Reflections on health communications aimed at a young audience:

Examining current practices in diabetes education and communication

for children

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May 5, 2019

MS in Scientific and Technical Communication

Abstract

This paper studies methods that technical writers can use to tailor their communications for a child audience. The approach taken was to study methods used in practice by diabetes educators working with pediatric patients with type 1 diabetes. Many type 1 diabetes patients are children. In order to manage their condition, these patients must be actively involved in their treatment and use a variety of technologies. It is the job of diabetes educators to work with these young patients to make sure that they understand their medical condition in order to maintain their health. After reviewing the literature and interviewing several diabetes educators, I analyzed communication materials that these educators use with their patients. In performing that analysis, I identified several methods that the diabetes educators use across a wide variety of formats. These methods include the use of narrative and techniques to encourage different types of interaction from the audience. Lastly, I consider the implications of these communication methods for technical writers.

Introduction

One of the core questions of technical writing is, "how can the writer best approach their particular audience?" As stated by Pringle and Williams: "Technical communicators work at the intersection of technology and people, migrating back and forth between technology and communication as they design products for specific audiences…We approach technology from a human perspective and believe that technology should adapt to people, not the other way around…People are the ultimate end, we would argue, not the technology." (2005, p. 369) Most practitioners and academics in the field today would likely agree that the audience is absolutely central to our work.

As technology becomes more ubiquitous, our intended audience becomes more diverse. The need to tailor our writing for new and more specific audiences increases. One audience that is under-studied from a technical writing standpoint is the young audience: children. How best can we communicate on technical topics to kids?

In the past, this question was less likely to come up in our work. Current trends in technology have changed that. Today, many kids are more adept at using smartphones, tablets, and web applications than their parents. Children are growing up familiar with technology from a very early age. They are described as "digital natives." Traditionally, much of the technology use by children centered on entertainment or education. However, the potential uses that new technologies have for kids are expanding. One particular area of expanded use is in healthcare.

To see how the use of technology in healthcare is expanding, consider a few of the recently developed technologies already in use in the management of diabetes (Fagherazzi, 2018, p. 3):

- Smart watch (can monitor activity, sleep, glucose level, heart rate)

- Flash or continuous glucose monitor (can monitor glucose levels continuously, rather that periodically throughout the day)

- Artificial pancreas ("closed loop" integrated system that automatically monitors blood glucose levels and delivers insulin or other medication based on those levels)

- Smartphone apps (can be used to control connected devices, access medical records, provide telemedicine, access diabetes-related social media groups, monitor activity levels and carbohydrate intake)

Initially, most new medical technologies are geared toward an adult audience. This is a common occurrence in medicine, as noted by the Pediatric Device Innovation Consortium:

> Medical device development for children is estimated to lag the adult market by a decade. Factors such as limited profit opportunities and high development costs remain barriers to the development of devices that are designed exclusively for kids. This innovation gap results in families and health care providers improvising or making due with inadequate products. (Pediatric Device Innovation Consortium, 2016)

The same barriers that apply to the development of medical devices for children are also often factors that slow the development of other technologies specifically for children. By improving our knowledge as technical writers for this audience, we can improve on the expediency with which this audience receives access to these technologies.

Of course, we will also be able to improve on the efficacy of these technologies as they are adapted for children. Understanding how to communicate with this audience can inform the design of instructions for using this technology, but it can also do more. This knowledge can inform the design of the technology itself for use by children.

In addition to becoming more widespread, technology is changing the way medicine is practiced. It has been estimated that at least half of routine, face-to-face clinical consultations could be replaced by these new technologies (Lee, 2010, p. 6). If technology is going to replace face-to-face consultations, then it becomes even more important that the technology accommodates the person using it. Another effect of using technology to replace personal contact with healthcare providers is that it puts the patient more in charge of managing his or her care. Digital technologies will empower patients "by giving them access to their own health data, thereby increasing their health literacy and understanding of their disease. Consequently, there is a need to train patients as much as caregivers on how to understand and take advantage of the digital transformation of healthcare" (Fagherazzi, p. 6). This all points to the increased need to understand how technical communicators can effectively communicate with children as their audience.

Prior Research

A limited number of studies have been done on communicating about technical and medical information with children. These studies sometimes focus on a particular communication problem. For example, a persistent problem in treating children is accurately measuring the amount of pain they are experiencing. Several pain scales have been developed for patients to report their pain levels. Some pain scales, such as the

Wong-Baker FACES Pain Rating Scale, were developed specifically for children (Wong, 1988, Pain in Children: Comparison of Assessment Scales). Wong and Baker worked directly with pediatric patients in developing the pain scale (Baker, 2016). Their initial work was carried out informally, while their later work was done under more clinically controlled conditions. While studies in specific areas, such as those related to pain scales, do offer insights, their focus on a specific problem makes parsing out more general insights into communicating with children difficult. For instance, pain scale studies might seek to compare the results of the different pain scales, without focusing on what general guidance those findings might have in other areas.

