Technical-Support Discourse Strategies

Prepared for the CR Anderson Research Fund Committee

Prepared by Vincent D. Robles, PhD

Vincent D. Robles, PhD
Assistant Professor
Department of Technical Communication
University of North Texas

December 18, 2017

CRARF Committee
Attn: Dr. Pris Rogers

Dear Dr. Rogers and the CRARF Committee:

Thank you for funding my opportunity to study language strategies in technical-support interactions. The committee helped me not only complete my dissertation project but also to grow intellectually as a communication scholar.

This report presents the following content related to this study:

- The motivation and purpose for the study
- The methods for achieving that purpose
- The study's findings and interpretations of those findings
- The recommendations from the study
- The future of this study

I hope you find the report helpful. Contact me at XXXXXXXX if you have any questions or would like additional information from the study.

Sincerely,

Vincent D. Robles, PhD

Table of Contents

List of Tables

List of Figures

Introduction

This report gives the findings from a two-year study of a face-to-face help desk in an English department at Midwest university. The report describes the purpose for the study, the methods for reaching that purpose, the results of the study and the meaning of those results, and it gives recommendations about communication practices that technical-support providers can employ when giving face-to-face technical help to users.

Background

This study explored spoken interactions between users and technical-support providers who work at the help desk in an English department at Midwest university. Help desks are technical-support interactions in which a customer (or user) personally consults an agent (or technical-support provider) face-to-face about a problem or question they have. In these interactions, technical-support providers helped users by using interpersonal communication strategies to understand the users' problems and then to resolve the users' problems.

Few studies have explored the technical communication within these interactions despite the known benefits of exploring them. Researchers have explored these interactions at two levels: the macrolevel, which focuses on the larger moments of the communication (whole sections of the interaction), and the microlevel, which focuses on smaller units of the communication (words, turns between speakers, or utterances). The macrolevel research is relatively well-established, but the microlevel has only looked at the communication from only a couple of specific angles: miscommunication and empathy. No research has looked at the fundamental issue of how communication helps in diagnosing and resolving a technical problem.

Informed by previous research in technical-support, technical and business communication, one-to-one tutoring interactions, and linguistics, this study explored the following questions:

- In these helpdesk interactions, to what extent do the interactions follow the established macrolevel structure?
- In these helpdesk interactions, how do technical-support providers and users communicate to diagnose problems and in what stage(s) of the technical-support interactions do they diagnose them?
- In these helpdesk interactions, how do technical-support providers and users communicate to resolve problems and in what stage(s) of the technical-support interactions do they resolve them?[1]

To answer these questions, this study explored the language in these interactions to help this organization and its oversight to maintain user

[1] Because this study focused on defining and resolving problems, this report presents the results from a close analysis of macro- and microlevel for these purposes only. An analysis of the macrolevel results for identifying, attempting, and closing are available in the full dissertation. No analysis is available for these stages at the microlevel. An analysis of attempting at both macro- and microlevels will be published at a later date.

satisfaction and to train technical-support providers so they can succeed in their service to users.

Methods

To answer these questions, this study employed a language analysis of conversations in 20 of your helpdesk interactions captured in recordings of the audio, the screen activity, and the facial expressions of participants during the interactions (March–October 2016). Satisfactory interactions were those interactions in which the technical-support providers and the users reported satisfaction in a post-session survey. To help interpret the language, technical-support provider participants described their intentions at various points of the video recording of an interaction during post-session stimulated recall interviews. For more about the participants in this study, see appendix A. For the post-session surveys, see appendix B. For an overview of context for each of the 20 interactions, see appendix C.

For the analysis, a coding scheme helped to classify various units of language from both technical-support providers and users. This coding scheme was informed by research literature, by a four-month pilot study, and by 9 rounds of interrater reliability coding that helped the coding scheme reach acceptable agreement measurements. For these schemes, see appendix D.

This study provided insight about the language in technical-support interactions that no previous study has done as completely. However, this study did have limitations. More data would reveal more useful information about the language in these interactions. The data-collection procedures took months and relied on users who were enrolled in the study to incidentally encounter a technical problem and visit the support office. These chance encounters took time, and for this reason, time constraints required the data-collection period to end. However, the 20 interactions still yielded insight for answering the research questions in this study, for projecting into future research, and for helping you in your work.

Results and Discussion

This section presents the findings from this study, first for the macrolevel language and then for the microlevel language. This section discusses microlevel language first for how it was used to diagnose technical problems and then for how it was used to resolve technical problems.

Macrolevel Language

The technical-support interactions included five main stages described in figure 1. The stages were identifying, defining, attempting, resolving, and closing. Reference appendix D for further explanation about each stage.

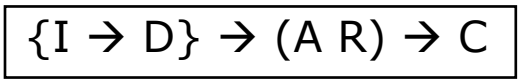

Figure 1. Macrolevel Structure for Technical-Support Interactions

The arrow symbol (→) indicates sequence, the curly bracket ({) shows that the degree of iteration for enclosed elements is equal, and the parenthesis () show that the enclosed elements are optional. I=identifying, D=defining, A=attempting, R=resolving, C=closing

Figure 1 demonstrates that these interactions included an identifying stage. In this stage, the technical-support providers greeted and identified the users in relationship to the organization and technology. For example, technical-support providers often asked for information about which course website was at issue or which ePortfolio website to visit so that the problem definition and resolution could begin. This stage gave immediate context to the technical problems and the users' encounter with those problems.

