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Developing an e-Learning Theory for Interaction and Collaboration Using Grounded Theory: A Methodological Approach

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Abstract

Grounded Theory (GT) is becoming an increasingly prevalent research methodology in many fields. Although researchers use it in qualitative and quantitative studies, it is more popular with qualitative studies, as evidenced by the citations from previous research. This paper aims to document and present how we used GT in our qualitative research to construct an e-learning theory for interaction and collaboration. It also includes the justification of GT. We adopted and adapted the constructivist GT (CGT). Therefore, this paper discusses the CGT methodology, its philosophical, ontological and epistemological perspectives. It also includes the research design that captures how we sampled the participants, collected, analyzed and interpreted the data, and how we documented the research findings in the context of CGT. It also includes the justification of the decisions we made and the extent to which they align with CGT. Using CGT, we listened to, observed and captured e-learners' and e-tutors' stories and experiences which yielded rich and insightful data that informed the development of the e-learning theory for interaction and collaboration. We also present the challenges we experienced when using CGT and the strategies we used to overcome them. Finally, we have included the methodological insights we drew from using CGT in our research. This paper has presented the CGT design strategy; thus, it will be helpful, especially to novice and future researchers aspiring to use the methodology to conduct their research.

Keywords

qualitative research, grounded theory, methodology, e-learning, interaction and collaboration

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Developing an e-Learning Theory for Interaction and Collaboration Using Grounded Theory: A Methodological Approach

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Grounded Theory (GT) is becoming an increasingly prevalent research methodology in many fields. Although researchers use it in qualitative and quantitative studies, it is more popular with qualitative studies, as evidenced by the citations from previous research. This paper aims to document and present how we used GT in our qualitative research to construct an e-learning theory for interaction and collaboration. It also includes the justification of GT. We adopted and adapted the constructivist GT (CGT). Therefore, this paper discusses the CGT methodology, its philosophical, ontological and epistemological perspectives. It also includes the research design that captures how we sampled the participants, collected, analyzed and interpreted the data, and how we documented the research findings in the context of CGT. It also includes the justification of the decisions we made and the extent to which they align with CGT. Using CGT, we listened to, observed and captured e-learners' and e-tutors' stories and experiences which yielded rich and insightful data that informed the development of the e-learning theory for interaction and collaboration. We also present the challenges we experienced when using CGT and the strategies we used to overcome them. Finally, we have included the methodological insights we drew from using CGT in our research. This paper has presented the CGT design strategy; thus, it will be helpful, especially to novice and future researchers aspiring to use the methodology to conduct their research.

Keywords: qualitative research, grounded theory, methodology, e-learning, interaction and collaboration

Some institutions of higher learning (IHLs) in Kenya have taken up e-learning to bridge the education access gap; however, they face some inherent challenges; key among them is lack of and/or limited interaction and collaboration (Kibuku et al., 2020; Muuro et al., 2014; Nyerere et al., 2012). Since learning is a social process, it is more efficient when learners actively participate in groups and discover knowledge on their own through real-life experiences (Wu et al., 2010). Unfortunately, this has not always been the case since many designers do not design e-learning systems for interaction and collaboration, leaving the learners isolated and lonely (Muuro et al., 2014; Nyerere et al., 2012). Further, Nyerere et al. (2012) reported that the e-learning platforms used by universities in Kenya are content-centred because they only employ asynchronous mode of delivering learning materials but lack learner-learner and learner-tutor interaction thus encouraging passive learning. Therefore, most e-

tutors use these e-learning platforms to post the e-content, quizzes and coursework. On the other hand, the e-learners access and download the e-content, study, and do the assignments independently since the e-learning platform and e-content design do not emphasize group work (Mwaniki et al., 2016; Nyerere et al., 2012). Even where the systems' design includes tools for interactivity, they remain unused, or their use is minimal, thus failing to reap their intended benefits and therefore defeating the reasons why they are there in the first place. Further, most e-learning systems are e-tutor-centred because they mainly focus on the activities of the e-tutor(s). As a result, they fail to provide an environment where e-learners can play an active role in knowledge creation, initiate discussions, and participate in learning activities (Muuro et al., 2014; Mwaniki et al., 2016; Nyerere et al., 2012).

Three theories underpin interaction and collaboration: constructivism, social constructivism, and connectivism (Anderson & Dron, 2011; Kibuku & Orwa, 2019; Muuro et al., 2014). Constructivism and social constructivism underscores the "social presence" of e-learners and e-tutors in the learning process (Anderson & Dron, 2011). Connectivism, on the other hand, emphasizes the use of contemporary technologies to achieve interconnectedness among e-learners and between e-learners and e-tutors (Siemens, 2005). However, there exist theoretical gaps in their application to e-learning. Although interaction is the hallmark of these theories, in the e-learning context, taken together, they fail to say what activities entail online interaction and collaboration (Kibuku & Orwa, 2019). They do not indicate who should initiate and control the interactions. They do not define the desired level of engagement in collaborative sessions by e-learning parties. They do not inform the best tools for interaction and collaboration. They do not advise on how to relate with the new technological tools and focus on the e-content and not on the technology (Kibuku & Orwa, 2019; Muuro et al., 2014; Sahin, 2012).

Therefore, we choose GT for this research because it was best suited to answer the research questions and address the existing theoretical gaps (Chun-Tie et al., 2019; El Hussein et al., 2014) in interactive and collaborative e-learning. Though many researchers have previously studied this area, few, if any, among these researchers took the theoretical perspective. Instead, their output has tended to be descriptions of e-learning systems in use, success stories and challenges of e-learning adoption. Moreover, most of these studies are hypothetico-deductive, aiming to test the grand theories through systematic quantitative techniques (El Hussein et al., 2014; Willig, 2013), thus denying the researchers the opportunity to interact with the research participants at a deeper level by listening to their stories and experiences. Further, the e-learners, e-tutors and IHLs have unique characteristics and challenges (Kibuku et al., 2020). Therefore, it is necessary to understand and address such challenges from a theoretical perspective in delivering e-learning. For instance, some e-learners live and work in areas without reliable Internet while others have nomadic jobs that take them to remote parts of the country without Internet. Hence such e-learners can't participate in interactive and collaborative activities. Most of the e-learners are adults who are already working, having career goals to pursue and family commitments to attend. Such commitment pose work-life-study challenges making the e-learners fail to participate in interactive and collaborative activities. On the other hand, the e-tutors equally have their unique sets of characteristics and challenges, such as limited technical and pedagogical training, overloaded with regular teaching, and lacking the necessary devices and e-tutelage facilitating conditions. Despite embracing e-learning, the IHLs also have challenges to contend with, such as technological, financial, training, and policy, among others constraints. Therefore, we saw the need to interact with the participants in in-depth interviews and observations using GT techniques to unearth how e-learning happens in such a context. This involved gathering data in depth and breadth to answer the "what," "how," and "why" questions (Kalpokaite & Radivojevic, 2019) regarding interaction and collaboration in e-learning. GT also allowed the

analysis of data by using systematic approaches and the application of researchers' intuition and imagination (El Hussein et al., 2014), leading to the conceptualization of interactive and collaborative e-learning.