More recent studies on communicating with children often focus on the use of technology. For instance, Stålberg et al (2016) worked directly with children to develop an interactive application meant to facilitate their participation in healthcare situations. Høiseth et al (2013) developed guidelines for designing healthcare games for toddlers. Studies such as theirs provide valuable insights into how best to design communications for children. While these studies focus on the use of technology, by looking at the design itself and by taking the child's perspective into account, they have much to teach us about what works for this particular audience.

Some of the key finding of these studies include the following:

- User performance is strongly associated to previous experience with a given medium (Stålberg, 2016)

- Children must be engaged as co-creators (Stålberg, 2016)

- Children should be treated as collaborators, with education materials meant as a tool to encourage this collaboration (Stålberg, 2016; Fairbrother, 2016)

By analyzing current materials being used in the field, I was able to compare current practices to the practices suggested by these other studies. In the following, I compare some of these studies' findings with the results of my own textual analysis of materials currently being used in the field.

Focus on Diabetes Education

For this study, I focused on diabetes education for pediatric patients with type 1 diabetes. I decided to focus on this area because of the nature of diabetes and because of how it is treated.

Type 1 diabetes is a chronic condition that usually appears during childhood or adolescence. Therefore, many of the patients are children. In type 1 diabetes, the pancreas produces little or no insulin. As a result, the patient's bodies can't properly regulate their blood glucose levels. Treatment for type 1 diabetes is primarily a matter of regulating the patient's blood glucose. Blood glucose levels are regulated in patients by the careful balance of insulin injections, diet, and activity levels. Patients must monitor their blood glucose levels to try to ensure that they stay in a healthy range. Possible complications from diabetes include neuropathy, nephropathy, cardiovascular problems, and blindness. However, properly managing blood glucose levels greatly decreases the risks of these complications (Mayo Clinic, 2017).

Type 1 diabetes patients must be actively involved in their care. They must take part in monitoring their food intake and blood glucose levels. They must be cognizant of how their physical activities might affect their blood glucose. They also must play a role

in making sure that they get insulin when they need it. As discussed above, there are a host of different and emerging technologies to help them do all of these things.

One important consideration to keep in mind is that, in addition to the medical/technical challenges faced by these children, they also must deal with emotional challenges. Kids with type 1 diabetes often feel different or alone. Checking blood glucose and administering insulin can be painful, inconvenient, and stressful. Oftentimes, kids' peers treat them differently when they find out that they have diabetes. These kids might be motivated to try to keep their condition a secret. Healthcare providers have found that they must address these emotional challenges as well the medical/technical challenges of diabetes in order to ensure that their patients are able to effectively manage their conditions (Freeborn, 2012; Kelo, 2011).

Pediatric diabetes patients often have a team of healthcare providers helping them to manage their diabetes. This team might consist of doctors, nurses, dieticians, social workers, mental health professionals, pharmacists, and more. Among the team could be one or several diabetes educators. Somewhat similar to the many possible job titles that a technical writer might take on, a diabetes educator's job title might be "Diabetes Educator," or it might be categorized under any one of the other positions that works directly with patients to help them manage their diabetes, such as doctor, pharmacist, or dietician. Somewhat like the certification process offered to technical communicators by the Society for Technical Communication (STC), the National Certification Board for Diabetes Educators offers a certification process. Pediatric diabetes educators have special training to teach parents and kids about managing their diabetes. As described by Davis (1990), the Linkage Model (developed by Havelock to explain how new

knowledge can be disseminated and used) describes how the diabetes educator provides the link between the resources of information and the end user.

In the Linkage Model, the diabetes nurse specialist is the link between users and resources of information.
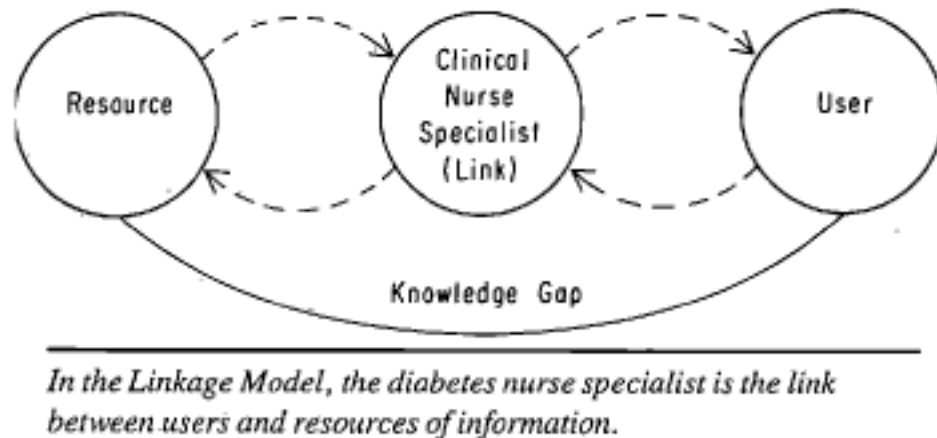
In this model, the role of diabetes educator parallels the role of technical communicators. The trend in medicine is for the more widespread use of technology. In diabetes care, this trend is very apparent. In their roles bridging the gap between medical and technological resources and the users/patients, diabetes educators are in a distinctive position to teach us about bridging that gap. Furthermore, because they work so closely with young patients, they can teach us specifically about communicating those technical topics to a young audience.