Second, the interactions included a defining stage that involved a discussion of the problems and the users' reasons for seeking technical help. In this stage, the speakers worked together to bring clarity and definition to the users' experiences and needs. Figure 1 shows how these stages appeared in optional order. That is, sometimes identifying began the interactions, and sometimes defining began the interactions. Many technical-support providers indicated that users came to them immediately with a description of the problem before they identified themselves in relationship to the technology. Technical-support providers should consider an alternate routine.

Recommendation: As may be customary in many customer-support contexts, the technical-support providers should consider beginning with identifying as soon as they encounter users. This practice would follow typical helpdesk and helpline conventions in which the technical-support providers immediately identify the users' names and identification numbers. Beginning with identifying would also give a routine organization to the interaction to which return-users would grow accustomed. New technical-support providers could also easily learn to begin their interactions in this way because such routine organization would help train them in the procedures.

Figure 1 shows also the optionality of either resolving or attempting stages. In other words, after the defining stage, the structure could continue into a resolving stage in cases in which the speakers resolved the problem, or the structure could continue into an attempting stage in which the speakers could not resolve the problem.

Lastly, figure 1 shows how the interactions had a closing stage in which the technical-support providers and users ended the conversation by ensuring that all problems had been resolved or at least acknowledged.

This macrolevel structure describes one particular technical problem. For interactions in which the users had many technical problems, likely identifying would begin again, followed by defining, and then attempting or resolving. Closing only occurred at the end of the entire interaction, no matter how many problems the speakers discussed.

To summarize, an ideal and successful structure would be I→D→R→C, while a technically complete but still unsuccessful structure would be I→D→A→C.

This macrolevel analysis demonstrates that these interactions do have a structure, lending it the identity of coherent language. To have coherence, language should reflect its purpose and situation and the roles of the speakers. Because the speakers have a shared understanding of what they are trying to accomplish and in what context (to resolve technical problems with a given technology or set of technologies) and what roles they have (users and technical-support providers), the speakers already bring to their interaction an awareness that can lead to a coherent interaction.

Recommendation: Technical-support providers should remember that in their roles as experts and institutional representatives, they must also provide a sense of leadership to the conversation, leading its movement from one stage to another. They can employ this sense of leadership precisely by ensuring the conversation meets another criterion that characterizes coherent language. The language must be cohesive. To help both speakers in the interactions sense this cohesiveness, the technical-support providers should express their leadership role by explicitly employing the microlevel strategy called "signaling" to communicate what stages that the speakers are entering and leaving. For example, they may explicitly state that they are leaving the defining stage and are about to resolve it: "O.K., now that we understand the problem, let's try to resolve it." By employing these explicit signaling strategies, the technical-support providers can lend coherence to the interactions by denoting explicitly the stages of the interactions, and thus, they will fill their leadership roles.

Microlevel Language: Diagnosing Technical Problems

This study found that technical-support providers and users primarily diagnosed the problems in the defining stage. However, this study found that follow-up questions and commentary related to diagnosing did appear in the resolving stage as well; though many of these questions were unrelated to the primary macrolevel purpose of resolving the problem.

To help describe the extent to which each speaker contributed to the defining stage, I quantified the word counts of both the technical-support providers and the users in each of the 20 interactions. Of the total number of words in the data set (26023), defining required 28.04% of the words. The users spoke more frequently in this stage, suggesting the users spent the stage giving information relevant to diagnosing the problem. In two interactions, the technical-support providers said nothing. Research affirms that the clients of a service organization provide answers or narratives in response to the representatives' questions during a stage like this one, suggesting that the clients tend to keep the floor and give the majority of the substance to the stage. These volubility results confirm that research.

Recommendation: Because users have the information that technical-support providers need in order to help them, technical-support providers should purposely and carefully inquire and listen in the defining stage. Without this purposeful disposition to listen and learn, the stage may be longer and/or less effective overall.

The most common microlevel language for technical-support providers in this stage was "inquiring to understand needs or background information" (80 times). Implied in the name is that speakers sought two types of information: needs or background information. Technical-support providers most often inquired to gain background information (59 times). This emphasis makes sense because technical-support providers required contextual information about the users' needs to adequately define the problem. They inquired about background information in three ways:

- Inquiring about problem location
- Inquiring about users' experiences
- Inquiring about users' previous actions

They inquired about needs (21 times) in two ways:

- Inquiring about specific needs
- Inquiring about general needs

Inquiring about Problem Location

First, technical-support providers inquired about where the problem might be so that they could have access to the problem. For example, scrolling through the interface, one technical-support provider asked, "Is this the one?" It makes sense that technical-support providers would seek this kind of background information because they need to know where users encountered the problems.

Inquiring about Users' Experiences

Technical-support providers also inquired about users' experiences with the technology. In one interaction, one technical-support provider asked a user to confirm her experience with the textbox in the Moodle grading system: "So you said that this entire editor box gets bigger?" This information likely helped the technical-support provider to ensure that she and the user had similar frames of understanding.

