Home Tech Care: Intergenerational Tech Support

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(ABSTRACT)

As the global population of older adults continues to expand at an unprecedented rate, the field of Human-Computer Interaction (HCI) must continue to evolve to address the increasingly complex and diverse needs of this demographic. Specifically, the older adult demographic is confronted with age-related bias in their relationship with technology. This paper introduces Home Tech Care, a novel intergenerational tech support program designed to increase allophilia, i.e., positive views of members of a group. At its core, Home Tech Care is an educational program that incorporates younger adults in the technological education of older adults. This is accomplished in two ways: 1) a formalized educational card game and 2) older adult-led daily use tech support. With this infrastructure in place, this thesis seeks to answer three RQs: 1) How can Home Tech Care practices foster intergenerational allophilia as measured by the Wagner et al. model?; 2) How does Home Tech Care's educational card game, Icon Recognition Go Fish, influence intergenerational icebreaking and social dynamics; 3) How do qualitative feedback themes (e.g. appreciation, frustration, confidence) map across the four tiers of the Kirkpatrick model. Each of these questions aligns with Home Tech Care's ultimate goal of exploring how intergenerational tech support can address age-related biases. Qualitative and quantitative data were collected through pre- and post-program surveys, volunteers' field notes, and older adult feedback. The results of this thesis showed a positive increase in intergenerational allophilia, specifically in the areas of affection and engagement. There were also positive responses to Icon Recognition Go Fish, with both older and younger adults seeing social benefits in gameplay. The Kirkpatrick model highlighted how Home Tech Care achieved these positive reactions while also identifying areas where the program could be improved. With the

largest older adult demographic on the horizon, intergenerational tools will be essential. The results of this thesis support the idea that intergenerational programs, such as Home Tech Care, could be instrumental in creating an age-inclusive future.

Home Tech Care: Intergenerational Tech Support

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(GENERAL AUDIENCE ABSTRACT)

As the global population of older adults grows at an unprecedented rate, the field of Human-Computer Interaction (HCI) must adapt to address the complex needs of this demographic, particularly in overcoming age-related biases in technology use. This thesis introduces Home Tech Care, an intergenerational tech support program designed to foster allophilia, positive attitudes toward members of other groups, through collaborative learning between younger and older adults. The program integrates two components: a formalized educational card game (Icon Recognition Go Fish) and older adult-led daily technology support. Three research questions guided the evaluation: (1) how Home Tech Care practices foster intergenerational allophilia, (2) how the card game influences social dynamics and icebreaking, and (3) how participant feedback maps onto the Kirkpatrick model of training evaluation. Data were collected through surveys, field notes, and participant feedback. Results indicate increased intergenerational allophilia, particularly in affection and engagement, alongside positive social outcomes from gameplay. The Kirkpatrick model further highlighted both successes and areas for improvement. Findings suggest that intergenerational programs such as Home Tech Care can play a vital role in building age-inclusive futures by reducing bias and strengthening social connections across generations.

Contents

Chapter 1

Introduction

Negative aging stereotypes affect all age groups. Today's young adults will age with their cultural attitudes, while the attitudes of their present-day counterparts will impact older adults of the future. With the older adult population projected to triple by 2050, addressing age-related attitudes is more important than ever [101]. Intergenerational bias is well-documented, with older adults viewing younger generations as antisocial and unintelligent [111], and younger adults perceiving older adults as incompetent [23, 73]. These biases harm both age groups, who internalize negative stereotypes [125]. Older adults have internalized the negative stereotype that they are bad with technology [74]. This poor self-concept can further distance older adults from younger, tech-savvy generations.

One way that these attitudes can be addressed is by putting both older and younger adults in proximity with each other [115]. An example of this, in a technological context, is intergenerational tech support [83]. This type of intervention builds off the principle of service learning and encourages the examination of biased beliefs [90]. In intergenerational tech support, both older and younger adults are confronted with their biases as they work towards addressing the older adult's technology questions [115]. While intergenerational tech support can be beneficial by answering questions and breaking down intergenerational barriers, it also raises several issues. One of them is the social dynamic between the younger adult volunteers and the older adult recipients. The different age groups will bring their personal bias into the interaction [12]. External social support is needed to navigate the potential negative attitudes. In addition to interpersonal issues, the tech support structure, if not examined, can impede the intergenerational tech support goals. An analysis of the participant's learning, reaction, and behavior is necessary.