GT is a methodology that allows researchers to develop new context-specific theories grounded in data instead of relying on analytical constructs, concepts, and variables derived from extant theories (Wiesche et al., 2017). The term "grounded theory" implies two things: the research process, namely the methodology and the output, namely a new theory that is empirically grounded in data (Walsh et al., 2015). It involves identifying and integrating *categories of meaning* as observed from the data, and its main output is a *theory* (Wiesche et al., 2017). Besides theories, other research contributions of GT include models and detailed descriptions of phenomena (Corbin & Strauss, 1990; Creswell, 2012; Wiesche et al., 2017). Therefore, researchers mainly use GT when the existing theories have lacunae in explaining a phenomenon of interest (Gasson & Waters, 2013; Willig, 2013). The output of our research is a theory to explain interaction and collaboration in e-learning which is why we used GT in our research. Theories offer accounts for why occurrences happen and give answers to questions (Corbin & Strauss, 2015). Other methodologies lead to theory development, such as the case study, ethnography, and phenomenology (Creswell 2012; Gentles et al., 2015). However, GT was favoured because, unlike the others, its procedures allowed us to flexibly examine the experiences of e-learners, e-tutors, and e-learning managers. It also allowed us to develop broad explanations necessary to create the substantive e-learning theory for interaction and collaboration.

Though many researchers perceive GT as the commonplace example of inductive research, it can also combine inductive and deductive approaches (Saunders et al., 2012). Furthermore, some perceive it as a qualitative approach to research, but it has also found use in quantitative and mixed methods (Walsh et al., 2015). Different versions of GT exist and include classical or Glaserian, Straussian, constructivist, feminist and post-modern, each with different philosophical perspectives, epistemological assumptions, and other differentiating characteristics (Rieger, 2018). However, there are certain shared principles between GT versions. The shared views include the use of open interviews to collect qualitative data and admissibility of data from other sources such as existing documents and observations. They also agree to analyze data through three levels: open/initial, axial/focused and selective/theoretical coding using constant comparative technique. Finally, the categorization of the data based on similarities and differences identified from the data is a shared view among the GT versions (Aldiabat & Le Navenec, 2018; Morse et al., 2009; Rieger, 2018).

In this research, the researcher is an e-tutor in an IHL and a participant-observer in the research process thus had experience and technical knowledge in e-learning. As a result, this was advantageous because the researcher understood the e-learning context, which was necessary for constructing the theory.

The Constructivist GT Methodology

This research adopted and adapted the CGT. Charmaz (2006) substantially modified GT and is considered the originator of CGT. This version of GT goes back to the original GT principles and tries to adjust them to fit the requirements of the modern methods (Rupšienė & Pranskuniene, 2010). Glaser and Strauss (1967) invited subsequent grounded theorists to use GT flexibly in their "*Discovery*." Charmaz (2014), in accepting that invitation, advocates for flexible guidelines for carrying out GT-based research as opposed to the rigid rules, procedures, and requirements prescribed by the classical GT methodologies. Therefore, CGT is not a strict set of prescribed rules but a flexible set of guidelines and procedures for collecting and analyzing qualitative data (Charmaz, 2014). She further argues the theory is "*constructed*"

from the data instead of discovering it from the data. “*Construction*” means that the researcher creates the theory from the analyzed and interpreted empirical data. Such an interpretation is not devoid of the researcher’s understanding/perspective of the phenomenon. Thus, the theory is a “*construction*” of how the researcher perceives and experiences the real phenomenon. The construction also involves the historical and current engagements and interactions with their research participants. This was the reason why we used the CGT to build the theory from our interactions with the e-learning participants and their perspectives on e-learning.

Gray (2018) defines the *research paradigm* as the ontological (what is) and epistemological (what it means to know) perspectives of a particular discipline. The ontological and epistemological perspectives define a person’s worldview. There two possible worldviews: *Objectivism and subjectivism* (Saunders et al., 2012). The CGT advocates for the *subjectivist* worldview. Thus, Charmaz (2014) argues that the resulting theory is a construction of reality by an active researcher who has subjective perspectives on the research area and the privilege of interacting with research participants under specific circumstances within the social context of the research. Gray (2018) defines the *research philosophy* as how to carry out research in a particular discipline, stating three research philosophies: *positivism, interpretivism, and pragmatism*. *Positivism* believes in objectively observing and measuring the events happening in reality. It is mainly associated with natural sciences based on empirical evidence that is clear and accurate. *Interpretivism* adds the subjective perspective to human behaviour. It argues that humans are different from physical objects in that they do not just act, but they have a reason for their actions, thus creating meaning for their behaviour (Gray, 2018; Saunders et al., 2012). *Pragmatism* is the middle ground position chosen when the research questions imply positivism and interpretivism (Gray, 2018; Saunders et al., 2012). CGT takes the “interpretative portrayal” of the data (Charmaz, 2014, p. 17). Finally, Gray (2018) defines the *research approach* as the perspective from which the researcher involves the use of theory in his/her research. If this engagement occurs before undertaking the research, the approach is said to be *deductive*. If it happens after the research, it is inductive; constructivist GT takes the inductive approach (Charmaz, 2014). Therefore, CGT takes the interpretivist philosophy, the constructivist paradigm and the inductive approach to research (Charmaz, 2014).

Figure 1 shows the resultant research design after adopting CGT for our research. It includes reviewing technical literature, sampling, data collection methods and tools, data analysis and interpretation (through the three coding levels), memo writing, and theory development.