Inquiring about Users' Previous Actions

Technical-support providers also inquired about users' and others' (such as students') previous actions. This information, one technical-support provider

told me in a post-session stimulated-recall interview, helped him to walk through potential causes of the problem, whether users or the system caused the problem. For example, this technical-support provider asked a user how she created a quiz that was not behaving the way she wanted: "And did you duplicate the quiz when you created the new one or did you just create a new one from scratch?" This inquiry seemed to help the technical-support provider to determine if the user's previous actions caused the problem or not.

Inquiring about Specific Needs

Technical-support providers tended to inquire about the specifications of users' needs. For example, a technical-support provider helped a user create a lesson module for the user's course website. As the technical-support provider set it up for the user, the technical-support provider inquired about the specifications wanted for the lesson's behavior. For example, "So you want them to keep doing it until they get it right?" Here the technical-support provider asked if the user wanted her students to have the ability to retry tests until the students got the correct answers.

Inquiring about General Needs

In other cases, technical-support providers wanted to understand needs in general. As may be expected, a conventional question was "What can I help with" or a variation on it such as "So what is your question?"

Recommendation: Technical-support providers should carefully consider the types of questions they ask during the defining stage and how these inquiry types can help them formulate their language as they define problems. They should also listen carefully for the corresponding answers to these questions. This study revealed that users often do not focus their topics when sharing background information, shifting from describing locations, to previous actions, to previous experiences rather quickly. Technical-support providers require listening skills that can help them differentiate between the purposes users have as they share these scattered narratives and how components of those narratives correspond to the inquiries that the technical-support providers employ.

Though this report does not include the analysis of user language, this study found that users often responded with short, "yes-or-no" type responses to these inquiries (42 times), and only followed-up the short responses with

further background information 11 times. This finding suggests another recommendation.

> **Recommendation:** Technical-support providers should be wary of asking questions to users that promote minimal responses (i.e., using close-ended questions) because users may not provide any additional information beyond the initial "yes-or-no" type response. Technical-support providers run the risk of miscommunication if they continually use yes-no questions to understand users' experiences. Nevertheless, if used judiciously, yes-or-no questions can yield the information that technical-support providers need to diagnose a problem.

The second-most frequent microlevel language that technical-support providers employed in the defining stage was "confirming or denying" (32 times). This language is a short "yes-or-no" type response such as "Yeah," "Mm-hmm," "Uh-huh," "No," or "Right." Technical-support providers responded with confirming or denying most frequently to "inquiring to understand the technology" (13 times). In these instances, a confirmation served as a means for instruction. For example:

U: O.K. So the first one is that I have some student names on here-
TS: Mm.
U: which I want to take off. Is there a way of doing that?
TS: Uh, O.K. **yeah**, I [think-

The second most frequent microlevel language to which technical-support providers responded with confirming and denying was "inquiring to understand needs or background information" (8 times). For example, one user wanted to confirm if a technical-support provider needed to gain permission to do what the user required:

U: And, um, I don't know if you need to talk to [*manager*] about it and he needs to talk to [*manager*] or whatever? But uh-
TS: **No, I don't think so.**

The third-most common inquiry to which technical-support providers responded with a short, yes-or-no type response was "inquiring to check comprehension" (6 times). For example, one user gave background information about her practice to mark student work with multiple colors:

U20: See how I use color- a whole lot?
TS4: **Mm-hmm.**

Recommendation: Technical-support providers should discern when minimal responses could leave users uncertain still about the answer to a question, or they may need to always move beyond minimal responses with additional detail as their default strategy because it increases the chances that users will understand.

Another frequent microlevel language that technical-support providers employed in the defining stage was "signaling" (29 times), which appeared in two main ways in the defining stage: "let" phrases and thinking aloud. Technical-support providers used "let" phrases to signal what they were about to do. For example, a technical-support provider signaled: "Let me just log in as a student really quickly."

Technical-support providers also used signaling to "think aloud." All technical-support providers said they thought aloud by reading the screen (the names of buttons or text that they saw or selected). For example, while pressing the button on Moodle's interface, one said "Users."

These instances demonstrated that technical-support providers were aware of their users' needs to understand what was happening during moments in the interaction, providing users context for the technical-support providers' actions. Furthermore, they coordinated the social dimension of these interactions by accounting for silence or wait-time. This strategy also helped, as a few technical-support providers in this study noted, to instruct users by keeping them learning about how the technology works and how to navigate it as the technical-support providers moved through parts of the websites.

Recommendation: Technical-support providers should employ signaling to help keep users aware of what is happening during the defining stage. Previous research on technical-support providers' organizational knowledge suggests that such language demonstrates the social awareness technical-support providers have for their clients, and theories of language suggest it signals a respect for listeners.

Though this report does not include the analysis of user language, this study revealed that users may ask to learn how to do something, or they may ask how something works. Both inquiries imply different goals.

Recommendation: Technical-support providers should carefully listen for the kinds of learning that users are pursuing as they listen to their inquiries, whether to learn how to do something or to learn how something works. Research in user motivation suggests they may want to learn, to listen to learn to do, or to have something done for them.