I created a free tech support program, Home Tech Care, to research the potential of intergenerational tech support. Specifically, Home Tech Care explores the areas of allophilia (positive feelings towards another age group), educational card game social dynamics, and program development and evaluation. Each of these areas plays a role in contributing to the overall intergenerational tech support goals as well as confronting the embedded issues. This thesis aims to create an age-inclusive tech support environment by answering three research questions: 1) How can Home Tech Care practices foster intergenerational allophilia as measured by the Wagner et al. model [133]? 2) How does Home Tech Care's educational card game, Icon Recognition Go Fish, influence intergenerational icebreaking and social dynamics? 3) How do qualitative feedback themes (e.g., empowerment, frustration, confidence) map across the four tiers of the Kirkpatrick model [71]?

Home Tech Care, launched nearly two years ago, is a cross-disciplinary tech support initiative developed in partnership with Virginia Tech's Human Development, Computer Science, and Gerontology departments. Operating in 8-week cycles at Warm Hearth Village (W.H.V.) in Blacksburg, the program pairs student volunteers with rural older adults to play an educational card game and answer everyday tech questions. It fosters intergenerational interaction in a relaxed, social setting. Originally modeled after group-based tech support programs, Home Tech Care shifted to in-home visits after learning from W.H.V. residents that rural living and bulky devices made travel to off-campus sessions impractical. Research confirms rural older adults face barriers like geographic isolation and limited resources, and prefer tech help from acquaintances rather than close contacts [80, 126]. The program addresses these needs by offering accessible, personalized support. Each

Figure 1.1: Home Tech Care is an IRB-approved research initiative that I have run at Warm Hearth Village, Blacksburg, for over a year. As part of my research, I take Virginia Tech Human Development capstone students to Warm Hearth Village to provide free, in-home tech support.

week, student volunteers visit the same residents to build rapport and maintain continuity. Residents were recruited via W.H.V.'s volunteer network and email outreach, while volunteers came from a Virginia Tech Human Development Capstone course. The program served nine older adults and four student volunteers. Sessions included 15 minutes of Icon Recognition Go Fish to act as a intergenerational icebreaker and create a positive social dynamic. The last 45 minutes of the session were devoted to daily use tech Q&A. Volunteers were trained beforehand, and complex issues involving W.H.V. devices were referred to the W.H.V's IT staff.

Based on the data collected in response to the research questions, a thematic analysis was conducted on both quantitative and qualitative results. This approach enabled the identification of recurring patterns and insights across the three research questions. Home Tech Care aimed to foster intergenerational allophilia categorized by affection, comfort, kinship, engagement, and enthusiasm between older adults and young volunteers [133]. Pre- and post-surveys showed overall positive shifts, with most participants reporting increased positive attitudes. The majority of the allophilia categorizations saw 20-50% increases. While some responses showed uniformly high ratings, these were interpreted as well-meaning rather than precise. The most notable gains were in affection and engagement, while minor declines were observed in kinship and enthusiasm, affecting only one participant. Personal interaction is crucial for fostering allophilia, as it's easier to respect someone you know [17]. These interactions have created positive outcomes. One of my previous Home Tech Care recipients, Martha, was struggling with the idea of web browsers. The student volunteer encouraged her by sharing that they struggled with mailing letters and packages. Martha was shocked that something so intuitive for her was a challenge for the younger volunteer, which helped put her web browser experience in perspective. These results suggest the program successfully strengthened intergenerational bonds and offer guidance for future improvements.