Methodology

I used an abbreviated grounded theory approach to learn about pediatric type 1 diabetes and the role that diabetes educators play in helping their patients manage their diabetes. Grounded theory is "general methodology for developing theory that

is grounded in data which is systematically gathered and analysed" (Noble, 2016, p. 34). It is often used in qualitative studies. One of the common features of grounded theory is that the researcher begins research without a set theory to test. Rather, data collection and analysis proceed simultaneously, allowing a theory to be developed that is grounded in the data.

I began by doing a literature review. Because this study is looking at topics that cross over into different disciplines, I reviewed literature on several different topics. The main focus of my review was on methods of communicating on technical matters to children (both generally and specifically in diabetes education).

While reviewing the literature, I also interviewed a pediatric endocrinologist and five certified diabetes educators on how they approach communicating with children. I first contacted the endocrinologist through personal contacts. She then put me in contact with three diabetes educators. Those diabetes educators then put me in contact with one more educator. In addition, I was able to make contact with and interview one additional diabetes educator. This last educator was identified from the writing credits of a diabetes management application designed for children.

According to Saldaña, some methodologists "advise that at least 10 interviews or observations with detailed coding are necessary for building a grounded theory...but other methodologists have recommended a minimum of 20, 30, or 40 separate interviews" (2015, p. 55). Because of time limitations, it was not possible to complete so many interviews. The initial goal of the interviews was to inform the development of a survey. The goal was for the survey to be sent out to a

larger pool of diabetes educators than what could be reached through traditional interviews. However, very few diabetes educators responded to the survey, so results from that were very limited.

In addition to answering my interview questions, the diabetes educators provided me with what they felt were representative examples of the types of artifacts they use to communicate to their patients. Guided by my literature review and the interviews with the diabetes educators, I performed a textual analysis on the artifacts that the educators provided. As part of the textual analysis, I coded the materials or, in the case of electronic materials, my memos about the materials, primarily using a combination of Descriptive and Process coding. Process coding has also been called "action coding" and uses gerunds to connote action. Process coding was used as a way to go beyond describing the contents to explore the rhetorical goals behind the different pieces of the artifacts. Descriptive coding can identify what a sample of text is, but Process coding goes further to identify the goals behind that. For example, Descriptive coding might identify a specific form, but Process coding can direct you to consider questions such as the following: What does the form actually do? How does it impact the reader? And what goals did the author have in putting it there?

In my textual analysis I have not attempted to critique the materials in depth from the perspective of a technical writer. Rather, in an attempt to allow the data gathered to guide the development of my theory, I have studied the given materials as they are and tried to analyze the approaches that they take. Rather than suggest best practices for diabetes educators from a technical communication standpoint, I

have sought to understand the current practices of the diabetes educators to see what we, as technical communicators, can learn. This is in line with the rhetorical theory developed by Brummet, who described research that sought to "identify some rhetorical tactic, strategy, device, etc., and attempt to account for its effectiveness" (1984, p. 97). This method was also noted by Ceccarelli (2011).

Textual Analysis

For textual analysis I have chosen to focus on three artifacts provided by the diabetes educators that seem most representative of their given genre. Each artifact was created either by or in consultation with diabetes educators. I have organized this analysis by starting with the most traditional formats and moving to the least traditional. Therefore, I will start with printed texts and move to the more digital /technological formats. Figures 1, 2, and 3 below show images from the three artifacts.

Analysis: *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children*

The first document that I examined is *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children*. Figure 1 below shows images from this artifact.

Figure 1. *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children.*

This guide was written by the University of Minnesota Masonic Children's Hospital Pediatric Diabetes Team. The title gives the intended audience—children, teens, and their families. Diabetes educators at University Children's give this book to every new patient. It's intended to be used as an initial resource to introduce new patients and their families to all the information they will need to manage their diabetes. It's also intended to be used long-term as a reference tool.

Instead of starting with an introduction or a table of contents, *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children* begins with a form for Important Contacts. This form has a place to put the name and phone number of everyone on the patient's diabetes care team, from the pediatric endocrinologist to the school nurse. This is important for a few reasons. First, by starting with a form meant to be written on, it encourages the reader to actively use the document. Once they write in it, it becomes theirs. This encourages readers to personalize the document with their own notes, making it more useful and interactive than it would otherwise be. Also, if the patient ever has a problem and goes to this book as a resource, the first thing they will see is a list of experts who they can contact for more help. For situations where the book is inadequate or unclear, it encourages the patient to go beyond the book and straight to their care team.

After a brief introduction and the table of contents, *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children* has another form. This one is a checklist of topics covered in the book, with instructions for patients to check off topics as they learn about them. The topics are organized by clinic session. These correspond to the sessions that all new patients go through in the clinic in the first few days after diagnosis. Again, this form shows how diabetes educators use this book as an interactive document. Rather than simply handing it off and hoping that the patients read and understand the material, the diabetes educators go over the topics in person. By finding the topics in the book and checking off what materials have been covered, the patient becomes adept at using the book as a reference tool.