Microlevel Language: Resolving Technical Problems

Resolving intends to solve the users' problems through technical instruction. This study found that technical-support providers and users resolved the problems primarily in the resolving stage. However, this study found that summaries and commentary related to resolving the problems did appear in the closing stage as well. For example, the technical-support providers reiterated how the problem or problems were solved. These explanations occurred late in the interaction and within the macrolevel purpose of closing the interaction; therefore, resolving occurred primarily in the resolving stage.

Of the total number of words in the data set (26023), resolving required 53.48% of the words, suggesting that resolving a problem required the majority of the time and talk exchange in technical-support interactions. Except for two interactions, the technical-support providers spoke more frequently, suggesting technical-support providers facilitated the problems toward resolution. Without the technical-support providers' knowledge and communication of that knowledge, the problems could not get resolved.

Recommendation: Because technical-support providers have the information that users need in order to resolve the problem, technical-support providers should purposely and carefully speak more in the resolving stage using the various microlevel language found in this study. Without this purposeful disposition to explain, to show, and to signal, the stage may be shorter and/or less effective overall.

The most common microlevel language for technical-support providers in this stage was "explaining how the technology works or how to do something" (141 times). It makes sense that explaining would occur so often in a macrolevel stage devoted to resolving users' technical problems. As implied in the name, the speakers who employed it explained two types of information: how the technology works or how to do something with the technology.

Technical-support providers more often explained how to do something with the technology (74 times) than they did how the technology works (67 times), though the two types appeared relatively equally. Some explanations were shorter (the shortest was 2 words) and some explanations were longer (the longest was 340 words). Most explanations were more moderate in length (averaging 32 words). For example, a technical-support provider described for a user how to implement text on the course website through what Moodle calls labels: "So we can't actually put the uh- what is it- the bullet points but instead I do as an instructor was that I added label."

Technical-support providers also described how the technology works. The shortest description was 4 words and the longest was 95 words. In one instance, a technical-support provider explained the privacy settings for the ePortfolio, depending how the user wanted to use it:

> TS: Just in case you would like that. Because eProfiles- the whole idea there is you know- create a site where you'll market yourself. So you're less concerned with security as we've set it up because the idea is to make it public, available to everyone.

This study revealed that technical-support providers explained often how to do something with the technology or how it worked. It did not frequently find technical-support providers *showing* how the technology works or how to do something with it, though it was a microlevel code and did appear at times. "Showing" allows for an additional visual component that may complement the explanation and assist users in their understanding. "Showing" involves the same components of "explaining" but with the additional use of the technology to either highlight text on the screen, hover the cursor over key parts of the screen, or demonstrate operations rather than speak of them abstractly. In this study, the users and technical-support providers employed a desktop computer between them. This tangible gave technical-support providers the means to supplement their instruction, if they chose. In many ways, "showing" uses the features of instructional videos because showing and instructional videos both provide "procedural information in multiple simultaneous channels (text, moving image, sound), creating complementary repetition that can help users isolate instructional messages" (Swarts 2015, 197). With these similarities in mind, a recommendation follows:

Recommendation: Technical-support providers should avail themselves of best practices in instructional video design and employ "showing" (not just explaining), as appropriate, for helping users

understand how the technology works or how to do something. For example, Swarts (2015) argues that the instructor in instructional videos should announce the step before the instructor shows the step, with a pause "long enough to get [the user] mentally 'set' for an action" (200). Such insights from this and other research in instructional videos might enhance the instructional process in the resolving stage, whether the instruction is step-by-step sequences or long-form explanation.

The second-most frequent microlevel language that technical-support providers employed in the resolving stage was "signaling" (139 times), which is how technical-support providers resolved the problems by working through the problem and communicating what they were doing or about to do. Technical-support providers employed "signaling" in two ways: think-aloud signals and announcing signals. The most frequent signal type was think-aloud signals (81 times). Just as in the defining stage, this language type often involved the technical-support providers reading buttons or text on the screen as they used the technology ("Continue"). In other instances, technical-support providers thought aloud as they encountered challenges with the technology. For example, as a technical-support provider helped a user to modify an image's size so that the image could be uploaded to the ePortfolio, she thought aloud about a challenge she faced when attempting to demonstrate how to do it. As she attempted to upload the adjusted image, she encountered an error messages from the ePortfolio system demonstrating that the image was still too large to upload. In response, the technical-support provider thought-aloud about the file she must have attempted to upload:

> TS: Did I pick the right one? I probably didn't pick the right one. [*Mumbling*] [*13 seconds; resaving image to another file name and location*]

In other instances, the technical-support providers would announce what they were about to do, as when a technical-support provider announced, "[a]lright I'm going to go do the exact same thing and log in as [*student name*] again."

Recommendation: Technical-support providers should employ signaling to help keep users aware of what is happening during the resolving stage, too. Previous research on technical-support providers' organizational knowledge suggests that such language demonstrates

the social awareness technical-support providers have for their clients, and theories of language suggest it signals a respect for listeners.

