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Pooja Mandagere
pooja.mandagere@hotmail.com

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The Effects of AI on Children's Use of Politeness

The Effects of AI on Children's Use of Politeness
Pooja Mandagere
Lee Honors College, Western Michigan University
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Dr. Autumn Edwards
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Abstract

This project is a study of the influence of Artificial Intelligence (AI) on children's politeness by providing positive reinforcement for good verbal behavior. How children communicate with artificial intelligence is identified. There is an observation as to how positive reinforcement will influence their behavior. The survey administered before and after the introduction of the Google Nest Hub into the homes of participating families (pre-intervention survey and post-intervention survey) is included in this document. There was an observation period during which the Google Nest Hub recorded queries made by the child participant within each of those families. These records were used for analysis. Five families participated in this study. All five child participants were between the ages of 5 and 13 and were all considered to be of average or above-average at being polite. There was a slight increase in the use of polite forms over the five weeks in 3 of the children. Reasons as to why the positive reinforcement feature may not be as effective were identified by using Brown and Levinson's (1987) politeness theory.

Introduction

“Alexa, play Jeopardy!’ my son will bark. And she follows his command.” This was the complaint of Ken Gordon who is the father of a thirteen-year-old son and an owner of an Amazon Echo (Gordon, 2018, p.). Hunter Walk, a father of a four-year-old daughter and an owner of an Amazon Echo, had a similar complaint. He wrote that the Amazon Echo was turning his daughter into “a raging a—hole” (Walk, 2016). Ken Gordon and Hunter Walk are not alone in their concern. There has been a loud chorus of customers who were concerned that the act of rudely commanding their AI assistant to do something sends the wrong message to the younger members of a household (Baig, 2018). Google and Amazon have rolled out in-home AI assistants. These commercially sold AIs were programmed to serve, and do not hold their owners accountable for their verbal behavior. Hunter Walk insisted that since his child was so young, the practice of not saying “please” or “thank you” was starting to become a habit.

To combat this issue, Amazon and Google have rolled out features on their in-home AI assistants that would enable AI to recognize when someone has said “please” or “thank you” and provide positive reinforcement accordingly. Google recently released its Google AI assistant's “Pretty Please” feature and boasts that this technology will encourage polite behavior in children (Vincent, 2018). However, research has not been conducted on whether this feature truly changes children's behavior. There is very little scholarly research exploring the relationship between children's use of polite language and their interactions with AI assistants. The purpose of this study is to understand how a small group of young children interact with an AI assistant in their homes for five weeks, and how the new positive reinforcement feature may relate to their parents' perceptions of their politeness and to the frequency they use polite language with the AI assistant. The first section of this paper will articulate some of the links between the use of AI assistants that provide positive reinforcement for polite behavior and the use of polite forms by the children who use them by reviewing research on human-machine communication, human-computer interaction, and politeness theory. The literature review concludes with a consideration of how AI assistants may produce lexical entrainment in users. The next major sections present the study methodology and results. Finally, I discuss the results of my research, focusing on their

relevance for several research areas and their implications for parents who may be concerned about their children's behavior towards their in-home AI assistant.

Related Work/Literature Review

Background/Theoretical Framing

Human-Machine Communication (HMC) is the area of study and the concept of the creation of meaning among humans and machines (Guzman, 2018). Related, the field of Human-Computer Interaction (HCI) focuses on the fundamental task of moving information between the brain of the user and the computer (Guzman, 2018) is viewed as Human-Computer Interaction (HCI).

In HMC and HCI, technology enters into the role of a communicator. This is different from technology's usual conceptualization as just a channel or medium of communication. AI voice assistants are an important and popular machine communicator to consider. In-home AI assistants are most commonly a part of smart speakers. A smart speaker is a type of speaker which comes with an integrated AI assistant that is voice-activated. If a song needs to be played on the smart speaker, the person making the request will have to verbally command the speaker to play the song using the speaker's respective prompt to activate the AI assistant (Rouse, n.d.). According to a brief published in January 2019, 21% of U.S. adults said they owned a smart speaker. In 2019, smart-speaker ownership surged to 53 million U.S. adults total. Many consumers own more than one smart-speaker device. The percentage of people who said they owned three or more devices rose to 30% in 2018. According to the brief, 118.5 million U.S. households indicated having a smart speaker in December 2018. 80% of U.S. adults received a smart speaker during the holiday season. Currently, Amazon's virtual assistant, Alexa, and the accompanying line of smart speakers, Echo speakers, are the most popular. However, their share of the market is set to drop due to competition from Google.

Despite the particular system, there is a high level of verbal interaction between humans and machines. In 1988, Rafaeli conceptualized interactivity as a process between people carried out through technology as well as between people and technology. Researchers delved further into people's communicative behavior towards technology and found that people act toward the media as if the media are social actors (Guzman, 2018). People draw on the social norms of communication with humans as they interact with machines. This paradigm is known as Computers Are Social Actors (CASA) (Nass, Steuer & Tauber, 1994). Communication is the means through which people learn about their world, form an understanding of self and other, and contribute to the shape of society. If people are communicating with machines as they would humans, there is a creation of meaning between humans and machines in human-machine communication (Guzman, 2018).

Politeness

One important norm of human communication is politeness. In order to adequately understand politeness and the importance of using politeness, we must first understand the concept of a person's public identity, or, their 'face'. A person's 'face' is always at stake when interacting with others. Hence, people are strongly motivated to protect and manage their face. People engage in

'face-work' to protect and manage their face, and it is in everyone's best interest to maintain each other's face. The idea of face and face-work was based on analysis by Goffman in 1967 (Holtgraves, 2005).

Brown and Levinson's politeness theory (1987) is a direct extension of Goffman's analysis of face and face-work. Politeness can be viewed as the linguistic means by which face-work is accomplished. Brown and Levinson proposed that politeness strategies are developed to save the hearers' or speakers' face. They stated that every person has two desires based on their face needs. Negative face is the desire to be unimpeded by others, or otherwise put upon by another. The use of "please", "thank you", and requests in the form of indirect questions such as "can you?", "could you?", etc., are considered uses of negative politeness as they provide the freedom from imposition. Positive face is the desire to be desirable to others, and to be liked and appreciated by others. Additionally, the use of honorifics or formal speech is considered uses of positive politeness, as they can be used to protect the hearer's positive face (Cook, 2011). Speech acts that threaten the face are ones that are contrary to the wants of the speaker or the hearer. These are referred to as Face Threatening Acts (FTA) and they infringe upon the speaker's or the hearer's desire to maintain self-esteem (Gupta, Romano, & Walker, 2005).

AI Voice Assistants and Politeness

When a speaker/hearer is a machine instead of another human, the traditional human norms of politeness may be challenged or changed. In the case of Google, the artificially intelligent assistant who speaks to the child is capable of using programmed language to protect the negative and positive face needs of the human user; but, it is not capable of experiencing an FTA in the same way a person would. Objectively, AI does not feel a need for its own positive or negative face protection. Knowing or sensing this, many users are impolite toward AI. As the parents who were quoted in the introduction demonstrate, the potential problem with threatening or failing to protect an AI assistant's face is not that it will hurt the machine communicator, but that rudeness could become a learned habit that is transferred onto other humans. Positive reinforcement for politeness may act as a way for the machine to indicate that polite behavior is desirable, thereby giving the human partner a reason to behave politely.