After this checklist, the core of the text begins in Chapter 1. Each chapter covers a discrete topic related to diabetes. Each chapter is organized in the same way, starting with the most important information broken down into a short, bulleted list, followed by more detailed information. The text follows basic principles of good document design, such as using clear, simple sentences, chunking information, and using descriptive headers. Most of the information is presented in third person, although sometimes second person is used. Because the intended audience is very broad, being written for all patients from young kids to older teens, plus their families, the reading level is not targeted to a certain age. Instead of accommodating the text to specific readers, the diabetes educators and parents themselves do the accommodating, helping the patient to understand concepts that they may not be able to get from the book. Again, the two forms at the beginning of the book help to ensure that this accommodation happens, the first form by encouraging the patient to call the diabetes care team directly if they need help, the second by encouraging the patient to familiarize themselves with the book while in a clinical setting, where they can ask questions in person.

One difficulty in communicating technical knowledge is getting the audience to see how it applies directly to their lives. For instance, it's one thing to be told while in clinic that symptoms of diabetes include, "frequent urination, excessive thirst, unintentional weight loss…" (Beasley et al, 2012, p. 1), it is another thing to see what those symptoms are like in your own life. Also, much of the challenge of managing diabetes comes from emotional challenges (Freeborn, 2012; Kelo, 2011). Most of the clinical information covered in *Managing Type 1 Diabetes in Kids: A Guide*

for Families, Teens and Children does not address those emotional challenges (although some chapters do explicitly discuss those challenges). In order to address these concerns, each chapter in *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children* ends with a short section called *Reality Check*. Each *Reality Check* is a short vignette that shows topics covered in that chapter from the point of view of fictional patients. This gives the patients mirrors to see how someone like them can manage their condition. Each *Reality Check* begins with a paragraph that feels much more personal and narrative than the informational text given in the rest of *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children.*

Analysis: *Coco's Type 1 Fun Activity Book*

I next examined *Coco's Type 1 Fun Activity Book*, part of a series of books published through a partnership of Disney Publishing Worldwide and Lilly Diabetes. Figure 2 below shows images from this artifact.
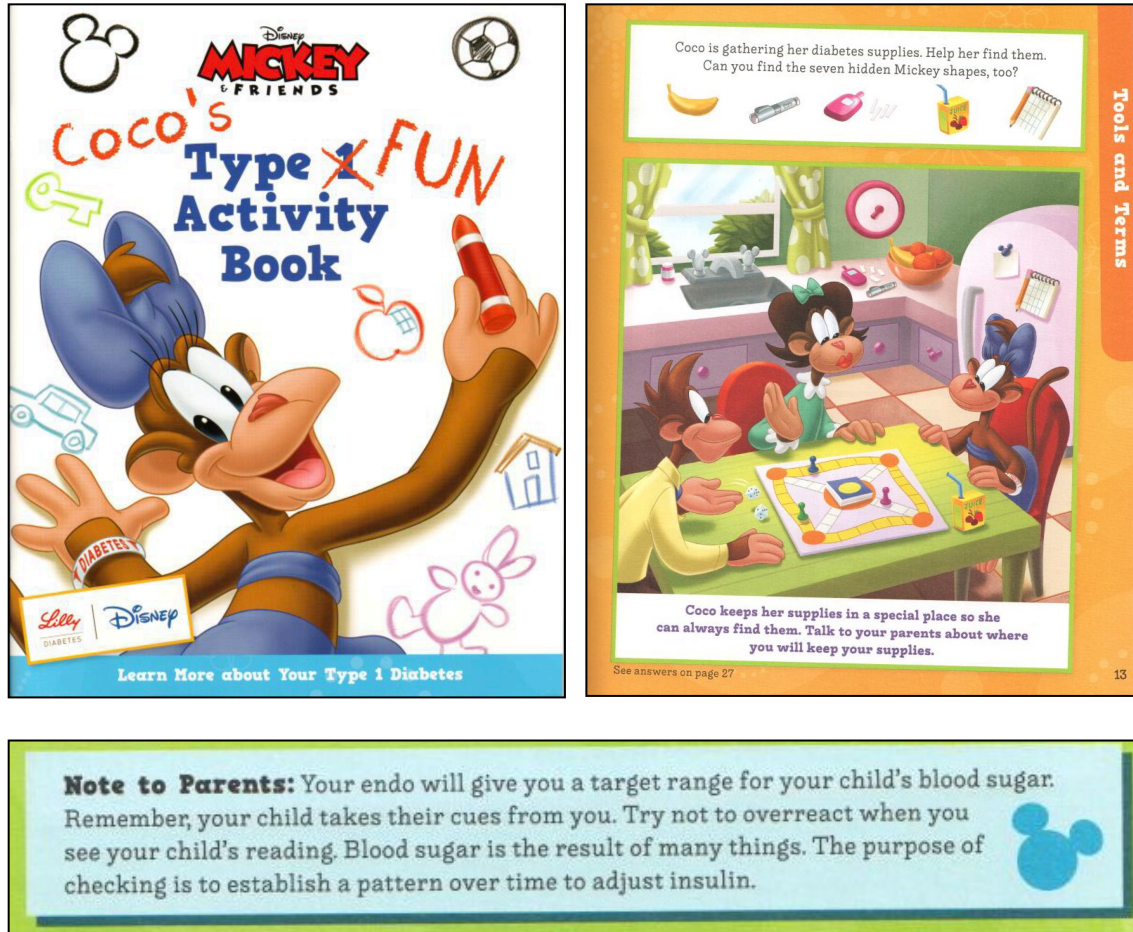
Figure 2. *Coco's Type 1 Fun Activity Book.*