Another frequent microlevel language that technical-support providers employed in the resolving stage was "confirming or denying" (78 times), suggesting that the technical-support providers would provide "yes-or-no" type responses to the users' questions ("Yeah," "Yup," "Mm-hmm."). The most frequent language to which technical-support providers responded with "confirming or denying" was inquiring to understand technology (55 times), each time in response to the user. For example, a user wanted to rearrange the gradebook table so that it displayed the records by last name. After the technical-support provider told her to click on "last name" in the column header, the user asked to ensure she understood how to use the table:

U: O.K. So I just click on "last name"?
TS: **Yes.**

In a similar instance in which a user required a confirmation for an instruction she just received, she wanted to confirm where she could find the option to add a label to her website:

U: Is it, um, under "resources"?
TS: **Yeah, there you go.**

As with the defining stage, technical-support providers might go beyond their minimal response. In 17 instances, the conversation revealed a pattern in which technical-support providers responded to users with this sequence: U inquiring about technology→TS confirming or denying→TS explaining how something works or how to do something. The technical-support provider's confirmation or denial appears in bold in the excerpt that follows:

U: And then it is that something that's a feature in quizzes or are quizzes structured just like this?
T: **No, quizzes are different**. Quizzes allow you a little more flexibility that way.

This pattern suggests another recommendation.

Recommendation: Technical-support providers should discern when minimal responses could leave users uncertain still about the answer to their question, or they may need to always move beyond minimal responses with additional detail as their default strategy because it increases the chances that users will understand what they are being told.

Though this report does not include the analysis of user language, this study also revealed that users provided background information about their experience late in the discussion, even as far into it as the resolving stage. This finding suggests the last recommendation:

Recommendation: Technical-support providers should carefully consider when users are providing information at this stage that helps them to resolve the problem (the main goal for the stage) and when the information is not as pertinent and seems more to help the users express their frustration. At the least, technical-support providers should be aware of this tendency from users, and at the most, technical-support providers should redirect the conversation back to the task at hand, resolving the problem. Also, the information may prove insightful for understanding the problem more deeply, and the technical-support providers should not dismiss this information outright.

Conclusion

This study has examined the language at the macro- and microlevels in technical-support interactions by analyzing 20 helpdesk interactions to determine how users and technical-support providers diagnose and resolve technical problems. Ultimately, this study aimed to help the organization and its oversight to maintain user satisfaction and to provide technical-support providers with language strategies that they can use to succeed in their service to users.

The following are the venues at which this study has been and will be reported:

- The coding scheme and related examples for diagnosing technical problems was presented at the ABC conference in 2016 (in Albuquerque, NM). I believe in this way I fulfill my agreement to present research findings at the ABC conference.

- Currently, the diagnosing process aspect of the study is undergoing a second revision with the *Journal of Business and Technical Communication*.

- Currently, the resolving process aspect of the study is under review with *IEEE Transactions on Professional Communication*.

- In 2018, the attempting aspect of the study (not reported here) will be submitted for consideration as a presentation at the ABC conference in 2018 (in Miami, FL). If accepted, I hope this also will fulfill the agreement that I present the research at the ABC conference.

- An article version of the attempting aspect will be submitted to *Business and Professional Communication Quarterly* in late 2018.

ABC and CRARF have received and will receive full acknowledgement for their help in this process.

Thank you again for your kind award.

/vdr

References

Swarts, Jason. 2015. "New Modes of Help: Best Practices for Instructional Video." *Technical Communication* 59 (3): 195–206.

Appendix A: Participants

This appendix details background information about the participants, specifically those who not only enrolled in the study but also engaged in a technical-support interaction during it. The main study had more female users than male users (10 and 1, respectively). Because enrolled participants visited the support team only if they had genuine technical problems, there was no control for the gender equity in my participants. Of 41 participants who enrolled in my study as users, only 9 users attended sessions, and 2 of them attended more than 1 time. The technical-support provider participants had an equal number of male participants than female (three and three), however. Table 1 gives the identifying code and gender for each participant.

Table 1. Participant Profiles

Participant ID	Gender
U2	Female
U5	Female
U11	Female
U14	Female
U19	Male
U20	Female
U23	Female
U32	Female
U35	Female
U40	Female
U41	Female
TS2	Male
TS3	Male
TS4	Female
TS6	Female
TS7	Female
TS8	Male

To learn more about the participants, the participants enrolled in the study completed a screening survey. This seven-question survey confirmed that participants were not minors and determined participants' levels of technical proficiency and years' experience with each technical system in the research site. Questions about technical proficiency employed a four-point (thus forced-choice) Likert scale asking participants to report their agreement or disagreement with statements about their proficiency with each technology, for example, "I am proficient with the Moodle Learning Management

System." After using this screening survey in the pilot study and because the study did not focus on the relationship between language and technical experience or proficiency, it provided enough data for the kinds of questions asked for the study. Table 2 gives the distribution for the study participants' individual years' experience with each technology. Table 3 describes these data by category of years' experience.