Another reason that people may worry when children are impolite to the machine is that the machine has the voice of an adult female or male. Human beings direct their politeness strategies to fit social norms when they speak to others. When speaking to a person who is older or senior, we speak to them more formally and politely. How polite we are to the hearer indicates the status of the relationship between the speaker and the hearer (Gupta, Romano, & Walker, 2005). This behavior suggests that the child would understand that, based on the voice of the Google AI assistant, the Google AI assistant is elder to them and deserves to be spoken to politely. However, if the child does not realize that they should say please and thank you, there is no social consequence unless the legal guardians choose to change their child's verbal behavior.

Google's AI assistant is called Google Assistant and is integrated with Google Home line of smart speakers and displays (Williams, 2019). The prompt to activate the Google Assistant is to

say "Ok, Google.." or "Hey Google.." For this study, I focused specifically on the Google Nest Hub. This is a product in the line of Google Home products that has the Google Assistant AI integrated into it. It works through voice activation. The Google Nest Hub also has display capabilities with a touchscreen. It does not have a camera. The Google Nest Hub is a screen that has a stand covered in fabric. The screen is the size of a 7-inch tablet. Users can watch YouTube videos, and integrate different accounts and other Google Home products to work with the Google Nest Hub. When a question has been asked to the Google Assistant, the assistant makes use of the display to provide visuals or to play the video that has been requested. The assistant can be set up with the "voice match" feature to recognize the user's individual voice.

In-home assistants' ease of use makes it a very operable option for younger members of a family. In his article, Hunter Walk (year) stated that "a voice is a very natural interface for a child, especially for pre-reading and writing." Parents are concerned that their children do not realize the difference between asking their in-home assistants for something and asking a real person for something. They fear that it creates a pattern that sends their children a message that as long their diction is good, they can get anything they want without having to use polite forms (Walk, 2016). Ken Gordon, whose child was a bit older than Hunter Walk's 4-year-old daughter at the time of having written the article, felt that his 13-year-old son may be mature enough to know the difference between a human being and an AI assistant. However, he still worried that AI assistants were encouraging his son to vocalize his authority repeatedly and in an unreflective manner. The fear for many parents is that if this verbal behavior is encouraged to be repeated and without reflection, their child may grow up to have an empathetic blind spot when making commands to other people (Gordon, 2018).

The Google AI Assistant now has a feature to reinforce polite behavior. If users say "please" or "thank you" to the Google Assistant, they will be rewarded with "delightful responses" as programmed by Google. The assistant will acknowledge the politeness and respond in kind. If a user is to say something like "Hey Google, please set a time for 5 minutes", the assistant will reply, "thanks for asking so nicely. Alright, 5 minutes. Starting now." The Google Assistant itself uses polite forms in any given opportunity. The child could either be influenced by the recognition and positive reinforcement provided by the Google AI Assistant, or they could mirror the polite forms being used by the Google AI Assistant.

Lexical Entrainment

According to Brennan (1996), "when two people repeatedly discuss the same object, they come to use the same terms" (p. 41). This phenomenon is known as lexical entrainment (Brennan, 1996). Since people often communicate with computer media and AI assistants as though they are people, which is known as the CASA paradigm, this idea of lexical entrainment can occur even when one of the interlocutors is an AI assistant. When human beings mirror the terminology used by a machine or the other person with whom they are interacting, it is known as 'Lexical Entrainment' (Beňuš, 2014). According to Beňuš (2014), entrainment is the tendency for interlocutors to match each other in verbal and non-verbal behavior. Using this definition, we can understand that lexical entrainment rests on the assumption that if a machine uses specific terminology, human beings are likely to mirror the way in which the machine uses the

terminology. In one specific research experiment on children’s adaptation in multi-session interaction with a humanoid robot, the children adapted their interaction behaviors to the robot’s behavior even if there was no clear need for them to do so. Children adapted their verbal behavior and nonverbal behavior by changing their rate of speech, pause duration, and vocal volume depending on the characteristics of the verbal behavior of the robot (Nalin, Baroni, Kruijff-Korbayová, Cañamero, Lewis, . . . , Sanna, 2012). People are more likely to mirror the machine’s lexical choices if they are trying to accomplish a goal. According to Beňuš (2014), “the degree of entrainment on linguistic structures tends to be greater in task-oriented scenarios than in spontaneous dialogues” (p. 806).

Given the possibility for politeness lexical entrainment in the human-machine communication between children and AI voice assistants, I pose the following research question:

RQ: Does the use of Artificial Intelligence that provides positive reinforcement for polite verbal cues improve politeness in children between the ages of 5 and 13?

Method

Participants

Table 1: Participant Characteristics:

Family Code	Demographic Information		Supplemental Information		Google Nest Hub Set-Up Information	
	Age of Child	Gender of Child	Languages spoken, other than English	Did the child use an AI assistant prior to this study?*	Was voice match set up to detect the sound of your child’s voice?	Gender of the voice assistant
Family A	5.5	Male		Yes	No	Female
Family B	7	Female	Kannada & Marathi	No	Yes	Female
Family C	12	Male		Yes	Yes	Male
Family D	9	Female	Nepali	Yes	Yes	Female
Family E	7	Male	Nepali	Yes	Yes	Male

*(ex: Alexa, Siri, Google, Cortana, etc.)

There were 5 total participating families. Children’s ages ranged from 5.5 to 12 years old (mean = 8.1, SD = 2.24) with 60% identified as male and 40% as female. All lived in the same midwestern U.S. city. All but one child had previous experience using an AI assistant.

Procedures

After securing HSIRB approval [Appendix E], potential participants were recruited through word of mouth. Eligibility involved being a legal guardian or primary caregiver of a child between the ages of 5 and 13 years old, able to make English verbal requests. Potential participants also

needed to hold a Gmail account and have in-home WiFi. They were told the purpose of the study and informed that participation involved adopting the Google Nest Hub, sharing the interaction logs between their children and the AI system over five weeks, and completing two surveys: one at the beginning and one at the end of the study. In return for participation, families were allowed to keep the Google Next Hub after the study concluded.

Upon obtaining informed consent [Appendix A], the researcher visited the home of each family to place a Google Nest Hub in their residences. The children were asked to interact with the Google Nest Hub for at least 10 minutes each week for five weeks. Each survey may have taken up to 10 minutes to complete. The researcher scheduled a 30-minute time block to set up the Google Nest Hub in the participating family's home and stopped by for up to 40 minutes in the middle of the five-week observation period to ensure that data collection is occurring. After the five weeks, participants were asked to submit the question logs to the researcher. All the data provided (the pre-intervention survey, the query logs, and the post-intervention survey) were shared through a password protected USB, or within a password-protected word document stored on a USB.

Surveys

The pre-intervention survey [Appendix C] was used to determine what behavior the legal guardians perceive as being indicative of politeness. The survey also asked them to indicate how they feel about the involvement of Artificial Intelligence in their lives and their child's life. The purpose of this question was to understand if the parents' attitude towards technology influenced the child's behavior towards technology. The post-intervention survey measured if the introduction of the Google Nest Hub, along with its positive reinforcement feature, increased the child's politeness.

Instrumentation/Apparatus: Google Nest Hub

The Google Nest Hub is one of the Home smart speakers ("Our Products, Google). It retails for \$99 on the Google Store ("Nest Hub"). The Google Nest Hub does not have a camera for visual recordings to be taken.

The Google Nest Hub is designed to record the query made to it by the user. I used the query logs from the associated Google Home app to observe how many times "please" and "thank you" were said by the child subject. These query logs were the main instrument used to measure polite verbal behavior from the child. As a result of using the query logs, I did not interfere in the natural day-to-day activities of the participants. I did not have access to the participants' personal information, and all information that was obtained was provided by the legal guardians. Additionally, participants had the option to go through their query logs and delete any private queries that they would like to not be analyzed by the researchers. This opportunity for them to delete private queries before submitting the queries to the researcher gave participants confidence that their data was not misused and that their privacy was respected. Query logs allowed determination of whether the child was naturally polite to the machine (without any suggestion to be polite) and if the positive reinforcement incentivized them to continue using polite verbal behavior.