Each book in the Coco series focuses on Coco, an anthropomorphized monkey who has been recently diagnosed with type 1 diabetes. Most of these books are in a traditional 24-page picture book format. *Coco's Type 1 Fun Activity Book* contains the story from one of the picture books plus additional educational content. As a genre, picture books are somewhat unique. They are written texts that are meant to be read orally. They provide a narrative through a combination of pictures and text. They also have two separate intended audiences—kids and their parents. As a

result, picture books represent a traditional format that features both multimodality and interactivity in ways that are normally associated with newer, digital formats.

Using an anthropomorphized character in a picture book to teach about complex topics makes sense for many reasons. When introducing new topics, educators often start with the familiar and move to the unfamiliar. By starting with the familiar, the educator gives the learner a frame of reference to work from. From the familiar, the learner is ready to move into the unknown. Coco exists in the Disney universe, where she interacts with familiar characters such as Mickey Mouse and Donald Duck. By placing Coco in this universe, the author of this series has created a familiar, safe setting for Coco, and the reader, to learn about type 1 diabetes. Furthermore, picture books are designed to be shared between the child and their caregiver. As a result, they can be a very effective format for introducing scary topics to children. By design, they allow the child to face their fears in a safe, supportive setting, with their caregiver at their side. Making Coco an anthropomorphized character also brings some abstraction to her situation, providing some distance between Coco's situation and the readers. At the same time, kids intuitively relate to these anthropomorphized characters, allowing the characters to serve as a kind of mirror to their own lives.

The story in *Coco's Type 1 Fun Activity Book* is about how Coco learns she has type 1 diabetes. She plays soccer, experiences symptoms, becomes hospitalized, is visited by friends, and learns about diabetes from her diabetes educator and her doctor. After being treated and learning about managing her diabetes with her parents, Coco gets to return home, which is the happy resolution of the story. By

placing Coco's initial diagnosis and treatment in a narrative, the patient is also encouraged to view their own diagnosis and treatment in narrative terms. Each of the books in the Coco series has Coco facing new challenges after her recent diagnosis, such as returning to school and going to a sleepover. These are the same challenges that most pediatric patients will have to go through.

Beyond the initial story, *Coco's Type 1 Fun Activity Book* contains education activities for the new patient, such as finding Coco's diabetes supplies in a picture and identifying the times of day when Coco should check her blood sugar. These activities make learning about diabetes self-care into interactive games.

Analysis: *Jerry the Bear*

I last examined the myriad of applications that have been created to help patients manage their type 1 diabetes. The diabetes educators I interviewed told me about the applications that they and their patients use. I also identified additional applications through my literature review and through searches both on the internet and Apple's App Store. I then downloaded and tried to use these applications. For all aspects of managing diabetes, from counting carbs to injecting insulin, there are apps to help. Most of the glucose meters and insulin pumps on the market have associated apps that are directly integrated with them. Many of these apps also have features to help patients share their data with their diabetes team. (My ability to use these features was limited because I do not have the medical devices to integrate with the apps or the medical data to upload). However, the vast majority of these apps are designed for a general audience, not specifically for kids.