Table 2. Participants' Technical Experiences (By Individual)

	Moodle	Portfolio	Depository
U2	3	1	1
U5	5	1	2
U11	5	2	1
U14	1	1	1
U19	1	1	1
U20	5	1	5
U23	5	1	1
U32	1	1	1
U35	1	1	1
U40	5	4	1
U41	5	1	3
TS2	2	2	2
TS3	1	1	1
TS4	2	1	2
TS6	1	2	2
TS7	2	2	1
TS8	3	2	3

Note: (1) Less than 1 year experience (2) 1–2 years' experience (3) 2–3 years' experience (4) 3–4 years' experience (5) 5 or more years' experience

Table 3. Participants' Technical Experiences (By Category)

	Moodle		Portfolio		Depository	
	TS	U	TS	U	TS	U
Less than 1 year experience	2	4	2	9	2	8
1–2 years' experience	3	0	4	1	3	1
2–3 years' experience	1	1	0	0	1	1
3–4 years' experience	0	0	0	1	0	0
4–5 years' experience	0	0	0	0	0	0
More than 5 years' experience	0	6	0	0	0	1

Figure 2 illustrates these tabular data, revealing that generally the users had more experience with Moodle than the technical-support providers did but that technical-support providers had more experience with the portfolio and

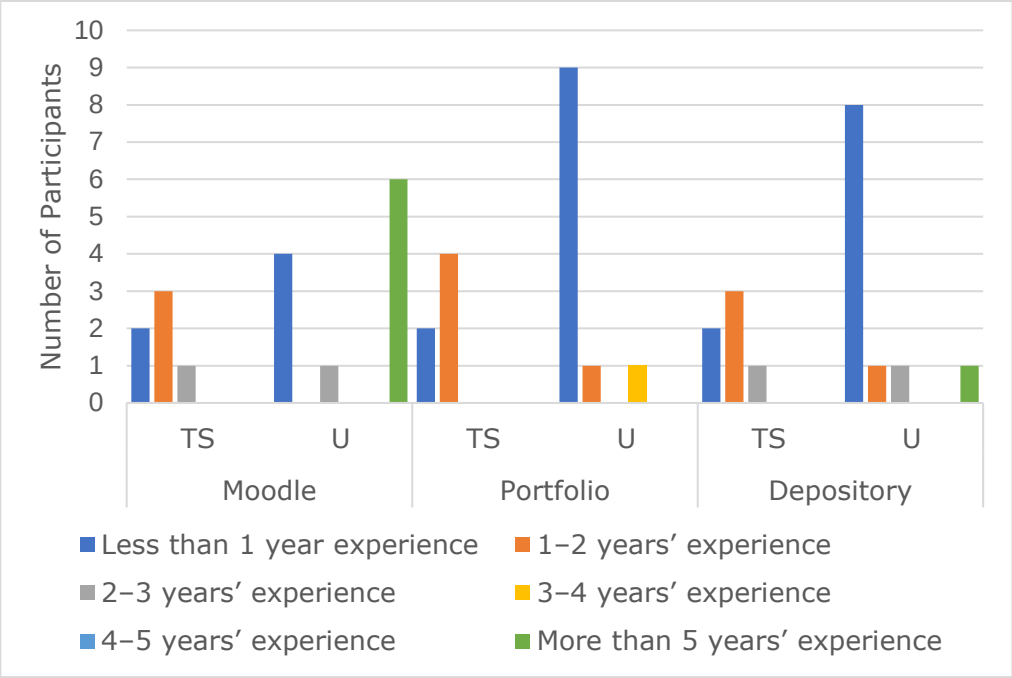

Figure 2. Users have more years' experience with Moodle and fewer years' experience with the other two systems.

profile system and the teaching depository. For Moodle, 6 users had more than 5 years' experience, and 1 user had 2 to 3 years' experience. None of the technical-support providers had this level of experience. The most experienced technical-support provider had 2 to 3 years' experience. Of the 11 participating users, 9 had less than 1 year of experience with the ePortfolio and eProfile system. By contrast, 4 of 6 technical-support providers had 1 to 2 years' experience with the ePortfolio and eProfile system. The technical-support providers also had more experience with the teaching depository system. But generally, the technical-support providers and users had little experience with this system. All had less than 2 to 3 years' experience. One participant, a user, had over 5 years' experience with it.

These data make sense because the Moodle system had been around longer than the other two systems (since approximately 2005). Users affiliated with the department longer than the technical-support providers would have more experience with it, especially because the users may have been faculty or lecturers while the technical-support providers were graduate students, with a shorter tenure at the university. The ePortfolio and eProfile system and depository system had many more users with less than 1 year of experience, and generally, technical-support providers had more years' experience with these technologies. Table 4 gives the descriptive statistics for these main

study participants' perception of proficiency with each technology. The lower the number, the more the participants perceived they were proficient with the technology.

Table 4. Participants' Perceived Proficiency

	Moodle			Portfolio			Depository		
	Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode
Users (n = 11)	2.1	2.0	2.0	4.0	4.0	4.0	3.6	4.0	4.0
Technical-Support Providers (n = 6)	1.5	1.5	2.0	1.5	1.0	1.0	2.2	2.0	1.0

Note: 1 = Strongly Agree; 2 = Agree; 3 = Disagree; 4 = Strongly Disagree; the higher the number, the more the participant feels he or she lacks proficiency

Figure 3 illustrates that technical-support providers felt more proficient than users for each technology. For the Moodle system, both sets of participants felt more closely proficient (M = 2.1; M = 1.5, users and technical-support providers respectively). The difference was larger for the other two systems, with technical-support providers feeling more proficient in both technologies.