Icon Recognition Go Fish shows promise as an educational and social tool for intergenerational tech support. Research suggests that small misunderstandings, like not recognizing icons, can create friction between the helper and the learner, slowing down progress and increasing frustration [45]. No one wants to feel confused or left behind, especially when learning something new. And no one wants to feel like they're failing to help. That's why Icon Recognition Go Fish was incorporated into Home Tech care, to help the tech sessions flow smoothly, without awkward pauses or growing frustration. Participants engaged meaningfully with the game, demonstrating curiosity, repeated attempts at icon recall, and a desire to improve. While some icons were challenging, structured gameplay encouraged learning in a low-pressure, socially engaging environment. Final levels achieved reflected older adults' comfort and progression, with volunteers adapting gameplay accordingly. The game also served as an effective intergenerational icebreaker, contributing to Home Tech Care's broader tech support efforts by fostering connection and digital confidence.

Themes were generated from the accumulated data and mapped across the four levels of the Kirkpatrick Model [71]. Reaction was measured by older adults' responses to recruitment, with sixteen participants expressing strong interest and appreciation for the program. Learning was assessed through Icon Recognition, Go Fish, and qualitative field notes, which revealed reduced anxiety and some frustration. Behavior was evaluated using the Wagner et al. model of allophilia [133], showing improved intergenerational attitudes among participants and an increase in technological confidence. Results reflected the program's broader impact, with older adults gaining practical tech skills and expressing enthusiasm and a desire to continue.

While this work represents only a small step toward addressing the broader challenges faced by the growing population of older adults, it underscores the potential of technology to foster inclusivity across generations. By combining educational gameplay with tailored tech support, Home Tech Care and the research presented in this thesis contribute to building a more age-inclusive digital future, one where older adults are empowered, engaged, and supported through thoughtful intergenerational design and innovation.

Chapter 2

Review of Literature

This thesis is grounded in a broad range of literature across various literary domains. It builds on existing challenges faced by rural older adults, intergenerational tech support, educational card games, and the Kirkpatrick and Wagner models. Each of these areas helps inform the research questions and approaches outlined in the methodology 4.

2.0.1 Rural Older Adults and Technology

In the context of this thesis, rural older adults refer to 65+ aged individuals living in rural areas. Their unique set of challenges distinguishes this subset within the older adult community. For example, rural older adults face unique challenges in terms of health, access to health services, affordable housing, and support systems [59]. Two factors play a significant part in these challenges: geographical isolation and socio-economic status [59]. Geographic isolation leads to a lack of emergency health resources and available commodities, as well as hostile environments [24]. Rural communities have historically been at a socio-economic disadvantage [124]. The weight of these challenges has to be taken into account when collaborating with rural older adults. For example, when Nurian et al. investigated rural adults' reactions to COVID-19, they were careful to acknowledge the unique challenges: a lack of services, such as transportation, communication infrastructure, healthcare, and social services [99]. Despite these challenges, rural older adults form a resilient community that is well-equipped to face what life throws at them [99].

Broadly, older adults' technology usage reflects unique generational preferences and challenges [10]. The HCI community has a history of exploring the relationship between older adults and technology [78]. A variety of questions have been raised about usability needs, including what older adults' usability needs are when interacting with voice assistants [82], e-health [137], and AI-enabled technologies [121]. Especially pertinent to this thesis is work done on age-related differences in usability of mobile device icons [56, 81]. Older adults have been responsive to interacting with various technologies, including cognitive stimulation software [2], voice interfaces [55], and wearable sensors [13]. While some struggle with specific technologies, they adapt and create workarounds [112].

The HCI community also has a history of looking at the intergenerational aspects of older adults' technology use. For example, how can technology be used to connect different age groups? [113] This has been explored in established relationships [9, 11] as well as among strangers [14, 28]. Intergenerational interventions have seen positive results in game design [37, 66] and digital education [40, 54]. Regardless of the experience being explored, it is essential to consider the sociocultural environment [114]. This thesis aims to consider the rural status of the older adult participants in the program design, as well as the social dynamics between the different age groups involved.

2.0.2 Intergenerational Tech Support

When older adults seek out new technologies, they can run into barriers [69, 85]. Anxiety around technology can reduce motivation for continued learning and experimentation with new technologies [130]. For example, multiple interventions have found that older adults frequently struggle to adopt video calling technologies, not because of a lack of interest, but due to difficulties with device setup, low confidence, and fear of making mistakes [49].