The assumption seems to be either that the user is a teenager who can navigate the app as easily as a grown up, or that the patient's caregiver will be the one to use the app for the child. Among the few apps that are designed specifically for children, one of the most comprehensive is *Jerry the Bear*. Figure 3 below shows images from this artifact.
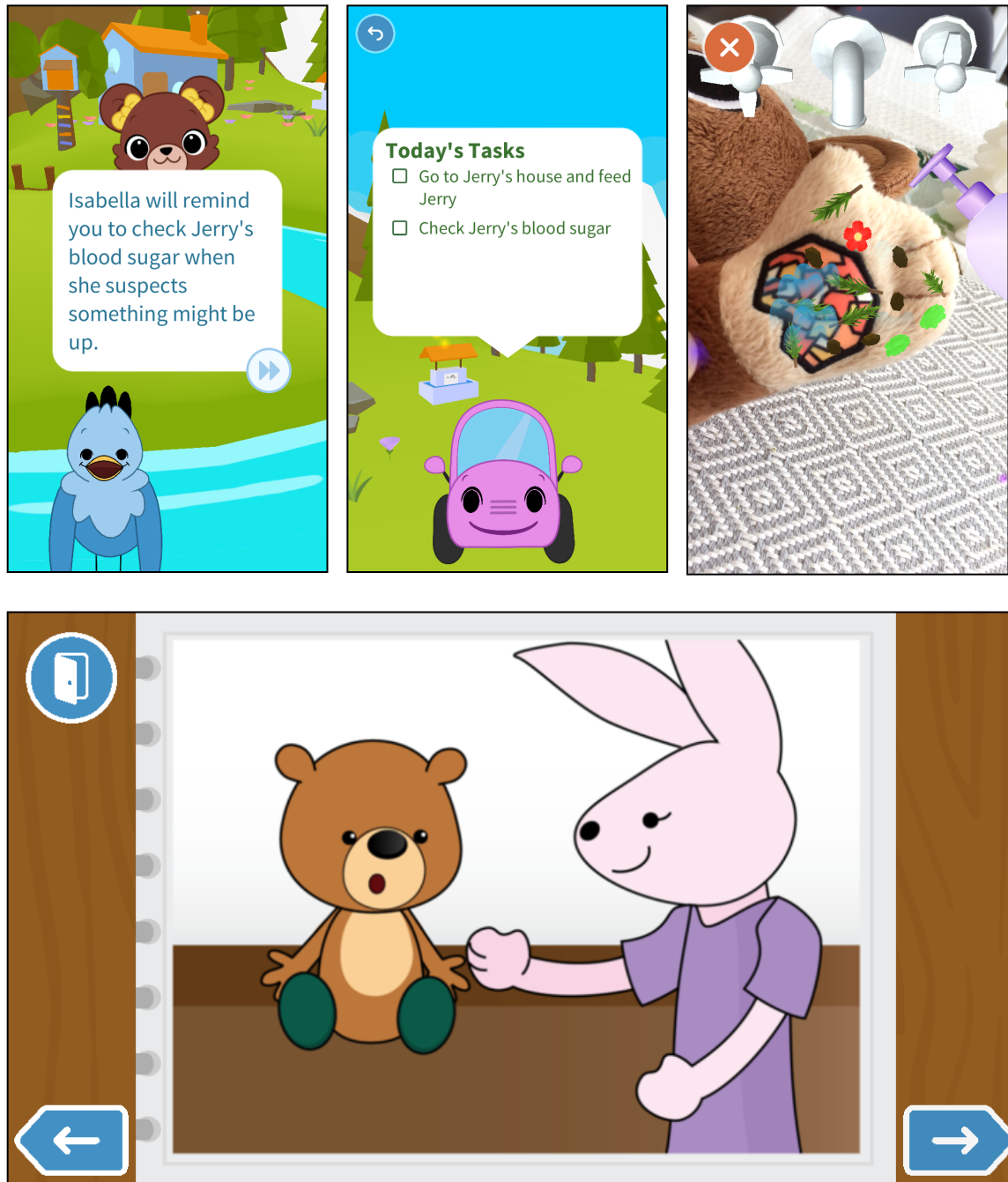
Figure 3. *Jerry the Bear.*

As both a teddy bear and an app, *Jerry the Bear* bridges the gap between the real

world and the digital world. Jerry has type 1 diabetes. The teddy bear has markings

on his body, clearly showing where his insulin injection sites are. The markings also

work like QR codes, working with the augmented reality features of the application. Using augmented reality, kids can wash Jerry's hands, check his blood sugar, administer his insulin (via injection or pump), and manage his diet.

The app also features a series of interactive eBooks that are paired with lessons about diabetes management and specific management tasks. Taken together, the eBooks form one complete narrative. Jerry, the patient, is the protagonist of the narrative. However, his main goal is not to manage his diabetes. Instead, his main goal is to compete in "the All Star Games." The books follow Jerry as he prepares and trains for the All Star Games. As he trains, he also learns about managing his diabetes, but diabetes is not his primary concern. By making the narrative about something other than the technical aspects of diabetes management, the authors are able to address the emotional challenges associated with diabetes management in addition to the technical and medical challenges. Jerry wants to participate, and even excel at sports, just like any healthy child. His success in competing in the All Star Games provides reassurance to the reader that they, too, can live normal, active lives despite the challenges of living with diabetes.

As Jerry learns about diabetes, the reader learns too. Each book unlocks new diabetes management tasks. The reader must complete the diabetes management tasks for Jerry before they can move on to the next eBook and the continuation of Jerry's story. In empathizing with Jerry, the reader relates to Jerry as a patient. In treating Jerry, the reader also gets to role-play as the caregiver of a patient. Thus, for the child audience, Jerry provides both a mirror to their own role in diabetes management and a window into their caregiver's role.

The app itself has a learning curve to it, in that it's not immediately clear how to proceed. It allows a certain amount of sandboxing, where you can move freely between various activities. However, it does have characters who guide the user to complete the tasks to unlock the story. It also features Jerry's sister, Isabella, who alerts you if she thinks that Jerry's blood glucose is too high or too low. In this way, it stresses the importance of the involvement of family and friends to help Jerry manage his diabetes. Of the three artifacts, this is the only one that doesn't explicitly address the caregivers as part of the intended audience. Tech savvy children could use this on their own without help from their parents. However, with its thoroughly interactive nature, by incorporating Jerry parents into the stories and his sister into the app, and by allowing the child to role-play as Jerry's caregiver, it does encourage interaction between the child and the parent, as do the other artifacts.

Discussion

Across all these artifacts designed for communicating with children, we see several key elements, including the following: the use of narrative, encouraging interaction between different audiences, encouraging interaction with the artifact itself, and encouraging interaction with the healthcare providers/experts.

The Use of Narrative

All three artifacts contained elements of narrative. In all three artifacts, the protagonists of the narratives were patients with type 1 diabetes.