All the parents either responded “no” or “not sure” as to whether they thought that their child would respond differently to the Google Nest Hub if it had an opposite gender voice assistant. When asked why the child chose the voice that they did for the voice assistant, parents responded that there was either no reason or that they were just comfortable with it. One parent mentioned that their child may have identified with the voice assistant since they were both the same gender.

Data Analysis

Descriptive statistics on demographic information of the children were computed. In addition, the pre-intervention survey and post-intervention survey scores for parents' perceived politeness of their child were compared. For the open-ended survey response answers, content analysis based on broad similarities was employed. The process involved using a text analyzer to find recurring words used in the responses and selecting the most commonly used words in order to group responses by similarity. For the screenshots of the query logs, OneNote's in-built OCR tool was utilized to extract text from the pictures. By searching for exact politeness words and phrases (e.g., Please, thank you), a tally of polite language was produced for each family. Politeness words were divided by the total words exchanged to produce a score that reflected the proportion of polite words to overall words. There are two tally tables per family, one for the child and one for the AI assistant itself.

Results

To answer the research question, does the use of Artificial Intelligence that provides positive reinforcement for polite verbal cues improve politeness in children between the ages of 5 and 13?, I started by analyzing all the information within the pre-intervention and post-intervention surveys. The children's ages were indicated in the pre-intervention survey. Descriptive statistics on demographic information of the children were computed. In both the pre-intervention and post-intervention survey, there was a question regarding how polite the parent would consider their child to be. In the pre-intervention survey, parents were asked to provide their definition of politeness and then score their children, on a scale of 1 to 10. On this scale, 1 meant that the child did not meet any aspect of their parent's definition of politeness, and 10 meant that the child met all the aspects of their parent's definition of politeness. In the post-intervention survey, the parents' previously provided definition of politeness was given to them as part of the survey question, and the parents were prompted to re-evaluate their child's polite behavior, on the same scale of 1 to 10, based on the previously provided definition of politeness. All the open-ended survey responses were grouped based on broad similarities. A text analyzer was used to find recurring words used in the responses.

Open-Ended Responses & Categories

A majority of the parents did not consider saying “thank you” and “please” as a major indicator of politeness. Table 2 shows that most parents indicated that being respectful was a better indicator of politeness. This information challenges the assumptions made by parents like Hunter Walk and Ken Gordon, and companies that rolled out positive reinforcement features for polite verbal behaviors like Amazon and Google. The ‘pretty please’ feature was rolled out to provide

positive reinforcement for polite verbal behavior. Saying “please” and “thank you” triggers the positive reinforcement from the Google AI Assistant. Most parents consider polite verbal behavior to be any behavior that is respectful during interactions with others, and not just saying “please” and “thank you.” Children may be considered perfectly polite to their AI assistant without having to say “please” and “thank you”, as long as they are respectful during their interactions. However, being generally respectful or even making requests in the form of indirect questions such as "can you?", "could you?", etc., does not trigger the positive reinforcement feature of the Google AI Assistant.

Table 2.0:

Categories	Volume	Percentage
How would you define politeness?		
Being respectful	4	67%
Saying thank you/expressing gratitude	2	33%

A majority of the parents felt that their child’s motivation to be polite came from their upbringing and/or their parents’ expectation, as opposed to being motivated by the reactions of others. Tables 3.1 and 3.2 show that parents consistently feel this way. If children learn to be polite from their parents, it may be more effective for parents to set the expectation that their child has to be polite to their in-home AI assistants, as opposed to expecting changed behavior based on the positive reinforcement feature that is provided by the AI itself.

Table 3.1:

Categories	Volume	Percentage
Pre-Intervention Question: What motivation do you believe your child has to be polite?		
"We teach them"/Upbringing/Expectation from Parents	3	60%
"Others' reactions"	2	40%

Table 3.2:

Categories	Volume	Percentage
Post-Intervention Question: What motivation do you believe your child has to be polite?		
"We teach them"/Upbringing/Expectation from Parents	4	57%
"Others' reactions"/"To get things from other people"	3	43%

There may have been more awareness and sensitization among parents about the influence they have on their child’s use of politeness. In Table 3.2, there is an increase in the number of parents who feel that their child is motivated to be polite due to their upbringing and expectation as set by their parents. There is a possibility that parents may have influenced their children to be more polite to the Google Nest Hub. Future studies could benefit from examining the improvement of children’s use of polite forms when motivated by their parents’ expectations to do so versus purely motivated by an AI Assistant positive reinforcement feature.

The major difference between the pre-intervention survey and the post-intervention survey was in the number of times and/or the situations in which parents felt their child says “please” and “thank you.” According to Tables 4.1 and Table 4.2, there was a unanimous agreement that children use polite forms when asking or receiving something, or when being helped by something, or when the situation calls for it.

Table 4.1:

Categories	Volume	Percentage
Pre-Intervention Question: How often would you say your child says “Please” and “Thank you” in a day? In what situations are they most likely to say this?		
1 to 4 times	2	40%
Whenever asking, receiving, or being helped, as the situation calls for it	3	60%

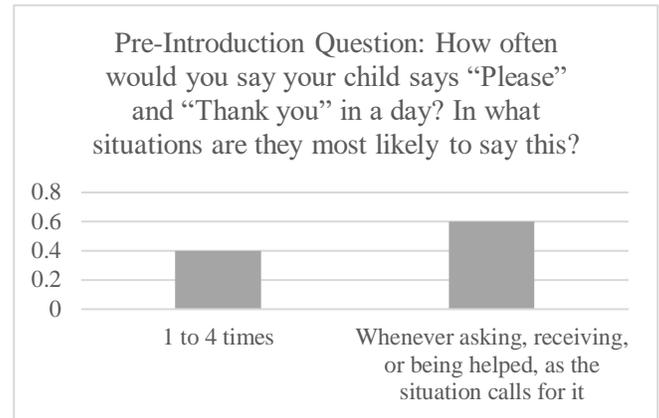
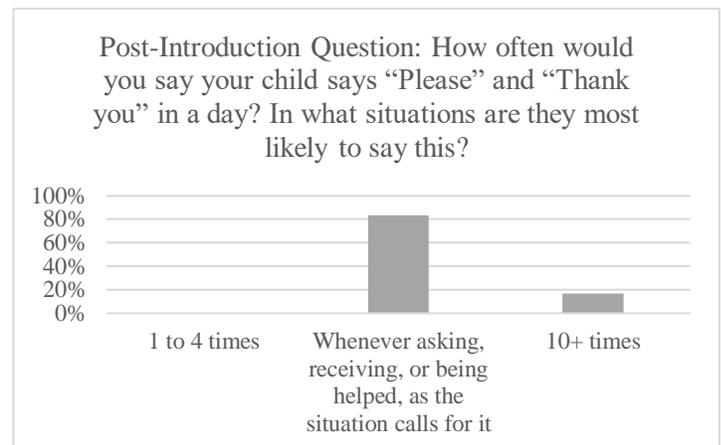


Table 4.2:

Categories	Volume	Percentage
Post-Intervention Question: How often would you say your child says “Please” and “Thank you” in a day? In what situations are they most likely to say this?		
1 to 4 times	0	0%
Whenever asking, receiving, or being helped, as the situation calls for it	5	83%
10+ times	1	17%



Most parents skipped the first part of the question where it prompted them to specify how many times their child says “please” and “thank you” in a day. This should be compared to the fact that all parents indicated that their child was either average or above-average in their polite behavior. Parents do not seem to take “please” and “thank you” into consideration as much when evaluating their child’s ability to be polite.