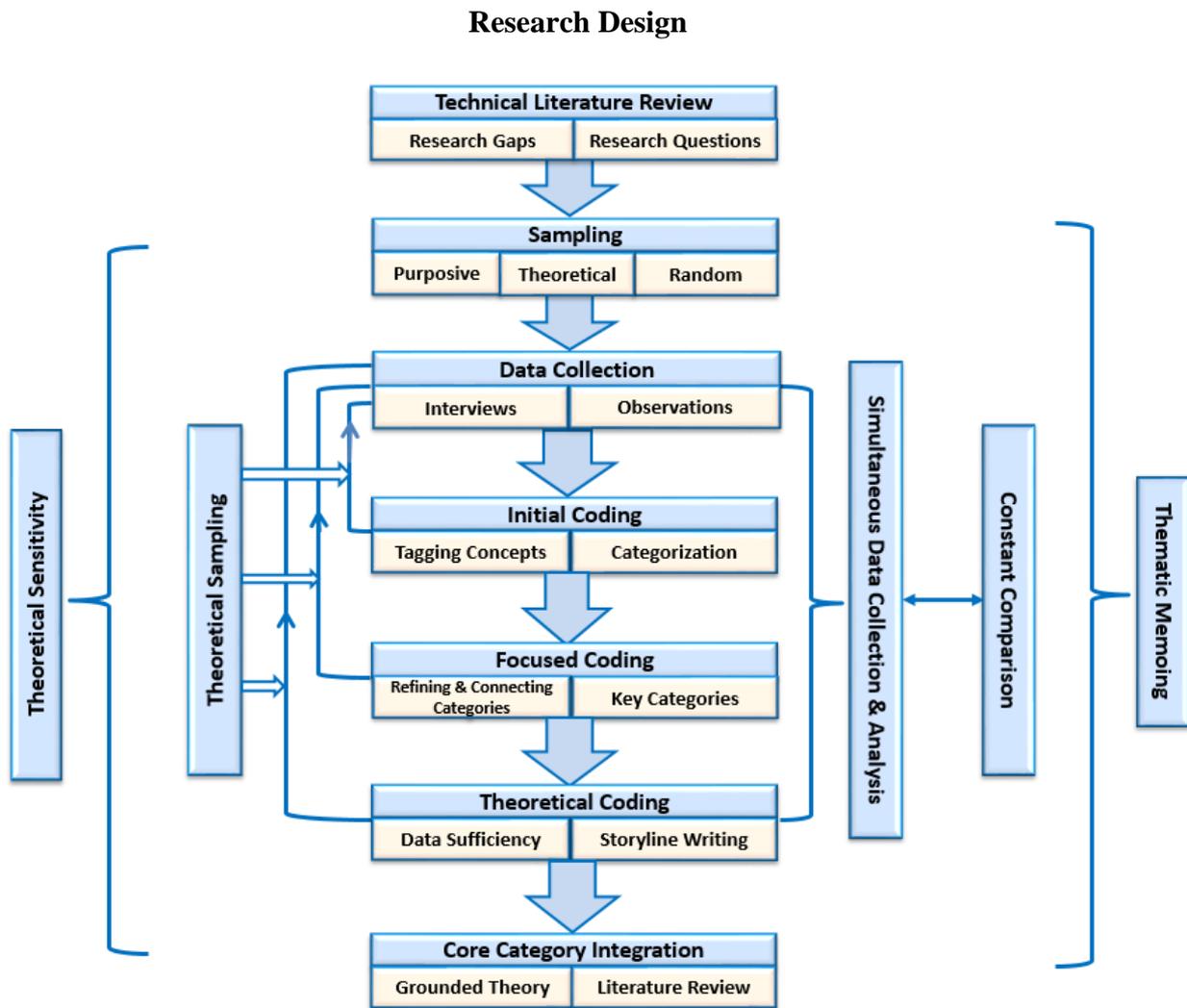


Figure 1
Research Design. Adapted from Charmaz (2014) and Chun-Tie et al. (2019)

Technical Literature Review

Some versions of GT advocate beginning the research process with data collection instead of literature review to avoid contaminating the emergent theory with preconceptions from existing literature and theories (Wiesche et al., 2017; Willig, 2013). However, this research adapted CGT to include a brief review of technical literature at the beginning of the research process (see Figure 1) for three purposes as advised by Charmaz (2014) and Corbin and Strauss (2015). First, it was to establish the theoretical gaps in existing theories and formulate the research problem (Kibuku & Orwa, 2019). Second, it was to establish the provisional concepts to guide the research in line with Charmaz (2014) recommendation. In this case, the provisional concepts that emerged from the technical literature included e-learners, e-tutors, e-content, technology and e-learning support. However, there were no predetermined properties for these concepts. Since the research did not have a *conceptual framework*, we remained alert and open to new and unanticipated concepts and their attributes that arose from the research process, a practice known as *theoretical sensitivity* (Willig, 2013). Third, it was to formulate the research questions that formed the agenda that took us to the field for data collection:

- i. What key concepts should we consider in developing the e-learning theory for interaction and collaboration?
- ii. What critical attributes of the key concepts should we consider in interactive and collaborative e-learning?
- iii. How does the relationship between key concepts and their attributes influence interaction and collaboration in e-learning?
- iv. How will the key concepts be integrated to form the e-learning theory for interaction and collaboration?

Sampling

The sampling was multi-stage involving three techniques: purposive, theoretical, and random. The population of this research is the IHLs in Kenya. The target population to which the results apply is the IHLs offering Open, Distance and e-Learning (ODEL) programs. We *purposively* selected two universities, namely Kenyatta University and KCA University, because they had e-learning programs. Among the characteristics that made them suitable for the purposive sample included the fact that they were both using the MOODLE platform customized to deliver learning content to the e-learners. We were interested in studying the extent to which the design of the e-learning systems meets quality attributes such as usability, affordance, learnability, acceptability, understandability and interactivity among its intended users. Both universities employed the blended e-learning model. Part of the e-learning activities is carried out online with two weeks of face-to-face interaction between the e-learners and the e-tutors, commonly known as the tutorials. This allowed us to establish the kind of online activities they engage in and the challenges experienced during the tutorial engagements. In both universities, interaction and communication are asynchronous through chats and discussion forums. This allowed us to study the nature of interactions between e-learners and e-tutors, the frequency of interactions and the technologies used in these interactions. Both universities appreciate the need for training, as evidenced by the orientation training early in the course for e-learners and e-tutors. This allowed us to establish the focus and frequency of the training and the challenges experienced in training. Both universities appreciate the need for technical support for e-learners and e-tutors by having IT support centres. This attribute allowed us to investigate the nature of technical challenges faced by e-learners and e-tutors. Both universities also allowed us to study the e-learners' and e-tutors' profiles in terms of their age, gender, motivation, interests, perceptions, attitude, personal characteristics, Information and Communication Technologies (ICT) skills and pedagogical preparedness and how all these, in turn, influenced interaction and collaboration in e-learning. Finally, they allowed us to establish the e-learning requirements from the perspective of the individual IHLs, e-learners and e-tutors regarding access to the internet, devices affordability and technical capability.

