewed 38% of his classmates' posts, when he did read, he took his time. Most sessions included posting actions, and he contributed one post more than the assignment required.

In the Critical Thinking discussion, Ron logged-in on three days, always in the evening. The first day he had three separate sessions; the other two days he only had one session each (see Table 5). Early Monday Ron visited the prompts for the current and previous discussions. Later Monday, he spent substantial time reading all five existing posts, cycling between them and the prompt. He was then inactive for two hours before creating his own reply to the prompt. Because of the extended time between actions, this was considered a new session. Ron then left the forum.

On Thursday Ron quickly viewed three new posts and then read a post by the Synthesizer, viewed its first reply, and reread the synthesis again. He then scanned his previous post, and replied to the synthesis, explicitly responding to a question raised. Finally, he spent 30 minutes revisiting the synthesis post, and 5 minutes on its first reply before exiting the discussion leaving 14 posts unviewed. On Friday Ron scanned a post midway through the discussion, before reading the final four new posts in reverse chronological order. He returned to the synthesis post, quickly viewed two of the replies to this post and posted, again addressing other questions raised by the Synthesizer. In total, Ron viewed only 18 of the 39 posts available this week.

Table 5. Ron's activities in the critical thinking discussion by session

Session	**1**	**2**	**3**	**4**	**5**	**Total Time**
Day	Mon	Mon	Mon	Thur	Fri	
Time Started	2:03	18:44	20:21	23:14	19:23	
Length (min)	4	96	13*	106	25	244 min
Scans (# of)	0	2	0	1	3	3 min
Reads (# of)	2	5	0	7	6	190 min
Posts (# of)	0	0	1	1	1	51 min
Reviews (# of)	0	0	0	1	0	<1 min

* Estimated value

Darren: A social coverage approach to listening

Darren spent little time in the discussions (33 sessions, 5.5 hours, see Table 2). He viewed most posts at least once, but the majority of his views were scans. He was active in making many short posts (26 in total).

In the Critical Thinking discussion Darren had several brief sessions and spent most of his time on a small number of posts (see Table 6). On Monday evening he "finished up" the prior discussion, viewing its remaining new posts. In the current week's discussion he read the discussion prompt, scanned four of the seven posts and read one post extensively. Later he viewed the prompt, the two skipped posts, and a previously scanned post; he then replied to the post he read earlier. On Wednesday, Darren first spent a few minutes reading a new post in the prior discussion. In the Critical Thinking discussion, he read the first reply to his post, scanned 11 new posts, and read the last one (contributed by a classmate, Mike). Later, Darren revisited nine of these posts, and posted a reply to Mike explicitly responding to his question. He also acknowledged another classmate (Sundeep) for sharing an example. Thursday, Darren continued the conversation by viewing the replies to his post (one by Mike) and contributing a reply to Mike's reply. He then re-viewed several posts in the same thread and made another post replying to the last one; this time he acknowledged a third classmate (Melissa). Darren returned to the discussion twice more, both times viewing all new posts in under a minute.

Table 6. Darren's activities in the critical thinking discussion by session

Session	**1**†	**2**	**3**†	**4**	**5**	**6**	**7**	**Total Time**
Day	Mon	Mon	Wed	Wed	Thur	Fri	Mon	
Time Started	19:27	21:09	18:19	22:13	21:17	16:36	11:59	
Length (min)	12	14	4	7	8	1	1	47 min
Scans (# of)	7	2	13	8	4	4	4	8 min
Reads (# of)	4	3	3	2	3	1	0	27 min
Posts (# of)	0	1	0	1	2	0	0	12 min
Reviews (# of)	0	0	0	0	1	0	0	<1 min

† Several actions in this session took place in the forum for the previous discussion, see text for details.

Julie: A disregard for listening

Julie had the fewest sessions and least amount of time in the discussions (Figure 1). She viewed only 39% of others' posts and read less than half of those. She was also inactive in speaking, contributing only 14 posts total.

During the Critical Thinking Discussion, Julie logged-in three times, creating a single post each time (see Table 7). On Monday, she quickly viewed the discussion prompt and the four existing posts in order. While she spent 54 minutes on the last post she read before making a post, it is likely that some of this time indicates off-task behavior because the post only consisted of 190 words and she did not refer to it in her own. Instead, her post (made in the final action of the session), replied directly to the discussion prompt and shared her own ideas on the subject. On Wednesday, Julie had a short session in which she viewed the synthesizer post, skipped its several replies, and replied directly to it. This post also did not refer to any other posts from the discussion. In her final session on Friday, Julie viewed only five posts. These posts were distributed across the forum and half of them were only scanned. Julie created a post as a reply to one of these, but its content repeated the same ideas as her previous posts. At the end of the discussion Julie had left two-thirds of the posts (22 of 33) unread.