Tables 4.1 and 4.2 also show a slight increase in the number of times a child says “please” and “thank you.” In the pre-intervention survey responses for this question, a parent had mentioned that their child says “please” and “thank you” 1 to 4 times a day. However, in the post-intervention survey responses for the same question, no parent indicated that their child says “please” and “thank you” 1 to 4 times a day. One parent specified that their child says “please”

and “thank you” more than 10 times a day. This question may have sensitized the parents to how often their child says “please” and “thank you” in a day.

Table 5.1 to 5.5 show response categories of responses parents had to questions about how they felt about technology. Although everyone agrees that technology is helpful and can have a positive impact, there was a consistent trend of parents feeling contradictory feelings of fear and worry.

Table 5.1:

Categories	Volume	Percentage
Pre-Intervention Question: How do you feel about technology?		
Positive/Good	4	67%
Fear/Concerns/Overwhelmed	2	33%

Table 5.2:

Categories	Volume	Percentage
Pre-Intervention Question: How do you feel about the involvement of technology in your child’s life?		
Too much (regarding the availability of technology in their child's life)	2	22%
Happy/Positive/Like	3	33%
Worry	2	22%
Negatively affects	2	22%

Table 5.3:

Categories	Volume	Percentage
Post-Intervention Question: How do you feel about technology? About the involvement of technology in your life? About the use of Artificially Intelligent machines? About the involvement of technology in your child's life?		
Like it/Useful/Beneficial	5	42%
Mixed Feelings/Fears of intrusion/overwhelming	3	25%
Has negative effects	2	17%
Unavoidable/Essential	2	17%

Questions about how parents felt about technology were asked in order to identify if the parents’ feelings towards technology an impact on the way children treated their AI assistants. This is further explored in the ‘Effects of Parent's Perception on the Child's Use of Polite Forms’ table. Some parents indicated feelings of worry and fear more than others.

In the pre-intervention and post-intervention surveys, the question was asked of how polite the child’s school teacher may have thought the child was. Also, if there were any behavior complaints from school teachers, it could have been identified here. If a child was considered to be impolite, to begin with, impolite behavior towards the Google AI Assistant may be expected. However, all the child participants of this study were either average or above-average in their ability to be polite.

Table 6.1:

Categories	Volume	Percentage
Pre-Intervention Question: How polite do you think their school teachers would say your child is?		
Very Polite	4	80%
Neutral	1	20%

Table 6.2:

Categories	Volume	Percentage
Post-Intervention Question: How polite do you think their school teachers would say your child is?		
Very Polite	4	80%
Neutral	1	20%

The children are very polite and did not change in a very even after the five weeks of this study. Table 6.1 shows that the children were considered as being polite, to begin with, regardless of their interactions with Google AI Assistant. This information challenges the assumption that children replicate the behavior they use with their AI assistants when interacting with humans. Most children made repetitive requests, and only 3 children showed a slight increase in the use of polite forms when speaking to their Google AI Assistant. If this behavior were to be replicated when speaking to school teachers, the school teachers would not have felt that the child is above-average in their polite behavior.

The information presented in Table 6.1 and the politeness score assigned by parents for their children in the pre-intervention survey showed that the children were considered to be polite prior to this study. This also challenges Ken Gordon’s assumption that children who do not say “please” and “thank you” to their AI assistants are going to be unreflectively vocalizing their authority when interacting with people and when it comes to making commands to other people (Gordon, 2018)

Query tallies and further exploration per family

Family A:

Family A: Child's Use of Polite Forms					
	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	398	72	35	269	58
“Please”	3	0	0	2	1
“Thank you/ Thanks”	1	0	0	1	0
“Can you”	0	0	0	0	0
“Could you”	2	1	0	2	0
“Would you”	0	0	0	0	0
Polite Forms per week/Total Queries per week	2%	1%	0%	2%	2%

Family A: AI Assistant's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	398	72	35	269	58
"Please"	6	3	1	3	6
"Thank you/ Thanks"	8	0	0	4	0
"Can you"	5	0	0	13	2
"Could you"	0	0	0	0	0
"Would you"	11	0	0	1	0
Polite Forms per week/Total Queries per week	8%	4%	3%	8%	14%

Question	Responses
Pre-Intro Politeness Score:	5
Post-Intro Politeness Score:	6

Mid-point check-ins were conducted between Week 3 and Week 4 to ensure proper data collection. As we can see in the Child's Use of Polite Forms table, the number of queries made to the Google Nest Hub increased after the mid-point check-in that happened during Week 3. There is no difference in the use of polite forms over the five weeks.

However, the child's politeness score did increase from 5 to 6. When asked how often the child would say "please" and "thank you" in a day and in what situations they would say it, in both the pre-intervention and post-intervention survey, the parent indicated that the child would use polite forms whenever asking, receiving, or being helped and as the situation calls for it. Regarding their feelings about technology, in both the surveys, the parent indicated that they had mixed feelings. In the pre-intervention survey, the parent felt positively about technology and the involvement of technology in their life. They felt contradicting feelings about the use of AI but felt positively about the involvement of technology in the child's life. In the post-intervention survey, the parent indicated that they liked technology and found it beneficial but also indicated mixed feelings. The parent expressed fears of intrusion of privacy and felt technology and artificially intelligent technology could be overwhelming. They expressed that they found technology as being unavoidable and essential.

Family B:

Family B: Child's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	176	67	45	74	28
"Please"	25	11	17	30	14
"Thank you/ Thanks"	1	0	0	0	1
"Can you"	0	11	26	54	10
"Could you"	18	41	8	1	3
"Would you"	0	0	0	0	0

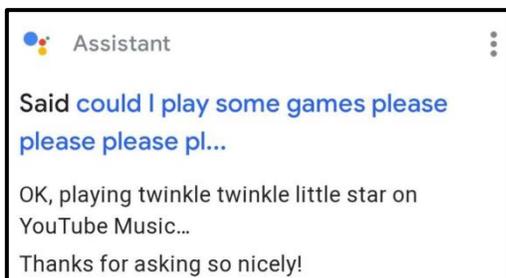
Polite Forms per week/Total Queries per week	25%	94%	113%	115%	100%
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Family B: AI Assistant's Use of Polite Forms					
	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	176	72	45	74	28
“Please”	0	0	2	5	0
“Thank you/ Thanks”	4	4	2	0	0
“Can you”	0	0	0	0	0
“Could you”	0	0	0	0	0
“Would you”	0	0	0	0	0
Polite Forms per week/Total Queries per week	2%	6%	9%	7%	0%

Question	Responses
Pre-Intro Politeness Score:	7
Post-Intro Politeness Score:	8

There is an increase in the child's use of polite forms over the five weeks. In the post-intervention survey, when asked whether there was anything unique about how the child interacted with the Google Nest Hub, the parent mentioned that the child used the word "please" often. There was an increase in the politeness score, which is appropriate due to the increased use of polite forms over the five weeks. Mid-point check-ins were conducted between Week 3 and Week 4 to ensure proper data collection. As we can see in the Child's Use of Polite Forms table, the number of queries made to the Google Nest Hub increased after the mid-point check-in that happened during Week 3.