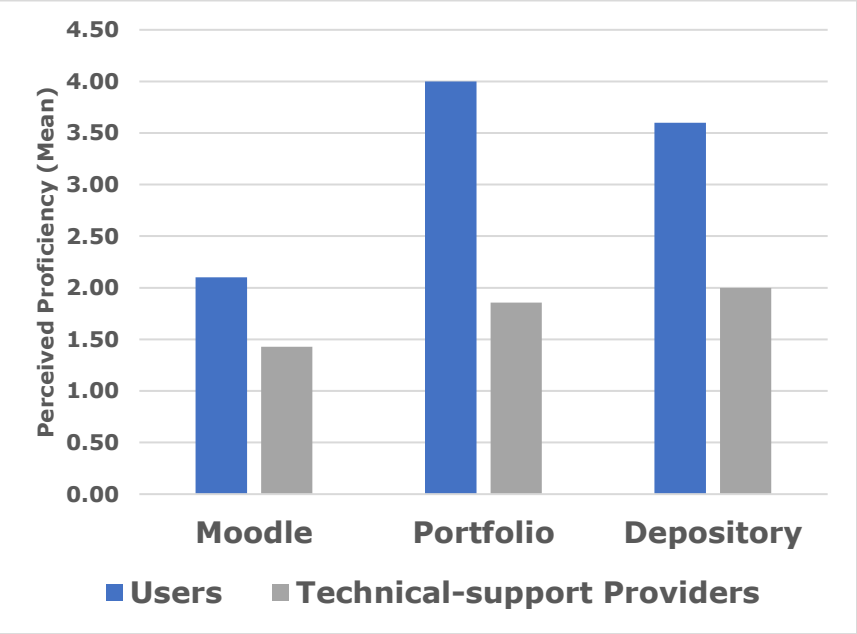

Figure 3. Technical-support providers feel more proficient than users.

As expected, those who support a system feel more proficient than the system users because they should and often do have technical proficiency with the systems they support. Likely both users and technical-support providers felt less proficient with the other two systems because the department has not used the two systems as long as they had used the Moodle system. Because users had used Moodle longer than technical-support providers, they likely felt almost as proficient with it as technical-support providers.

Appendix B: Post-session Survey

TECHNICAL SUPPORT MEMBER Post-Session Survey
Name:_____ Date:_____
Please indicate how much you agree with the following statements about the support session you just had.

1. I answered different question(s) or complaint(s) the user had with little difficulty.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
2. I adapted to every situation that occurred during the session.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
3. I took the user's knowledge into account when helping solve the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
4. I remained calm and friendly no matter what feelings I was interpreting from the user.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
5. I helped define specifically the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
6. I was able to help with each and every problem in a timely way.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
7. I clearly and thoroughly explained each and every step I took when solving the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
8. I clearly and thoroughly explained solutions or recommendations.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
9. I was able to imagine what the user was going through with his or her problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
10. I treated the user uniquely from other users.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
11. I treated the user's problem(s) as important.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
12. I had the necessary authority to solve the user's problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
13. I will have to follow up with the user to help him or her with the problem(s) because I need to seek permission or help.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree

USER Post-Session Survey
Name:_____ Date:_____
Please indicate how much you agree with the following statements about the support session you just had.

1. The technical support person answered different question(s) or complaint(s) I had with little difficulty.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
2. The technical support person adapted to every situation that occurred during the session.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
3. The technical support person took my knowledge into account when helping solve the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
4. The technical support person remained calm and friendly no matter how I was feeling.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
5. The technical support person helped define specifically the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
6. The technical support person was able to help with each and every problem in a timely way.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
7. The technical support person clearly and thoroughly explained each and every step he or she took when solving the problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
8. The technical support person clearly and thoroughly explained solutions or recommendations.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
9. The technical support person was able to imagine what I was going through with my problem(s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
10. The technical support person treated me uniquely from other users.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
11. The technical support person treated my problem(s) as important.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
12. The technical support person had the necessary authority to solve my problem (s).
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree
13. The technical support person will have to follow up with me to help me with the problem(s) because he or she needs to seek permission or help.
    1. Strongly Agree
    2. Agree
    3. Agree Somewhat
    4. Disagree Somewhat
    5. Disagree
    6. Strongly Disagree