In *Jerry the Bear*, the narrative was broken across multiple eBooks. As discussed, these books could only be unlocked in order by completing specific diabetes-management tasks. The tasks were performed on the teddy bear using the app's augmented reality features. Thus, the reader received hands-on training in diabetes management while following along with the story.

In *Coco's Type 1 Fun Activity Book*, the narrative was in a reformatted picture book format (reformatted from a standard 24-page picture book). The picture book format encourages interaction between the parent and child, placing the parent in a position to assist the child in both comprehension and processing any difficult emotions.

Even the most informational artifact, *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children,* incorporates elements of narrative with the *Reality Check* sections at the end of each chapter. Including these sections gives the readers something they can relate to. They also show the reader how the clinical information provided might be applied in their day-to-day lives.

Encouraging Interaction Between Different Audiences

All three artifacts have elements in their design for two distinct audiences, the child and the caregivers. In managing type 1 diabetes, the involvement of the parent has been shown to be one of the most important factors determining outcomes. As Kelo et al found, "Parental support is most crucial in promoting self-care in school-age children" (2011, p. 2105). The importance of parental involvement has been found to extend from early childhood through adolescence. As one diabetes educator who I

interviewed said, "In order for the child to learn, the parent must be engaged and be willing to reinforce any information discussed" (A. Fischl, personal interview, March 14, 2019). Thus the parent should be seen as both a target audience and a resource for reinforcing the message. Even outside of diabetes, when communicating technical topics to kids it is often likely that the parents or caregivers will be involved. As technical writers, we can take deliberate steps to try to engage both of these audiences.

Picture books engage both audiences naturally, by encouraging the caregiver to read the book to the child. As a well-developed genre, many techniques have been developed for picture books specifically to encourage the interaction between these two audiences. For instance, one method picture books use is redundancy. In *Choosing Powerful Words: Eloquence that Works*, Carpenter writes, "In the vocabulary of Information Theory, the more a word is predictable, the more it is redundant. Thus, for some eloquent style in discourse, redundancy does not mean being repetitive but rather helping people anticipate how accurately statements end" (1999, p. 146). Picture books often combine pictures and text in ways that are deliberately redundant. The adult reader might read the beginning of a sentence and then leave off the end, waiting for the child to complete the sentence. The pre-literate child can then infer the end of the sentence from the pictures. In this way, the child becomes an active participant in making meaning from the story. This active participation encourages knowledge retention.

In addition to techniques already developed, new technologies could provide new methods to encourage this sort of collaboration/interaction between two

audiences. For instance, a diabetes management application might be designed as a turn-based game. The child could have a task to complete, and then the parent could receive a notification that the task has either been completed or is overdue. The parent could then have their own task (perhaps assigning a reward to the child for completing their task). The tasks themselves could be modified as the child becomes more independent. Specific communication problems could lend themselves to different methods of interaction. As technical communicators, we can be cognizant of ways to incorporate this type of interaction into our work.

Encouraging Interaction with the Artifact Itself

Another aspect in all three artifacts is some way of encouraging the audience to interact directly with the artifact itself. The most informational artifact, *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children*, incorporates forms to encourage the patient to familiarize themselves with the material and reach out for help if they had a problem that the artifact did not solve. *Coco's Type 1 Fun Activity Book* is filled with games and activities that incorporate diabetes education in a fun, age-appropriate way. The cover of *Coco's Type 1 Fun Activity Book* shows Coco changing the title of the book, interacting with the artifact in exactly the way that the reader is intended to, by making it her own. Lastly, *Jerry the Bear* uses technology to create an interactive experience in a way that no printed book could replicate, through the interactive app, augmented reality, and the teddy bear itself, which, with its coded injection sites, is in itself an educational tool. Of the three artifacts I analyzed, only the most informational artifact, *Managing Type 1 Diabetes*

in Kids: A Guide for Families, Teens and Children, did not incorporate games into the educational material.

For a young audience, play and learning are closely tied. When writing for a young audience, it is important to remember this duality between play and learning. Games can be incorporated into standard text documents, while digital applications afford a wealth of opportunities for gamification.

Play also includes hands-on learning. The last page of *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children* shows a diagram of a body with injection sites illustrated. The Jerry teddy bear shows those same injection sites. The teddy bear contains the same information as the diagram, but in a format that the child can physically touch and relate to. The diabetes educators have other tools along these lines: "We also use some props such as a model pancreas, or a tube of fluid with beads in it to represent sugar in the blood" (M. Clark, personal interview, March 27, 2019). For many, especially children, hand-on learning can be extremely effective. When trying to engage with this audience, we should also be open to exploring unconventional formats that can facilitate this style of learning.