When asked how often the child would say "please" and "thank you" in a day and in what situations they would say it, in both the pre-intervention and post-intervention survey, the parent indicated that the child would use polite forms whenever asking, receiving, or being helped and as the situation calls for it. Regarding their feelings about technology, in both the pre-intervention and post-intervention survey, the parent indicated mostly positive feelings. In the pre-intervention survey, the parent indicated that they feel neutral about the use of Artificially Intelligent Machines and that they worry about the involvement of technology in their child's life. In the post-intervention survey, the parent indicated only positive feelings regarding technology in their life and their child's life and the use of AI machines. They indicated that they found it useful and beneficial.



There could be explanations for the increase in the use of polite forms outside of the positive reinforcement feature. The child may have modified their behavior to help the research. In the legal guardian's (Appendix A) consent document, it is stated that we would be looking at query logs to see if the child says "please" more often throughout the five weeks. There is also the possibility of influence from the parent. If the use of

polite forms when interacting with the AI assistant was an expectation set by the parent, it would also explain the increase in the use of polite forms over the five weeks. Even though there were instances where the child would say "please" multiple times in a row, most of the time, they were starting their query by saying "can you please...?"

Family C:

Family C: Child's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	105	61	12	6	25
"Please"	0	0	0	0	0
"Thank you/ Thanks"	0	3	0	0	1
"Can you"	2	0	0	0	0
"Could you"	0	0	0	0	0
"Would you"	0	0	0	0	0
Polite Forms per week/Total Queries per week	2%	5%	0%	0%	4%

Family C: AI Assistant's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	105	61	12	6	25
"Please"	0	0	0	0	0
"Thank you/ Thanks"	0	0	0	0	0
"Can you"	0	0	0	0	0
"Could you"	0	0	0	0	0
"Would you"	0	0	0	0	0
Polite Forms per week/Total Queries per week	0%	0%	0%	0%	0%

Question	Responses
Pre-Intro Politeness Score:	10
Post-Intro Politeness Score:	9

There is no apparent increase in the child's use of polite forms. There is a decrease in the politeness score between the pre-intervention survey and the post-intervention survey. The parent indicated their disappointment that their child did not use polite forms when interacting with their AI assistants in the post-intervention survey. Mid-point check-ins were conducted between

Week 3 and Week 4 to ensure proper data collection. As we can see in the Child's Use of Polite Forms table, the number of queries made to the Google Nest Hub increased after the mid-point check-in that happened during Week 3. When asked how often the child would say "please" and "thank you" in a day and in what situations they would say it, in both the pre-intervention and post-intervention survey, the parent indicated that the child would use polite forms whenever asking, receiving, or being helped and as the situation calls for it. Regarding their feelings about technology, in both the pre- and post-intervention survey, the parent indicated mixed feelings. In the pre-intervention survey, the parent indicated that they feel positively about technology and the involvement of it in their lives. They indicated contradicting feelings regarding the use of artificially intelligent machines. They felt positively about the involvement of technology in their child's life but were also worried. In the post-intervention survey, the parent indicated that they found technology and AI to be useful and beneficial but felt that it may have negative effects as well.

Family D:

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	65	20	74	18	39
"Please"	0	0	0	0	0
"Thank you/ Thanks"	0	0	1	0	1
"Can you"	0	0	0	0	0
"Could you"	0	0	0	0	0
"Would you"	0	0	0	0	0
Polite Forms per week/Total Queries per week	0%	0%	1%	0%	3%

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	65	20	74	18	39
"Please"	0	0	3	0	0
"Thank you/ Thanks"	6	0	1	0	0
"Can you"	3	0	2	0	0
"Could you"	0	0	0	0	0
"Would you"	6	0	7	0	0
Polite Forms per week/Total Queries per week	23%	0%	18%	0%	0%

Question	Responses
Pre-Intro Politeness Score:	10
Post-Intro Politeness Score:	9

There is a small increase in the child's use of politeness forms over the five weeks. However, there is a decrease in the politeness score from the pre-intervention survey to the post-

intervention survey. When asked how often the child would say "please" and "thank you" in a day and in what situations they would say it, the parent had said that their child says "please" and "thank you" 1 to 4 times a day in the pre-intervention survey. In the post-intervention survey, the parent indicated that the child would use polite forms whenever asking, receiving, or being helped, and as the situation calls for it. In both the pre- and post-intervention surveys, the parent had mixed feelings about technology. In the pre-intervention survey, the parent indicated that they had fears and concerns about technology and felt that the involvement of technology was necessary. Regarding the use of artificially intelligent machines, the parent indicated that they found it scary, but also indicated contradicting feelings. They spoke about the opportunity for their child to learn things from AI machines that the parent may not want the child to know about yet. They felt that there was too much involvement of technology in their child's life, especially regarding the availability of technology. They indicated that they feel positively about the involvement of technology in their child's life but also mentioned that it negatively affects the child. In the post-intervention survey, the parent indicated that technology and AI were beneficial, but also indicated mixed feelings due to fears of intrusion and feeling overwhelmed.

Family E:

Family E: Child's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	7	13	121	21	108
"Please"	0	0	0	0	0
"Thank you/ Thanks"	0	0	1	0	0
"Can you"	0	0	0	0	1
"Could you"	0	0	0	0	0
"Would you"	0	0	0	0	0
Polite Forms per week/Total Queries per week	0%	0%	1%	0%	1%

Family E: AI Assistant's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	7	13	121	21	108
"Please"	0	0	0	0	0
"Thank you/ Thanks"	0	0	0	0	0
"Can you"	0	0	0	4	0
"Could you"	0	0	0	0	0
"Would you"	0	0	0	0	0
Polite Forms per week/Total Queries per week	0%	0%	0%	19%	0%

Question	Responses
Pre-Intro Politeness Score:	8
Post-Intro Politeness Score:	9

There is a slight increase in the child's use of polite forms. There is an increase in the politeness score from 8 to 9 between the pre-intervention and post-intervention surveys. When asked how often the child would say "please" and "thank you" in a day and in what situations they would say it, the parent had said that their child says "please" and "thank you" 1 to 4 times a day in the pre-intervention survey. In the post-intervention survey, the number of times a day increased to over 10 times a day and the parent indicated that the child would use polite forms whenever asking, receiving, or being helped and as the situation calls for it. In both the pre- and post-intervention surveys, the parent had mixed feelings about technology. In the pre-intervention survey, the parent indicated mixed feelings about technology. They felt positively about it and they had fears and/or concerns. They felt that the involvement of technology in their life was necessary and that it required them to make a compromise. They felt that the use of artificially intelligent machines was scary and that they had contradicting feelings about its use. They felt that there was too much involvement of technology in their child's life, especially regarding the availability of technology and also mentioned that it negatively affects the child. In the post-intervention survey, the parent indicated that they found technology and AI useful and beneficial but also indicated mixed feelings. They had fears of intrusion and felt that technology and AI were overwhelming. They felt that the usage of these machines had negative effects but that the usage was unavoidable and/or essential.

RQ: Does the use of Artificial Intelligence that provides positive reinforcement for polite verbal cues improve politeness in children between the ages of 5 and 13?

Discussion

The effects of AI that provides positive reinforcement for polite verbal cues among children were varied and inconclusive. There was no apparent increase in the use of polite forms with the use of the Google Nest Hub over the five weeks. There is an impressive increase in the use of polite forms in Week 2. However, there is no consistent positive trend. The percent of the use of polite forms does increase in Week 4. Mid-point check-ins were conducted between Week 3 and Week 4 to ensure proper data collection. There is an increase in queries and an increase in the overall use of polite forms in Week 4. There could be explanations for the increase in the use of polite forms outside of the positive reinforcement feature that is provided by the Google Nest Hub.