Specifically, Kenyatta University is an old institution with a long history of ODeL. The university's digital school undertakes its ODeL activities. Their ODeL programs evolved through all the distance learning generations, from correspondence learning to broadcast learning, computer-based learning, and Internet-based learning. Though it cannot be said to have fully evolved to intelligent and flexible e-learning, it has adopted mobile learning (m-learning) to a greater extent. By virtue of its age, part of its faculty is older; thus, they have witnessed the evolution in e-learning. Therefore, we had the highest likelihood to observe how the gender and age of the e-tutors influenced ICT skills acquisition and the adoption of technology into e-learning among the e-tutors. We also had the best chances of understanding how the attitude and perceptions of the older e-tutors affected the uptake of e-learning over time. The institution also has a broader selection of e-learning programs and, by extension, a larger student base from which to sample. It still uses the satellite learner support centres

inherited from the previous generations of distance learning spread across the country to bring the much-needed learner support closer to the e-learners. KCA University, on the other hand, represents contemporary universities with its e-learning history dating back to the year 2012. As a young university, a department undertakes its e-learning activities and has fewer courses offered via e-learning. It delivers ICT support from the main campus-based ICT support centre to e-learners and e-tutors. It moved straight to the fourth generation of web-based/online learning, and therefore it has a short history since it did not go through the previous e-learning developmental stages. It also exhibits a great deal of m-learning. With its brief e-learning history, it was possible to observe and compare the e-tutor's ICT skills of the relatively younger faculty compared to the older universities.

The research involved 51 participants, who included 35 e-learners and 16 e-tutors. We determined the 51 participants based on *data sufficiency* principle as recommended by Dey (2007). This is the point at which we had "heard it all" in terms of the codes that emerged and "understood it all" in terms of the meanings that we derived from the emerging codes and categories (Aldiabat & Le Navenec, 2018, p. 247). McMillan and Weyers (2013) and Vasileiou et al. (2018) guided the sample selection based on our research's scope, complexity, and design. They recommend that the sample be big enough to permit a new understanding of the e-learning experiences yet small enough to allow deep analysis of the qualitative data. To identify the e-learner participants from Kenyatta University, we obtained the class lists of the e-learners enrolled in the relevant departments from which we sampled *theoretically*. And because the lists were long, we used random sampling to select the participants. Similarly, in KCA University, we obtained the class lists of all the e-learners enrolled in the various programs. Again, we sampled theoretically and picked the participant using random sampling.

Out of the 16 e-tutors that participated in the research, we selected ten of them by theoretical sampling. To identify the e-tutor participants from Kenyatta University, we obtained a list of departments heads who supplied the list of e-tutors in their departments from where we theoretically sampled. And since there were many e-tutors in the lists, we selected the participants using random sampling. We purposively picked the remaining six e-tutors since they were also e-learning managers; hence they had prior e-learning knowledge in their respective universities. At KCA University, we obtained a list of e-tutors from the e-learning department. We used the combination of theoretically and random sampling to select the participants. Data variability determined the data needs that we pursued through theoretical sampling (Miles et al., 2020). Among the e-learners, there were various data needs. First, we sought the physical location of the e-learners in the country because it determined the availability, access, and quality (speed and reliability) of the internet in e-learners' location. These internet attributes influence the extent of interaction and collaboration among e-learners and between e-learners and e-tutors. Second, we sought the e-learners' gender and age because these attributes have a combined effect on the adoption of e-learning technologies, influencing their ability to use technological tools to interact and collaborate online. Third, after having interviewed e-learners in social sciences, we sought e-learners taking science-based courses that require the performance of laboratory practicals. Sciences-based courses were necessary because they helped establish the delivery of practicals via e-learning. Fourth, we sought the year of study where we were interested in interviewing senior e-learners, especially in their 3rd or 4th year of study, because they had accumulated a richer experience in e-learning than the new entrants. Fifth, we sought other factors such as employment, career, and family commitments, to establish their influence on the extent and quality of interaction and collaboration.

For the e-tutors, several data needs determined theoretical sampling. First, we sought the mode of engagement, which refers to whether the e-tutors are dedicated e-tutors, or conventional tutors (teaching in traditional programs) turned e-tutors. Conventional tutors

turned into e-tutors are usually overloaded with work hence do not find time to engage their e-learners in interaction and collaboration (Serdyukov, 2015). Thus the mode of engagement is necessary because it influences e-tutors' ability to initiate and participate in interaction and collaboration activities with the e-learners. Second, we sought the age and gender of the e-tutors again, just like in the e-learners case, because these attributes have a combined effect on the adoption of e-learning technologies, influencing their ability to use technological tools to interact and collaborate online. Third, after having interviewed e-tutors in social sciences, just like in the case of e-learners, we sought e-tutors engaged in teaching science-based courses that require the performance of laboratory practicals. Sciences-based courses were necessary because they helped us establish the delivery of the practicals via e-learning. Fourth, we sought the length of time in which the e-tutors have been teaching in the e-learning programs; this was necessary because those engaged for a long time had a richer experience than those involved recently.

Data Collection

The research mainly used in-depth interviews and participant observations to a lesser extent. As advocated by Charmaz (2014), Corbin and Strauss (2015), and Gentles et al. (2015), we preferred the in-depth interviews because they fitted the GT approach and thus enabled us to conduct in-depth and open-ended exploration of interaction and collaboration by interacting with participants who had substantial experience in e-learning. We also preferred the in-depth interviews because they gave room to address and pursue emerging issues and probe for more data in the subsequent interviews (Miles et al., 2020). We designed data collection tools in the form of observation guides and interview schedules for e-learners and e-tutors. We presented the data collection tools to the ethics and review board and other relevant authorities to seek data collection authorization. However, we did not strictly adhere to the interview schedules during interviews because that would limit the scope of the data that the participants would have availed to us. Thus strict adherence would lead to foreclosure of some of the participants' views and experiences (Charmaz, 2014; Dey, 2007).