Table 7. Julie's activities in the critical thinking discussion by session

Session	**1**	**2**	**3**	**Total Time**
Day	Mon	Wed	Fri	
Time Started	13:48	22:32	12:45	
Length (min)	64	6	18	89 min
Scans (# of)	3	0	3	1 min
Reads (# of)	3	1	3	60 min
Posts (# of)	1	1	1	28 min
Reviews (# of)	0	0	0	0 min

Discussion

The case studies displayed unique interaction styles, showing approaches to listening that emphasized different aspects of the conversation. Gigi, Stephanie and Darren viewed a large percentage of their classmate's posts, but in different ways for different apparent purposes. Gigi's listening activity was broad yet superficial; she seemed to "cover" the content by glancing over all the posts without spending much time on any one post and briefly revisiting the forum to check for new posts after fulfilling her posting requirement. She also seemed to compare her classmate's posts to her own but never drew on their ideas. Her posts often used academic language. Darren also "covered" the discussion by opening a high percentage of posts for short periods of time; however his use of casual language and focus on acknowledging classmates by name suggests a more social purpose to his behavior. The inverse levels of interactivity and formality of language used by Darren and Gigi has also been seen in previous research (Thomas, 2002), suggesting that the goals of having a high level of academic discourse and building trust and relationships between students may at times be at cross purposes.

While Stephanie also viewed a large percentage of the discussion, she is distinguished from Gigi and Darren in that she not only attended to all of her classmates' posts, but also built substantively on their ideas. In addition, Stephanie tended to concentrate her reading activity on only a portion of the posts made, spending a substantial amount of time reading (and re-reading) them. Her posts drew on these posts, at times synthesizing them together, and built her ideas on top of them to move the conversation forward. In contrast to these three, Ron and Julie did not seem to worry about "covering" the conversation. Instead, Ron focused on strategically reading certain posts (particularly by the Synthesizer) to respond to the prompt while Julie made no effort to read deeply or thoroughly. While Julie's behaviors echo common findings of minimal student effort (Palmer et al., 2008; Webb et al., 2004), the other students' behaviors extend the knowledge base by presenting evidence of several new, distinct, and seemingly purposeful strategies for listening.

Comparing the cases with the proposed listening typologies (see Table 1), Julie's actions align with the predicted behaviors for disregardful listening, indicating that she did not value, or understand how to engage in collaborative processes in online discussions. No student seemed to exhibit a preparatory listening style; this is unsurprising in a formal discussion context requiring students to post. Social listening appeared present in Darren's behaviors of reading posts by particular classmates and acknowledging people without engaging deeply with their ideas. Targeted listening was evidenced in Ron's focus on the "authoritative" voices of the prompt and synthesizer, and Interactive listening was clearly enacted by Stephanie as she spent extensive time reading and responding to others' ideas. Stephanie's focus on a subset of the posts was not predicted as part of Interactive listening and thus is an interesting phenomenon for further investigation. It may be that this selective attention make the tasks of interactivity and synthesis more manageable, or simply that these were the posts she found most valuable. One student's behavior did not clearly align with a single typology. Gigi paid superficial attention to many of her peer's comments, but did not respond to them socially. The posts she made herself

focused on her own ideas, but her listening was not targeted towards the instructor or authoritative others. Finally, despite her lack of interactivity in posting, she spent considerable time comparing her posts with those of others. Further work is needed to examine if Gigi's behaviors can be explained as a hybrid of existing categories, if an additional listening typology is needed, or if these patterns simply reflect one person's idiosyncratic behaviors.

Conclusion

Past research has indicated that student interactions with prior messages in online discussions are often sub-optimal; however, little empirical work has examined the different approaches students take to "listen" to others' ideas. The general fit between the theoretically proposed typologies and the empirical cases studied here presents some initial validation for a taxonomy of listening in online discussion, showing that students' listening is more varied and nuanced than previously known. The hybrid of behaviors seen for Gigi also indicates that categories may not be mutually exclusive. Further work is needed to probe the motivation for and usefulness of Gigi's eclectic behaviors, as well as Stephanie's concentration on subsets of the discussion. This work lays the foundation for building a more detailed understanding of different learner participation approaches that can be used to analyze and support online discussions. Specifically, this can provide useful information for educators in designing early detection and support (e.g. feedback, listening strategies and interaction guidelines) tailored for different participation types. Additional work is ongoing to test, validate, and expand these listening prototypes for different discussion contexts using additional measures and larger data sets. Future research will extend this work by examining motivations behind different behaviors as well as their impact on the quality of individual and group learning using additional data and measures such as interviews and content analysis.

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