Aggregate - Child's Use of Polite Forms

	Week 1	Week 2	Week 3	Week 4	Week 5
Total Queries	751	233	287	388	258
“Please”	28	11	17	32	15
“Thank you/ Thanks”	2	3	2	1	3
“Can you”	2	11	26	54	11
“Could you”	20	42	8	3	3
“Would you”	0	0	0	0	0
Polite Forms per week/Total Queries per week	7%	29%	18%	23%	12%

The child may have modified their behavior to help the research. In the legal guardian's (Appendix A) consent document, it is stated that we would be looking at query logs to see if the child says “please” more often throughout the five weeks. The child may have become sensitized to this and appropriately modified their behavior to say “please” and/or “thank you” more often. There is also the possibility of influence from the parent. If the use of polite forms when interacting with an AI assistant was an expectation set by the parent, it would also explain the increase in the use of polite forms during Week 4. As time went on and the parent forgot to enforce politeness towards the machine, the child may have decreased their use of polite forms when making a query.

Effects of Parent's Perception on the Child's Use of Polite Forms					
	Pre-Intervention: Parent's Perception of Technology and AI	Post- Intervention: Parent's Perception of Technology and AI	Pre-Intervention Politeness Score by Parent	Post- Intervention Politeness Score by Parent	Actual Child's Use of Politeness Trends
Family A	Mixed	Negative	5	6	No difference
Family B	Positive	Positive	7	8	Increase
Family C	Mixed	Mixed	10	9	No difference
Family D	Negative	Mixed	10	9	Increase
Family E	Mixed	Mixed	8	9	Increase

The pre-intervention and post-intervention perception of technology and AI were identified through the use of content analysis to group the responses based on broad similarities. The politeness score was specifically given by the parents. The actual child’s use of politeness trends was observed by looking at the individual tally tables. These tables indicated how often polite forms were used in ratio to how many queries were made to the Google Nest Hub.

Parents' perception of AI machines and technology has no apparent impact on the child’s use of polite forms when interacting with the Google Nest Hub. In the pre-intervention survey, all the children were given either an average or above-average score. This politeness score was based on how well the child met all the aspects of the parents’ definition of polite behavior. All the children were considered as being average or above average in their polite behavior. The increase or decrease in the child’s use of polite forms when interacting with the Google Nest Hub may have not been taken into consideration when evaluating their politeness score in the post-intervention survey.

Family A mentioned that they did not notice their child using polite forms until the child began interacting with the Google Nest Hub. This may account for the increase in the politeness score in the post-intervention score. Family C mentioned having noticed that their child was not using polite verbal behavior with their AI and expressed disappointment, which may account for the decrease in the politeness score in the post-intervention survey.

Academic implications

Brown and Levinson (1987) stated that there are two desires based on face needs. Negative face is the desire to be unimpeded by others. Positive face is the desire to be desirable to others, and to be liked and appreciated by others. The use of "please" and "thank you" and requests in the form of indirect questions such as "can you?", "could you?", etc., are considered as uses of negative politeness as they provide the freedom from imposition (Brown & Levinson, 1987).

In the examination of the query logs, it was very noticeable that children would make identical, repetitive queries often. Their need would be met every single time without any resentment from the Google AI assistant. Children could ask the Google AI assistant to perform a task repeatedly within a small timeframe and have that need be met every time. No child was alone in their tendency to make repetitive requests. Almost all child subjects had a favorite TV show, or a favorite game to play, or a favorite bedtime story that they liked listening to at various and unpredictable times of the day. The Google AI Assistant never makes the child feel as though the child is imposing by making their request. The child sees no need to be polite because their needs are met regardless of the extent of their imposition on the Google AI Assistant.

The Google in-home assistant does not suggest saying "please" and "thank you". There is no social consequence if the child does not speak to the Google AI assistant politely. Legal guardians can choose to change their child's verbal behavior if they feel that it needs to be changed.

Practical Implications

According to Tables 3.1 and 3.2, the most common motivation for children to be polite is their parents' expectations. The fear for many parents is that if impolite verbal behavior is encouraged to be repeated and without reflection when speaking to their AI assistants, their child may grow up to have an empathetic blind spot when it comes to making commands to other people (Gordon, 2018). A solution for this behavior is to make polite verbal behavior an expectation when speaking with an AI assistant. Children may also benefit from being made aware of their verbal behavior when speaking to their AI assistant.

On the other hand, it may be beneficial for children to have the opportunity to ask questions while feeling free of imposition. AI assistants are known to aid people and free people from mundane, unengaging, and tedious tasks and jobs. When a child wants a bedtime story read to them at an inopportune time, an AI assistant does not mind fulfilling that task without complaint. Children can freely make repetitive requests and ask every question on their mind regardless of the time of day or the number of requests previously made. Children are free to make these requests without the fear of imposition. This frees up a parent from having to perform this task repetitively and at inopportune times.

Limitations

These results cannot be generalized to everyone since we had a very small sample of only 5 participating families. These results are not representative of everyone. People who participated in this study may have been particularly interested in the subject of this study and this technology.

In the post-intervention survey, questions were asked about why the specific gender of the voice assistant was chosen, and if a different gender would have resulted in different verbal behavior. This question was asked based on research by Nass, Moon, and Green (1997) that showed that our tendency to gender stereotype is deeply ingrained in human psychology, extending even to our treatment of machines. The majority of existing research within the field of HMC is conducted on adults. We cannot assume that these same conclusions are true for children as well.

There may have also been selection bias. Our sample may not have been representative of the general population since our participants consisted of families who were willing to allow their children to use an artificially intelligent voice assistant that collects data. Reservations about AI and the involvement of such technology in their child's lives may have yielded different results as to how their children treat their voice assistants.



There was a limitation in the way data was collected. To respect the families' privacy, participants were asked to screenshot the query logs and upload those screenshots to a password-protected USB. Some screenshots

would not show the full query that was made by the child to the Google AI assistant. There is a possibility of having missed some use of polite forms due to this issue.

For future research, it may be beneficial to have access to the query logs to ensure that no words are being cut out. Future research could also explore having two groups of family participants in a single-blind study: a control group and an experimental group. The control group could be given information in their consent document stating that the researchers would be looking at query logs to see if the child says "please" more often throughout the five weeks and that the parents are allowed to encourage children to use polite verbal behavior when interacting with their AI voice assistant. The experimental group could be given a similar consent document but the parents would be discouraged from expecting their child to behave differently when interacting with their AI voice assistant. Such a study would truly shed light on the effects of parents' encouragement on their child's use of polite forms when interacting with their AI voice assistant.

Conclusion

Many parents have expressed concerns that the practice of not saying "please" and "thank you" to their in-home voice assistants is starting to become their child's habit. Parents fear that their child will expect their needs to be met without having to use polite forms (Gordon, 2018, & Walk, 2016). This issue touches on Brown and Levinson's Politeness Theory. Brown and Levinson (1987) stated that there are two desires based on face needs – negative face is the desire to be unimpeded by others. The use of "please" and "thank you" and requests in the form of indirect questions such as "can you?", "could you?", etc., are considered as uses of negative politeness as they provide the freedom from imposition. Positive face is the desire to be desirable to others, and to be liked and appreciated by others (Brown & Levinson, 1987).