Before data collection, we conducted a preliminary study using participant observation to understand the real situation on the ground. The preliminary study entailed observing the e-learning systems' design features, the exchanges among the e-learners and their e-tutors on the e-learning system, the frequency of such interactions, the tools used in the interaction, the e-content exchanged, and any observable characteristics and behaviours. Thus the preliminary study shaped the research by establishing the variability of the sample. It also assisted the researcher to reflect and focus on the data needed and where to get it. The results of these observations in the preliminary study guided the design of the interview schedules. Furthermore, we conducted more observations during the interviews and data analysis stages to corroborate (triangulate) the interviews' data as Aldiabat and Le Navenec (2018) advised.

Data Collection Procedures and Ethical Consent

We sought data collection authorization from the ethics and review board to access the participants. We then used the ethics and review board approval to seek further data collection approval from the National Commission for Science, Technology, and Innovation (NACOSTI). These authorizations were then presented to the respective universities' research and postgraduate schools to seek data collection authorization from their e-learning programs. After that, we called the participants to request an interview, upon which, when granted, we scheduled the interview date. At the beginning of every interview, we explained the interview's

purpose and terms and also presented the participants' letter of informed consent. Once we did the introductory preliminaries, the interviewing process began.

Data Collection, Analysis, and Memoing

We interleaved data collection, analysis, and memoing activities to align with GT guidelines (Miles et al., 2020; Willig 2013). The three activities were also carried out iteratively (Aldiabat & Le Navenec, 2018; Charmaz, 2014). Having indicated that there was no strict adherence to the interview schedule, the interviews began with a general question posed to the participants as follows “*Would you kindly narrate your e-learning story, the journey and the experience so far?*”. This question was strategic since it opened up the interview to varied responses from the participants. It gave them the latitude to respond in the best way possible from their experiences and any relevant viewpoint. Further, we asked probing questions depending on their responses to the general question, allowing us to seek more information, clarify, and collaborate on the previously received data. Data collection took place in iterations where the first iteration was a face-to-face interview conducted at a location convenient to the participants and within the official working days in line with the ethics and review guidelines. Iterative data collection gave us room to return to the previously interviewed participants to seek clarification and collect more data based on the emerging concepts and theory. The initial interview took about one hour to 1½ hours. Then, we conducted the successive data collection iterations, using member-checking as advised by Aldiabat and Le Navenec (2018) and Charmaz (2014). Member-checking used telephone calls to check on the participants’ welfare and progress, clarify any pending issues, and collect more data. Member-checking was easy in the successive iterations of data collection because we had already interacted, formed a rapport and familiarized ourselves with the participants during the first iteration of face-to-face interviews.

We used note-taking to capture the e-learners’ data and note-taking and audio recording (when e-tutors accepted) to capture the e-tutors’ data. Before analysis, we carried out an “*Inspection cycle*” on the data to establish the “*look and feel*” of the data and understand each participant’s views (Kalpokaite & Radivojevic, 2019, p. 50). It involved transcribing, cleaning, and ordering the data into a logical flow. It also involved identifying any errors and gaps. Then, where necessary, we called the participant(s) to corroborate the transcribed information, correct any mistakes, fill in the gaps and probe for more data. Figure 2 below shows an excerpt of the first interview from an e-learner participant.

Q: How you access the e-learning portal?

A: When I started, I did not have a laptop, so I used the desktop at work, but now I do. But I had and still have a smartphone, which is necessary because it is always at hand, allowing me mobility; hence, I can track notifications from e-learning tutors and the admin from the portal. And I also have a modem for internet connection. Both the modem and phone are on Network-1. Though Network-1 is expensive, it has good quality internet service. It enables me to carry out my e-learning studies with ease and at a reasonable speed compared to the other available networks here in my locality. So I buy internet data bundles of between KES 500-1000 per month, which is not very expensive because I mainly do my e-learning activities here at work. I don't study at home unless I am just checking on notifications. I don't download materials or do and submit coursework at home

Q: You have hinted that you do your e-learning activities at work, is there an ICT and Internet use policy?

A: I don't know if it [policy] is there or not, but this is a government office, so even if it is there, it is not enforced except, of course, for pornography and other weird sites; otherwise, they don't prohibit me from accessing the portal and doing my studies. Besides, I do it over the lunch hour and after work at 5 pm. So I download the notes, do the course work and submit them.

Q: Why are you using your employers' resources to do your private studies? What is the motivation?

A: In the beginning, I told you earlier, I could not afford a laptop, so I had to use the office / resources. But now I am just trying to reduce the cost incurred because at work it is free. You know Network-1 is very expensive, and if I have to meet all the costs, I may not pay for it. Besides, the internet connection here at work is very efficient, not even comparable to the connection when I am at home; that is why I prefer to do my e-learning studies from here at work.

Figure 2

An Interview Excerpt From an e-Learner Participant

Initial Coding

The in-depth interviews and participant observations yielded qualitative data that we analyzed using the Atlas.ti software. Atlas.ti was favoured because it is a well-established and widely accepted scientific Computer-Assisted Qualitative Data Analysis Software (CAQDAS). Besides, it is affordable with readily available technical training and support. Atlas.ti offered the functionalities for condensing, storing, maintaining, visual displaying, retrieving, and querying the data. It also provided tools for writing memos, annotating and presenting data in various formations, which aided us in the analysis and reflection on the data (Charmaz, 2014; Friese, 2016; Miles et al., 2020).

Data analysis started with *initial coding* (Charmaz, 2014; Chun-Tie et al., 2019; Kalpokaite & Radivojevic, 2019) or *tagging* of data (Friese, 2016) from the transcripts using the *constant comparison* technique. According to Charmaz (2014), Corbin and Strauss (2015) and Friese (2016), initial coding means giving meaning to pieces of data. Constant comparison means comparing and contrasting the pieces of data to establish variability in data belonging to the same category (Charmaz, 2014; Corbin & Strauss, 2015). We used attribute and concept coding styles at the initial coding level of analysis. In concept coding, we interpreted and lifted the raw data to a higher level of abstraction than the actions/events/situations described by participants (Miles et al., 2020; Suddaby, 2006). In attribute coding, we assigned meaning to

the descriptions of properties/characteristics of data and their emerging sub-categories (Miles et al., 2020).