Appendix C: Interaction Overview

Table 5. Overview of 20 Interactions

Interaction	Participants	Time	Agenda	Tech	Topic	Date	Outcome	Success
1	TS2-U11	6:11	Function	Moodle	Getting a course website duplicated	Mar. 2016	Very Satisfactory	Resolved
2	TS2-U11	10:16	Function	Moodle	Getting lessons to show students the correct answer to activity questions	Mar. 2016	Satisfactory	Unresolved
3	TS4-U2	1:56	Operation	Moodle	Missing button	Apr. 2016	Very Satisfactory	Resolved
4	TS4-U20	31:02	Function Operation	Moodle	Getting student unenrolled from course website; getting alternate color choices in editor; font size in editor changes to a large size; creating a label; Student is not able to submit an assignment; moving files on course website	Apr. 2016	Satisfactory	Both
5	TS2-U14	8:55	Operation	Moodle	Students cannot see the grade for an assignment	Mar. 2016	Satisfactory	Unresolved
6	TS7-U2	11:47	Operation	Moodle	Students cannot submit assignments.	Aug. 2016	Satisfactory	Resolved
7	TS7-U19	7:33	Operation	Moodle	Students cannot enroll in the course or into Moodle	Sep. 2016	Very Satisfactory	Resolved
8	TS7-U2	8:58	Function	Moodle	Making the attendance module extra credit in the gradebook	Sep. 2016	Satisfactory	Unresolved
9	TS8-U2	6:27	Operation	Moodle	News announcements are not going to students' email inboxes	Sep. 2016	Very Satisfactory	Unresolved
10	TS2-U23	10:31	Function Operation	Moodle	Making unit images uniform on course website; quizzes are not showing the questions that U23 created; using wikis	Sep. 2016	Somewhat Satisfactory	Unresolved
11	TS6-U2	11:12	Operation	Moodle	Students' see different weight percentages for the same assignment; news announcements are not going to student e-mail inboxes; assignment submission modules reset due date to the current time upon saving the settings	Sep. 2016	Very Satisfactory	Both
12	TS2-U5	1:57	Function	Moodle	Accepting more than one answer on a quiz	Sep. 2016	Satisfactory	Resolved
13	TS2-U40	17:36	Function	Moodle	Explaining rubrics to students; using clickable rubrics; ensuring students can upload documents with images	Sep. 2016	Very Satisfactory	Resolved
14	TS8-U2	7:39	Function	Moodle	Setting week views to prevent students from being unable to view grades	Oct. 2016	Very Satisfactory	Resolved
15	TS3-U2	1:49	Function	Moodle	Viewing edit screen to leave students feedback files	Sep. 2016	Very Satisfactory	Resolved
16	TS7-U40	33:12	Function	ePortfolio Moodle	Getting correctly sized images to upload to portfolio; using clickable rubrics in Moodle; getting password to work in Adobe product; separating course sections while grading	Oct. 2016	Very Satisfactory	Resolved
17	TS3-U35	12:52	Operation	Moodle	Student course grades don't appear to calculate correctly.	Oct. 2016	Satisfactory	Resolved
18	TS2-U32	5:47	Function	ePortfolio	Making websites private from students; managing websites for different purposes	Oct. 2016	Satisfactory	Resolved
19	TS7-U41	27:42	Function	ePortfolio	Preparing for a ePortfolio workshop; using ePortfolios for portfolio pedagogy; grading ePortfolios	Oct. 2016	Very Satisfactory	Resolved
20	TS2-U40	15:24	Function	Moodle	Setting extra credit for an assignment; Selecting a rubric for an assignment	Oct. 2016	Very Satisfactory	Resolved

Appendix D: Coding Schemes

Final Macrolevel Language Coding Scheme

After three rounds of coding and reaching a satisfactory agreement level with coders, the following codes are acceptable for coding the macrolevel language in technical-support interactions.

Table 6. Final Macrolevel Language Coding Scheme

Code ID	Definition
Identifying	Identifying U as part of the technical system such as Moodle, including obtaining U's name and any other pertinent identifying information about U, such as course section.
Defining	Outlining, summarizing, and/or indicating that there is a problem or question. Often prompted by U but could also be prompted by TS.
Attempting	Working through possible solutions to the problem or possible answers to the question. The problem does not get resolved fully or the question answered fully in that session. TS or U may not be satisfied with a proposed resolution or answer. Or U and/or TS move on to a new problem without a resolution or answer.
Resolving	Providing information, instruction, and/or solutions for a problem and confirming a specific problem is resolved. TS and U are satisfied with resolutions or answers. The problem has to be resolved or the question answered in that session. Making plans to solve the problem at another time (e.g., following-up through e-mail or another meeting, or trying something later at home) does not mean the problem or question was resolved or answered.
Closing	Confirming that U is satisfied, that U has no more problems to talk about, and saying good bye and/or setting-up a follow-up meeting or email conversation; includes taking the post-session survey if recorded

Final Microlevel Language Coding Scheme

After nine rounds of coding and reaching a satisfactory agreement level with coders, the following codebook are acceptable for coding the microlevel language in a study of technical-support interactions.

Table 7. Microlevel Coding Scheme

Code ID	Description for TS and U
inquiring to understand needs or background information	inquiring to understand or confirm listener's needs or background information
inquiring to learn about the technology	inquiring to learn about the technology, its settings or features, and/or how to use them
inquiring to check comprehension	inquiring to check if listener comprehends what speaker said, did, or saw/sees
inquiring to gain permission	inquiring to gain permission to do something at that moment during the interaction
stating needs	stating needs for the technology's settings/features or for the session's procedures
giving background information	giving background information about the problem or question brought up in that macrolevel unit or session
confirming or denying	confirming or denying what listener or speaker said, did, or asked with a yes- or no-type answer, an I-don't-know-type answer, or a noncommittal answer
declaring the problem or problems as solved	declaring a problem as solved or a question answered
judging the technology	judging the technology and/or its features
observing	describing what speaker sees, hears, or notices while using or observing the technology at that moment during the session
speculating	speculating about a problem or question brought up in that macrolevel unit or session
signaling	signaling what speaker is doing at that moment or what speaker will do next
planning	planning what to do either within or after the session
showing how the technology works or how to do something with it	showing listener how the technology works or how to do something with it by using the technology itself
explaining how the technology works or how to do something with it	explaining to listener how the technology works or how to do something with it without using the technology itself
telling	telling listener what to do at that moment in the session