Encouraging Interaction with Healthcare Providers/Experts

One theme that every diabetes educator addressed was the need to personalize the education: "Diabetes is such a personal disease, meaning that every person has a different diabetes monster to tackle, so that is why our care has to be so personalized and focused on person to person communication" (M. Clark, personal interview, March 27, 2019). As noted in the quote, the best way to personalize care

and education is to do it in person. Outside of that, in educational materials, one way to facilitate this interpersonal communication is to design the materials so that rather than replace the interpersonal communication, they encourage it. For example, the *Important Contacts* form at the beginning of *Managing Type 1 Diabetes in Kids: A Guide for Families, Teens and Children* encourages the reader to reach out and contact the healthcare team if the artifact itself does not solve their problem. Similarly, the first page of *Coco's Type 1 Fun Activity Book* encourages both the patient and the patient's parents to reach out to the diabetes care team for help. For *Jerry the Bear*, after Jerry's problem is introduced in his narrative, the first thing he does is go to his diabetes educator for advice. In all three cases, the communication and the technology is meant to promote rather than replace personal communication.

Specifically on the topic of *Jerry the Bear*, one educator wrote that Jerry is most useful in the first few months after diagnosis, but is of limited use beyond that. She was hopeful that something could be designed that would take this personalization further. "Creating something that grows with the individual would be awesome" (A. Fischl, personal interview, March 14, 2019). New technologies provide us with new ways to target information to our audience, based on their inputs. Finding new ways to use technology to personalize learning should be a focus of designing materials for this audience.

One concern about technology in general is that it depersonalizes communication. This is a concern that technical writers and application designers should keep in mind as they develop materials. When appropriate, we should look

for methods to encourage our audience to go beyond the materials we are providing and get personal assistance from available experts.

Conclusion

Table 1 below summarizes the methods identified for communicating with children and the artifact within which those methods were found.

Table 1. Artifacts and Communication Methods

	Managing Type 1 Guide	**Coco's Activity Book**	**Jerry the Bear**
Narrative	*Reality Check* sections in every chapter.	Picture Book story within the book.	eBooks form one complete narrative.
Interaction (Child and Care Team)	*Important Contacts* form.	• Narrative featuring child and care team working together. • Images showing Coco interacting positively with care team.	Narrative featuring child and care team working together.
Interaction (Child and Caregiver/Family)	• Implied by title—patient and patient's families included as audience. Reinforced in clinic. • *Reality Check* narratives stressing importance of family working together.	• Use of Picture Book format, designed to be read by caregiver to child. • Activities and forms designed to be completed by parent and child together. • Narrative featuring parent and child working together. • Images showing Coco interacting positively with family.	• Narrative featuring parent and child working together. • In treating Jerry, the child role-plays as the caregiver. • Inclusion of Isabella, Jerry's little sister, as a helpful character in the app.
Interaction (Child and Artifact)	*Diabetes Education Checklist* and other forms.	• Various activities and forms, mixing play with learning. • Cover image features Coco personalizing book, encouraging child to do the same.	• Jerry the teddy bear (physical object) • Augmented Reality for treating Jerry the teddy bear while using the app. • Games and activities within app. • eBooks tied to tasks, unlocked as tasks are completed.

One diabetes educator summed up her overall approach in the following way:

> "One main challenge is their distractibility. Sometimes since what we must
>
> educate is so serious, it can be hard with little ones to keep them
>
> concentrated. We address this challenge by bringing play into education,
>
> such as use with stuffed animals for demonstration, use of picture books that

tell stories of life with type one diabetes, and engaging the child in education

with the parents" (M. Clark, personal interview, March 27, 2019).

In this one response we have the use of narrative and the different kinds of

interaction that can be used to reach this audience.

Going back to previous studies, Stålberg et al (2016) found that "the most

crucial aspect regarding user performance was associated with previous experience

of using interactive technology" (2016, p. 156). Stålberg's user testing showed that

this prior experience was even more important than the user's age in determining

user performance. Stålberg was looking exclusively at interactive technology, but

this connection between familiarity and ease of use likely extends to other modes of

communication. As technical writers, we can choose genres that our audience is

most familiar with. If we have an audience that is used to learning through picture

books, then we can write for them in picture books.

Another of Stålberg's key findings was that children needed to be engaged as

co-creators of these communications. "What is needed…is a willingness by the adult

world to emphasize the children's agency in the situation, because that is a crucial

component for a satisfactory outcome" (2016, p. 157). Aren't all the different

methods of encouraging interactivity discussed here ways of increasing the child's

agency? In particular, when the artifacts are designed to encourage interaction

between the child and the artifact itself, the result is that they are encouraging the

audience to create meaning.

Stålberg also touched on the need to encourage collaboration between the

child audience and others, describing her study's interactive application as "a communication tool built upon visual guidance, meant to be used in combination with oral support from the professionals" (2016, p. 157). Similarly, Fairbrother et al focus on the need of children's health literacy materials to facilitate "the cross-pollination of ideas and the co-production of knowledge and insights" as well as "viewing children as 'equals' and 'co-learners' in the creation of knowledge." (2016, p. 483) Høiseth et al also explored the importance of narratives, encouraging interaction, and viewing the child as a co-creator, and connected all three of these themes together: "Exploring and playing with different aspects of the treatment together with caretakers or peers can enhance the meaning-making processes of toddlers. Narratives of healthcare games should use stories that confirm togetherness in some way" (2013, p. 144).

This study has identified methods that diabetes educators use in practice to communicate to children. As technical communicators, we can incorporate these methods into our own work as we try to reach a child audience. With further advances in technology, we can take these ideas as starting points toward innovating techniques that use these methods in new ways.

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