To be in line with GT principles that require interleaving data collection and analysis (Miles et al., 2020; Willig, 2013), the analysis of the previous interview data mainly occurred before progressing to the following interview. Therefore, our data analysis exercise began with the first interview data before conducting the second interview. Therefore, we loaded the first interview transcript into Atlas.ti for analysis and memo writing started right away. Data analysis followed thematic analysis, as advocated by Miles et al. (2020), which is the “process of identifying patterns or themes within qualitative data” (Maguire & Delahunt, 2017, p. 3352). To be in line with GT principles, we used theoretical sampling to collect more data (Muhaiyuddin et al., 2016). Theoretical sampling is the iterative/cyclic process of simultaneously gathering and analyzing data for theory development and pursuing more data to saturate and densify the theory (Charmaz, 2014; Gentles et al., 2015; Muhaiyuddin et al., 2016). For example, after the responses in the interview excerpt shown in Table 1, we established that this participant lived in a suburban area. From there on, we pursued e-learners who lived/worked in urban, rural and remote areas of the country to hear their internet access stories and experiences.

Figure 3 shows how we tagged the data at the initial coding level for the interview excerpt in Figure 2 using Atlas.ti.

The screenshot displays the Atlas.ti interface with a transcript on the left and a code list on the right. The transcript includes the following text:

Q: How you access the e-learning portal?

A: When I started I did not have a laptop so I used the desktop at work but now I do. But I had and still have a smart phone which is a necessity because of the fact that it is always at hand so it allows me mobility hence I can track notifications from e-learning tutors and admin from the portal. And I also have a modem for internet connection. Both the modem and phone are on Network-1. Though Network-1 is expensive it has good quality internet service it enables me to carry out my e-learning studies with ease and at a good speed as compared to the other available networks here in my locality. So I buy internet data bundles of between KES 500-1000 per month, which is not very expensive because mainly do my e-learning activities here at work. I don't study at home unless I am just checking on notifications I don't download materials or do and submit course work at home

Q: You have hinted that you do your e-learning activities at work, is there an ICT and Internet use policy?

A: I don't know if it [ICT Policy] is there or not but this is a government office so even if it is there it is not enforced except of course for pornography and other weird sites otherwise they don't prohibit me from accessing the portal and doing my studies. Besides I do it over lunch hour and after work at 5 pm. So I download the notes, do the course work and submit.

Q: Why are you using your employers' resources to do your private studies? What is the motivation?

A: In the beginning like I told you earlier I could not afford a laptop so I had to use the office resources. But now I am just trying to reduce the cost incurred because at work it is free. You know Network-1 is very expensive and if I have to meet all the costs I may not be able to pay for it. Besides the internet connection here at work is very efficient not even comparable to the connection when am at home that is the other reason why I prefer to do my e-learning studies from here at work.

The code list on the right includes the following codes:

- Challenge:DeviceAffordability
- E-Learning Cost
- DeviceAffordability:SmartPhone
- Mobile-Learning
- DeviceAffordability:NetworkCo...
- ISPDeterminants:Cost
- ISPDeterminants:Speed
- E-Learning Cost
- Employer ICT Policy Violation
- InternetAccessPoint:AtHome
- InternetAccessPoint:AtWork
- E-Learners' Employer ICT Policy
- EthicalImplication:InfoSecurity
- EthicalImplication:ManHours
- EthicalImplication:ResourceMis...
- E-Learners' Employer ICT Policy
- EmployerICTPolicy:NotEnforced
- E-Learners' Employer ICT Policy
- PolicyViolationReason:Devices
- E-Learners' Employer ICT Policy
- Challenge:HighInternetCost
- EmployerInternetCost:Free
- PolicyViolationReason:Speed
- E-Learners' Employer ICT Policy
- PolicyViolationReason:Cost
- E-Learning Cost

Figure 3
An Example of Initial Coding Cycle

Focused Coding

Focused coding is the second analytical level of analysis that focuses on the initial codes and sub-categories obtained from the initial coding level. It is also known as pattern coding because it involves identifying the ones that appear more frequently and are more significant in the study (Charmaz, 2014). Thus it requires grouping the initial codes and sub-categories into categories of meaning and gathering more data to refine the categories. Therefore, at this level, we grouped the initial codes obtained from the previous initial coding level into categories based on their similarities in line with Charmaz (2014), Chun-Tie et al. (2019) and Kalpokaite and Radivojevic (2019). We constructed eight key categories of meaning; thus, we focused data collection and analysis towards refining the constructed categories. As the process unfolded, we continued to document the emerging themes and the relationships between the key categories and their attributes in the form of memos.

Theoretical Coding

Theoretical coding is a later stage of analysis that involves collecting and analyzing more data in the light of the identified categories, which aims at checking/validating the emerging theory/framework/portrait/description against reality (Charmaz, 2014; Chun-Tie et al., 2019; Kalpokaite & Radivojevic, 2019). At this level, we carried out more data collection and analysis to identify any negative cases (that did not fit in the constructed categories) and to qualify and elaborate the developed theory. Theoretical coding also aims to saturate the theory, where theoretical saturation is the point at which more data collection and analysis yields no new categories or different instances within the identified categories (Willig, 2013). Through theoretical sampling, we conducted 51 interviews following various leads and hunches to achieve more variation in data up to the point where we attained *theoretical sufficiency*. We chose theoretical sufficiency in to align with Charmaz (2014), Dey (2007) and Saunders et al. (2018), who advise that theoretical sufficiency is preferable to theoretical saturation. They argue that a claim on saturation may prematurely foreclose opportunities for more theoretical insights from the data. Therefore, we believe that the data we obtained was sufficient for the theoretical insights and formulation. Table 1 shows how we carried out the three coding levels of the interview excerpt shown in Figure 2.