To combat the issue identified by concerned parents, Google rolled out the “pretty please” feature which provides positive reinforcement for polite verbal behavior – specifically for saying “please” and “thank you.” Five families participated in this study. A majority of parents did not consider saying “please” and “thank you” as being a major indicator of politeness, and that their child’s motivation to be polite was their upbringing and the expectation set by their parents. Although all parents agreed that technology is helpful and that it can have a positive impact, there was a consistent trend of parents feeling contradictory feelings of fear and worry. All child participants were considered to be either of average or above average in being polite. There was a slight increase in the use of polite forms over the five weeks in 3 of the children. This increase may have occurred due to expectations set by parents. Children could make repetitive identical requests without facing any resentment from the Google AI Assistant. There was no need for the child to use politeness in order to free themselves from imposition on the Google AI assistant. The Google AI assistant never makes the child feel as though the child is imposing by making their request. The child sees no need to be polite because their needs are met, regardless of the extent of their imposition on the Google AI assistant. AI assistants are known to free people from mundane and repetitive tasks. If a child is free to make repetitive requests to an AI assistant without the fear of imposition, it frees up a parent who may have more important things to do.

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Appendices

Appendix A: Legal Guardian Consent Document

Appendix B: Child Assent Document

Appendix C: Pre-Intervention Survey

Appendix D: Post-Intervention Survey

Appendix E: HSIRB Approval

Appendix A: Legal guardian Consent Document

Legal guardian Consent Document

Western Michigan University

School of Communication

Principal Investigator: Dr. Autumn Edwards

Student Investigator: Pooja Mandagere

Title of Study: Effects of AI on Children's Use of Politeness

STUDY SUMMARY: This consent form is part of an informed consent process for a research study and it will provide information that will help you decide whether you want to take part in this study. Participation in this study is completely voluntary. The purpose of the research is to find out how children interact with in-home artificially intelligent (AI) assistants, and will serve as Pooja Mandagere's honors thesis, for the requirements of the Lee Honors College. If you take part in the research, you will be asked to complete two surveys, and you will receive a Google Nest Hub with which your children will be asked to communicate for at least 10 minutes each week for five weeks. Your time in the study may take up to 10 minutes to complete each of the two surveys. The researcher will need to schedule a 30-minute time block to set up the Google Nest Hub in your home, and will be stopping by for up to 40 minutes in the middle of the five week observation period to ensure that data collection is occurring. After the five-week period, you will be asked to submit the question logs to the researcher. This step may take up to 30 minutes. The total time over a five-week period would be up to 2 hours. If we include the time that the child will interact with the Google Nest Hub, the total time would be up to 2 hours and 50 minutes. Possible risk and costs to you for taking part in the study may be as with the risks that come with using any machine or program that is deployed by a technology company, such as Google, the data stored within the machine maybe collected by the company. This data, if not secured sufficiently by the company, could be mismanaged if a data breach were to occur. By asking that you should have a Gmail account, we are not subjecting you to any more risk than you have already consented to on your own. By setting up the Google Nest Hub in your name, we are making sure that the questions asked by your child cannot be traced back your child. All the information you provide us (your pre-introduction survey, your query logs, and your post-introduction survey) will be provided through a password protected USB, or within a password-protected word document stored on a USB. Your name will not be on any document that you provide, and no information that you provide to us can be traced back to you. You will be given the password to your USB and/or the document stored in the USB. We will not use your name or your child's name in our analysis. Although there are no direct benefits to the participants, you will be contributing to our understanding of how successful machines are in promoting politeness behavior. Your alternative to taking part in the research study is not to take part in it.

You have been invited to participate in a research project called “The Effects of AI on Children’s Use of Politeness.” The following information in this consent form will provide more detail about the research study. Please ask any questions if you need more clarification and to assist you in deciding if you wish to participate in the research study. You are not giving up any of your legal rights by agreeing to take part in this research or by signing this consent form. After all of your questions have been answered and the consent document reviewed, if you decide to participate in this study, you will be asked to sign this consent form.

What are we trying to find out in this study?

We are trying to find out how children interact with in-home artificially intelligent (AI) assistants. We want to know if they will be polite to their in-home machines without any prompting from you or anyone around your child. We want to know if the positive reinforcement feature on Google’s in-home assistants would improve children’s politeness. We want to understand the motivation behind a child’s polite behavior towards the machine and observe if this behavior changes over time. We want to know if machines have the capability to successfully promote polite behavior in children.

Who can participate in this study?

You can participate in this study if you

1. Are a legal guardian or primary caregiver of a child between the ages of 5 and 13 years old,
2. Are a legal guardian or primary caregiver of a child who is able to make verbal requests,
3. Are a legal guardian or primary caregiver of a child who has a command of the English language
4. Are a current Gmail account holder,
5. Have in-home Wi-Fi.

Where will this study take place?

The Google Nest Hub will be placed in your home, and all data collection will take place in your home as the machine logs the questions that are asked.

What is the time commitment for participating in this study?

Each of the surveys may take up to 10-minutes to complete, and there are two surveys. The researcher will need to schedule a 30-minute time block to set up the Google Nest Hub in your home. At a time, convenient for you in the middle of those five weeks, the researcher will stop by your house and ensure proper data collection is occurring. This may take up to 40 minutes. After the five-week period, you will be asked to submit the logs to the researcher. This may take up to 30 minutes. The total time over a five-week period would be up to 2 hours. If we include the time that the child will to interact with the Google Nest Hub, the total time would be up to 2 hours and 50 minutes.

What will you be asked to do if you choose to participate in this study?

You will be asked to complete two surveys, and you will receive a Google Nest Hub. The researcher will set up the Google Nest Hub in your home. The child will have to periodically communicate with the machine for five weeks, for at least 10 minutes each week. The researcher will set up a time with you to stop by in the middle of those five weeks and make sure that data collection is occurring. You will be asked to screenshot and paste the results of your child's queries to a word document and share it with us.

What information is being measured during the study?

We will be measuring how children use verbal politeness cues when interacting with AI. We will be measuring how much more polite they are at the end of the five weeks than before. We will be looking at query logs to see if the child says "please" more often throughout the five weeks. We will also look at the results of the surveys to measure any improvements in politeness.

What are the risks of participating in this study and how will these risks be minimized?

We want to protect your privacy and make sure no information you provide can be traced back your name and your identity, and especially not your child or your child's identity. As with the risks of using any machine or program that is deployed by a technology company, such as Google, the data stored within the machine maybe collected by the company. This data, if not secured sufficiently by the company, could be mismanaged if a data breach were to occur. By asking that you should have a Gmail account, we are not subjecting you to any more risk than you have already consented to on your own. By setting up the Google Nest Hub in your name, we are making sure that the questions asked by your child cannot be traced back your child. All the information you provide us (your pre-introduction survey, your query logs, and your post-introduction survey) will be provided through a password protected USB or within a password-protected word document stored on a USB. Your name will not be on any document that you provide, and no information that you provide to us can be traced back to you. You will be given the password to your USB and/or the document stored in the USB. We will not use your name or your child's name in our analysis. To further ensure protection, we will provide a how-to guide after the set up of the Google Nest Hub in your home. The how-to guide will show you how to disable the microphone on the Google Nest Hub, how to turn the Google Nest Hub off completely, how to set up parental controls on the Google Nest Hub, and how to access the query log so that you can delete any sensitive or private questions that you child asked that you do not want analyzed in our study. Even after you have edited out sensitive information before submitting the queries, if we find that the Google Nest Hub has captured queries that are reportable, we will report to the local or state authorities. At the end of the study, you will be provided instructions to factory reset your Google Nest Hub.

What are benefits of participating in this study?

There are no direct benefits to you; however, the positive reinforcement provided by the Google Nest Hub may increase your child's use of "please" and "thank you". You may be contributing to our understanding of how successful machines are in promoting politeness behavior.

Are there any costs associated with participating in this study?