Table 1
A Coding Levels' Example

Excerpt From the First Interview	Initial Coding	Focused Coding	Theoretical Coding
<p>Q: How you access the e-learning portal?</p> <p>A: <i>When I started, I did not have a laptop, so I used the desktop at work, but now I do. But I had and still have a smartphone, which is necessary because it is always at hand, allowing me mobility; hence, I can track notifications from e-learning tutors and the admin from the portal. And I also have a modem for internet connection. Both the modem and phone are on Network-1. Though Network-1 is expensive, it has good quality internet service. It enables me to carry out my e-learning studies with ease and at a reasonable speed compared to the other available networks here in my locality. So I buy internet data bundles of between KES 500-1000 per month, which is not very expensive because I</i></p>	<p>Mainly doing e-learning activities at work</p> <p>Minimally doing e-learning activities at home</p> <p>Inability to afford a laptop computer</p> <p>Ability to afford a smart mobile phone</p> <p>Mobile learning</p>	<p>Devices needed</p> <p>Looking to reduce internet access cost</p> <p>E-learner internet challenges faced by e-learning</p> <p>Seeking to exploit their employers' good quality internet for free</p> <p>Ethical issues raised in violating</p>	<p>How the e-learner coped with e-learning internet access challenges</p>

<p><i>mainly do my e-learning activities here at work. I don't study at home unless I am just checking on notifications. I don't download materials or do and submit coursework at home</i></p> <p>Q: You have hinted that you do your e-learning activities at work, is there an ICT and Internet use policy?</p> <p><i>A: I don't know if it [policy] is there or not, but this is a government office, so even if it is there, it is not enforced except, of course, for pornography and other weird sites; otherwise, they don't prohibit me from accessing the portal and doing my studies. Besides, I do it over the lunch hour and after work at 5 pm. So I download the notes, do the course work and submit them.</i></p> <p>Q: Why are you using your employers' resources to do your private studies? What is the motivation?</p> <p><i>A: In the beginning, I told you earlier, I could not afford a laptop, so I had to use the office resources. But now I am just trying to reduce the cost incurred because at work it is free. You know Network-1 is very expensive, and if I have to meet all the costs, I may not pay for it. Besides, the internet connection here at work is very efficient, not even comparable to the connection when I am at home; that is why I prefer to do my e-learning studies from here at work.</i></p>	<p>Choice of the Internet at home based on cost and quality</p> <p>Ethical questioning of CT Policy Violation</p> <p>The organization does not enforce the ICT Policy though it has defined safe use.</p> <p>Internet at work is free</p> <p>Employer ICT policy violation reasons</p> <ol style="list-style-type: none"> 1. Internet access cost at home is high 2. Lack of devices to interconnect 3. Internet's quality at work is good than at home 	<p>employers' ICT Policies</p>	
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Memoing and Data Presentation

Memoing is the process of documenting the participants' experiences and the unfolding stories to observe the emerging themes or patterns from the data (Charmaz, 2014). It took place from the time the first interview was coded and ran throughout all the data collection and analysis cycles. Generally, and where possible, memoing started right away after analyzing the last interview data before proceeding to the following interview. Figure 4 shows an example of a memo after updating with subsequent interviews and data analysis following the excerpt from Figure 2.

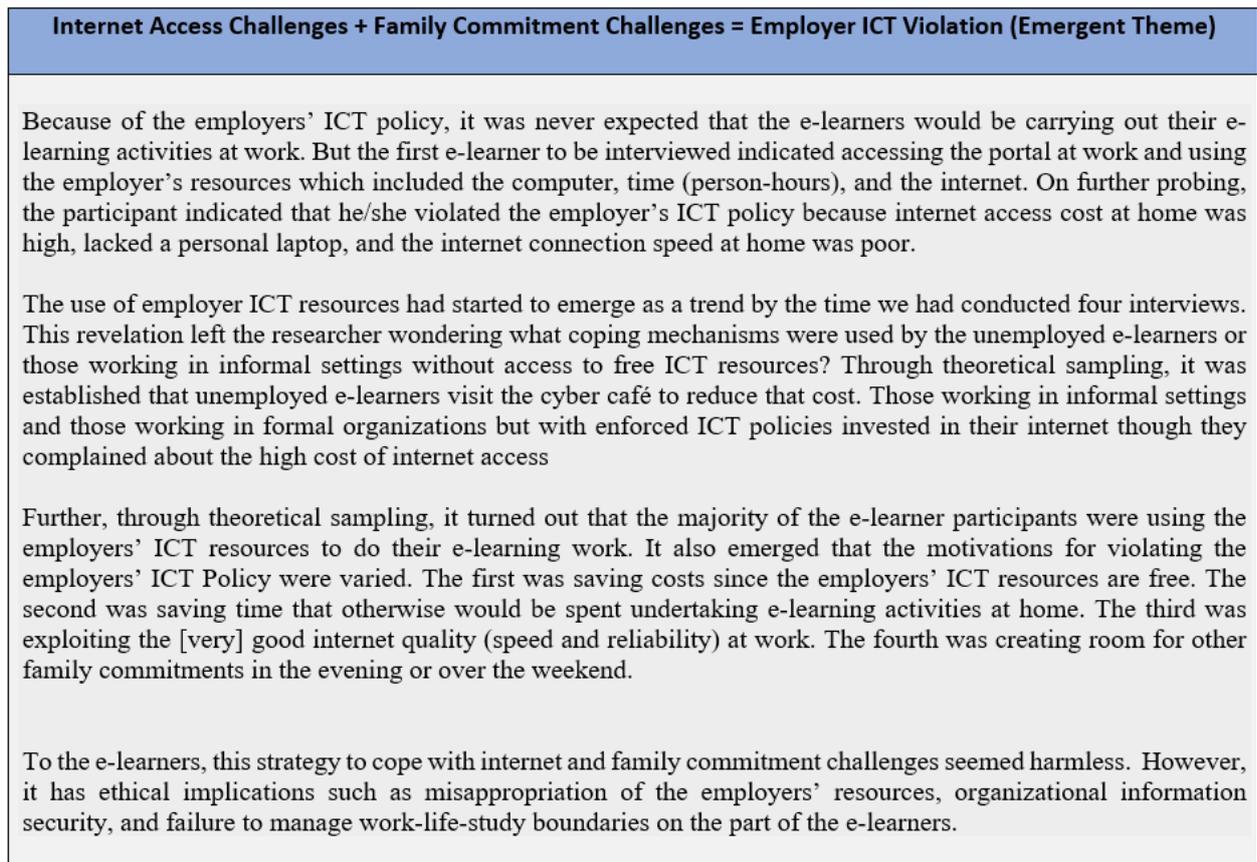


Figure 4
Memo Example

Throughout the iterative and simultaneous data collection, analysis and memoing period we remained alert and open to new and unanticipated concepts and their attributes that arose from the research process, a practice known as *theoretical sensitivity*. It involves the researcher interacting with the data and interrogating it by making comparisons and contrasts. Since it is a part of an iterative process it involves the researcher going back to collect more data in order to qualify earlier collected data (Willig, 2013). We mainly presented the results of our research using Gioia charts which is a technique of presenting qualitative findings using (Gioia et al., 2012; Reay et al., 2019). We combined Gioia charts with vignettes from the data (Reay et al., 2019), which resulted in the *summarization, categorization* and *structuring* of data interpretations (Saunders et al., 2012) into the e-learning storyline of interaction and collaboration.

Core Category Integration

The key categories/concepts from the previous stages of the research design are the theory-building blocks. To be in line with CGT principles as recommended by Charmaz (2014), we *sorted, related, connected* and *integrated* the key categories to form the substantive grounded theory for interaction and collaboration in e-learning. The integration criteria were based on interrogative and introspective questions on our part. Such questions included: what have been the participants been saying about interaction and collaboration? What have we been dealing with in this entire process? What is the overarching them in the research? Once our key concepts were integrated into the grounded theory we ended our adapted CGT process with another round of literature review on the development of theories, where the new theory was

compared with existing learning theories as recommended by Rupšienė and Pranskuniene (2010) and Willig (2013).

Validation of the Results

Having indicated the role of the researcher and the background we undertook the research, we contend that the methodology and its results can be deemed trustworthy based on the following premises. First, the use of a sample of two universities yielded comparable results. Second, the combined use of interviews and observations ensured triangulation of the methodology and results. Third, although we used theoretical sampling, we also used random sampling to select the participant. Fourth, the involvement of e-tutors and e-learning managers triangulated e-learners' findings. Finally, the researcher conducted and recorded face-to-face interviews with participants drawn from different parts of the country, eliminating room for biasing the data.

GT Challenges and Solutions

GT has some challenges associated with it (El Hussein et al., 2014; Timonen et al., 2018). This section presents the methodological difficulties that we experienced and how we overcame them along the way. First, despite the convincing, all the e-learners declined to have the interviews recorded. Therefore, note-taking was the only method for capturing the data. Unfortunately, this meant that we did more writing which consumed the interview time. Consequently, we did not have an audio or video of the interview to replay when the need arose. In such situations we called the e-tutors to clarify their earlier received data. Second, when conducting the interviews, we encountered two introverted e-learners whose answers to the interview questions were very brief, sometimes in the order of one-word response. These participants could not narrate their e-learning experience no matter the amount of probing. This is where the interview schedule came in handy to get the interview moving. Further, we also planned more face-to-face interview sessions at a later date to gather more data after the e-learners felt relaxed and familiarized with us. Third, three e-learners who had scheduled the interview after a long day of work were very weary, leading to rescheduling of the interview in the early hours on another day. This challenge was advantageous because it led to the critical observation of the difficulty that the e-learners experience when trying to engage in interaction and collaboration activities normally scheduled in the evening after a tiring day of work. Finally, it was impossible to claim theoretical saturation with precision and certainty. Hence, we settled on theoretical sufficiency, believing that we obtained sufficient data through theoretical sampling to derive and deliver the theory.

Methodological Insights

Several methodological insights emanate from using CGT methodology in this research. First, since GT versions insist on reading the literature after data collection, the decision to adapt the CGT to include a literature review of extant theories at the beginning of the research allowed us to establish the theoretical framework. Theoretical framework was necessary because it informed the theoretical and knowledge gaps in the existing learning theories, which formed the justification and foundation of the research. Therefore, we used this theoretical framework to formulate the research problem and research questions that guided the data collection process. Second, we conducted a preliminary study using participant observation of the e-learning platforms. This preliminary study allowed us to establish the sample variability and get an accurate picture of interaction and collaboration in e-learning.

We used the results of the preliminary study to design the interview schedules, which we used to seek data collection authorization from the ethics and review board. However, the use of the interview schedules remained very minimal in the research. Third, the decision to interview the e-learners in their location of duty and residence allowed us to experience firsthand the work-life-study balance challenges that face the e-learners. It also allowed us to observe and relate to their internet access challenges. Fourth, conducting the first iteration of the interviews via face-to-face interaction enabled us to familiarize and establish a rapport with the e-learners. Therefore, we conducted the subsequent iterative interviews through member checking via telephone calls with ease. Fifth, since we drew a segment of the sample from security officers, it turned out that all of them were hesitant to narrate their e-learning stories. We attributed the hesitancy to their training as investigating officers. Thus, they were unable to handle the reversed roles during the interviews. Furthermore, they were afraid that we might use the data they gave us for purposes other than the research. Therefore, there was the need to keep reassuring them when such feelings of fear arose during the interview. Finally, although researchers in social sciences initially used GT methodology to develop context-specific theories, this research has demonstrated that GT is becoming an increasingly popular methodology in disciplines outside social sciences such as IS. The use of GT is apparent because there is a need to understand how people and social factors influence technology adoption and use.

Discussion

This being a methodology paper, we have presented a detailed description of the how we used CGT in our research to develop an e-learning theory for interaction and collaboration. The choice of CGT methodology was informed by the need to seek for a deeper understanding of what is happening in e-learning and why it is happening in terms of interactive and collaborative e-learning in Kenya towards the development of a substantive theory. We present the research design that resulted after adopting CGT to suit our research. The research design includes the review of technical literature, sampling techniques, methods of data collection and analysis, and the core category integration. CGT offered us the opportunity to interact and observe the e-learning participants at a personal level that would not have been possible with other qualitative methodologies such as ethnography, case study and phenomenology. It allowed us to visit the physical locations of the e-learners across the country which aided in understanding the environment in which they undertake their e-learning activities. Specifically, it allowed the researcher to experience firsthand the Internet access challenges in their various locations in the country. By use of data analysis principles, we were able to lift the raw data to an abstract level that allowed conceptualization, an aspect that also would not have been possible with the other qualitative methodologies. Along the way it became apparent that some of the GT proposed principles and practices are not meant to be rigidly applied. Thus we flexibly adapted and used them to suit our particular situations without missing or violating the core GT principles of theoretical sampling, constant comparison, theoretical sensitivity, theoretical sufficiency and saturation and so on. As such we have offered methodological insights that we learned along the way. Such flexibility coupled with the rich body of available literature on how to execute a GT-based research enabled us to overcome the methodological challenges that assailed the process.

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