No, there are no costs associated with participating in the study.

Is there any compensation for participating in this study?

You will be given a Google Nest Hub to keep after you complete the study. You will be given instructions to factory-reset the machine after the study if you so please.

Who will have access to the information collected during this study?

We will have access to your completed survey, and the co-investigators will have access to the completed survey as well. Your name and the name of your child will not be written on the surveys. The surveys will be identified by a code number. If the results of this project are presented at a professional conference or published in a professional journal, no individual information will be provided. That means your name and the name of your child will remain confidential. The information collected about you for this research will not be used by or distributed to investigators for other research.

What will happen to my information or biospecimens collected for this research after the study is over?

The information collected about you for this research will not be used by or distributed to investigators for other research.

What if you want to stop participating in this study?

You may discontinue your participation in this study at any time for any reason. Even if you decide to begin the study, and change your mind, you may do so without any difficulties. The Google Nest Hub will be returned to the researcher if you do not wish to participate any longer so that it can be used by another family. If you decide to not answer the survey questions, you will be considered as no longer participating in the study.

You can choose to stop participating in the study at anytime for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences either academically or personally if you choose to withdraw from this study.

The investigator can also decide to stop your participation in the study without your consent.

Should you have any questions prior to or during the study, you can contact the principal investigator, Dr. Autumn Edwards at (269) 387-0358 or autumn.edwards@wmich.edu or the student investigator, Pooja Mandagere at (269) 598-6971 or pooja.p.mandagere@wmich.edu You may also contact the Chair, Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Western Michigan University Institutional Review Board (WMU IRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

Please sign each part for which you are providing consent.

1. I have read this informed consent document. The risks and benefits have been explained to me. I agree to share my responses on the checklist forms with Ms. Mandagere.
2. I agree to let Ms. Mandagere analyze the query logs of my Google Nest Hub, which includes queries that my child has made.

Please Print Your Name

Participant's Signature

Date

Appendix B: Child Assent Form

Assent Form

Western Michigan University

Department of: School of Communication

Principal Investigator: Dr. Autumn Edwards

Student Investigator: Pooja Mandagere

Project Title: The Effects of Artificial Intelligence on Children's Use of Politeness

We are doing a research study. A research study is a special way to find out about something.

We want to find out about how you interact with a robot like the Google Nest Hub.

You can be in this study if you want to. If you want to be in this study, you will be asked to talk to the Google Nest Hub.

We want to tell you about some things that might happen to you if you are in this study. The Google Nest Hub is a machine that you can ask questions to, play games and hear bedtime stories, and even listen to music and watch YouTube videos. You will be asked to talk to the Google Nest Hub for at least 10 minutes every week for 5 weeks. If you are in this study, your parent will look through your questions that you have asked the Google Nest Hub and delete any inappropriate questions. After they look through all the questions you have asked and made sure that it looks alright, your parent will submit your questions to us.

If you decide to be in this study, we might find out things that will help other children some day.

When we are done with the study, we will write a report about what we found out. We won't use your name in the report.

You don't have to be in this study. You can say "no" and nothing bad will happen. If you say "yes" now, but want to stop later, that's okay too. No one will be mad at you, or punish you if you want to stop. All you have to do is tell us you want to stop.

If you have any questions or concerns about this study, you may call either Dr. Autumn Edwards at (269) 387-0358 or Pooja Mandagere at (269) 598-6971.

The stamped date and signature of the board chair in the upper right corner means this consent document is approved for use for one year by the Human Subjects Institutional Review Board. Do not participate if the stamped date is more than one year old.

If you want to be in this study, please sign your name.

I, _____, want to be in this research study.
(write your name here)

Investigator signature

(Date)

Appendix C: Pre-Intervention of the Google Nest Hub Survey

Child's Gender (circle one):

Male	Female	Prefer not to say
------	--------	-------------------

Child's Age: _____

Today's Date: _____

Relationship of the person completing this survey to the child:

How do you feel about technology?

How do you feel about the involvement of technology in your life?

How do you feel about the use of Artificially Intelligent machines?

How do you feel about the involvement of technology in your child's life?

How would you define politeness?

Using this definition, would you consider your child to be polite?

On a scale of 1 to 10 (10 = very much meeting all aspects of your definition of politeness) how polite would you say your child is?

Does not meet
any aspect of
my definition of
politeness

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Meets all
aspects of my
definition of
politeness

What other language(s) do you speak at home? What are indicators of politeness in the language other than English?

If you speak languages other than English: would you consider your child to be someone who uses politeness cues in this language as well?

How polite do you think their school teachers would say your child is?

Have there ever been any behavior complaints about your child's ability to be respectful of others? Especially complaints made by those who have authority over them?

Has your child ever become frustrated with a piece of technology?

What motivation do you believe your child has to be polite?

How often would you say your child says "Please" and "Thank you" in a day? In what situations are they most likely to say this?

Is there anything else about your child's behavior that you would like to disclose?

Appendix D: Post-Introduction of the Google Nest Hub Survey

How often would you say your child says "Please" and "Thank you" in a day? In what situations are they most likely to say this?

How do you feel about the Google Nest Hub? About the involvement of the Google Nest Hub in your child's life?

In what manner did your child interact with the Google Nest Hub? Was there anything unique that happened with the way they spoke when they spoke to the Google Nest Hub?

Did your child ever become frustrated with the Google Nest Hub?

Did you set up voice match to detect the sound of your child's voice?

Why do you think you or your child chose the (male/female, the gender selected would be provided here) voice for the Google Assistant?

Do you think your child would respond differently to a (opposite gender would be provided here) voice?

Based on your previously provided definition of politeness (the previous definition would be provided here), On a scale of 1 to 10 (10 = very much meeting all aspects of your definition of politeness) how polite would you say your child is?

Does not meet
any aspect of
my definition of
politeness

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Meets all
aspects of my
definition of
politeness

Using your previously stated definition of politeness (the previous definition would be provided here), would you consider your child to be polite?

How polite do you think their school teachers would say your child is?

Did your child frequently use an AI assistant prior to this study? (ex: Alexa, Siri, Google, Cortana, etc.)

If so, did you notice your child ever say "please" and "thank you" when interacting with this device?

How do you feel about technology? About the involvement of technology in your life? About the use of Artificially Intelligent machines? About the involvement of technology in your child's life?

What motivation do you believe your child has to be polite?

Is there anything else about your child's behavior that you would like to disclose?

Appendix E: HSIRB Approval

WESTERN MICHIGAN UNIVERSITY



Institutional Review Board
FWA00007042
IRB00000254

Date: November 20, 2019

To: Autumn Edwards, Principal Investigator
Pooja Mandagere, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: IRB Project Number 19-08-32

This letter will serve as confirmation that your research project titled "Effects of AI on Childrens' use of Politeness" has been **approved** under the **expedited** category of review by the Western Michigan University Institutional Review Board (IRB). The conditions and duration of this approval are specified in the policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes to this project (e.g., ***add an investigator, increase number of subjects beyond the number stated in your application, etc.***). Failure to obtain approval for changes will result in a protocol deviation.

In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

A status report is required on or prior to (no more than 30 days) November 19, 2020 and each year thereafter until closing of the study.

When this study closes, submit the required Final Report found at <https://wmich.edu/research/forms>.

Note: All research data must be kept in a secure location on the WMU campus for at least three (3) years after the study closes.

Office of the Vice President for Research
Western Michigan University
1903 W. Michigan Ave., Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276
WEBSITE: wmich.edu/research/compliance/hsirb

CAMPUS SITE: Room 251 W. Walwood Hall