In response to these challenges, a growing number of programs now engage younger people to support older adults' technology learning through intergenerational interaction [102]. These initiatives are grounded in the idea that younger adults, who are often more fluent in digital technologies [131], can serve as accessible and relatable guides [139]. While such approaches show strong social potential [44]. This is especially true when hierarchical structures are avoided and participants are instead positioned as co-learners to help foster greater empathy, mutual respect, and sustained engagement [133].

Wagner and Luger, for instance, found that assigning youth as "instructors" and older adults as "learners" often led to functional exchanges focused on task completion, with little emotional connection or flexibility [134]. These findings highlight the importance of designing intergenerational tech support experiences that are not only effective but also socially meaningful. Moreover, younger tech support providers often report feeling unprepared to guide learning or manage communication gaps, especially when older adults appear hesitant, confused, or slow to respond [104, 134]. These challenges can be further exacerbated by generational differences in communication styles, expectations, and familiarity with digital terminology [115].

This thesis seeks to address these gaps by emphasizing the need for a functional intergenerational tech support tool that actively supports the social dynamics of tech support sessions. Intergenerational tech support can be a scaffold for building mutual understanding and preventing miscommunication or interruptions [80]. Rather than relying solely on instructional models, this thesis focuses on Icon Recognition Go Fish to create shared learning experiences that are both educational and relational. By embedding digital literacy within a playful, collaborative context, this thesis seeks to reduce anxiety, promote curiosity, and foster more equitable and empathetic interactions between generations.

2.0.3 Older Adult Educational Card Games

Games are widely recognized as an effective educational strategy due to their ability to increase engagement, provide structured learning goals, and improve motivation [142]. These strengths have positioned educational games as serious tools across a variety of domains. For example, they have been used in cognitive training for older adults [29, 39, 87], health education and behavior change [50, 63], reducing stereotypes and shifting attitudes [80], and teaching domain-specific content such as chemistry or computational thinking [47, 51, 129]. With appropriate interaction design and narrative scaffolding, games can help users explore complex topics, engage in safe practice, and make abstract knowledge more tangible and understandable [6, 35].

Given these advantages, Home Tech Care sessions are centered around older adult educational card games as the foundation for intergenerational tech support intervention. Card games offer a familiar and accessible format for older adults, providing opportunities for both structured interaction and informal assessment. Prior research has explored several strategies to enhance the effectiveness of educational games for older adults, including simplifying interactions, designing around familiar themes, and providing timely and appropriate feedback [39, 87]. For instance, Lu et al. demonstrated that older adults could complete frustration-free memory exercises when the game design incorporated intuitive, daily-life tasks [87]. Similarly, in the domain of health education, games that utilize metaphorical storytelling and interactive challenges have enabled younger users to engage with sensitive topics, such as sexually transmitted infections and contraception, in a non-threatening and informative manner [50].

Educational card games also offer a unique opportunity to assess cognitive and behavioral progress through gameplay. Gielis et al. (for example) demonstrated that cognitive functions such as attention, flexibility, and executive control can be inferred from observable behaviors in familiar card games, like Klondike Solitaire [47]. These findings suggest that card games serve not only as learning tools but also as informal diagnostic instruments, providing insight into user engagement and cognitive processing without the need for formal testing. Despite the strong evidence supporting the use of educational card games for older adults, a notable gap remains in their application to intergenerational tech support. Most existing tech support research focuses either on knowledge acquisition [5, 6, 129] or on shifting attitudes and reducing stereotypes [80], rather than on supporting the collaborative and social processes that are central to effective intergenerational learning [35, 63, 75].

This thesis integrates both knowledge acquisition and social attitudes into Icon Recognition Go Fish. To support the educational aspect of Home Tech Care, Icon Recognition Go Fish focuses on older adults' ability to recognize and interpret computer icons. Icons with high semantic distance, minimal detail, or abstract representations can be complicated for older users to interpret accurately [51, 64, 140]. By focusing on collaborative instruction and shared gameplay experiences [29], Icon Recognition Go Fish aims to create a learning environment that is both supportive and socially engaging. Through this dual focus, Icon Recognition Go Fish is positioned not only as a tool for digital literacy but also as a platform for building empathy, communication, and mutual respect between generations.

2.0.4 Kirkpatrick and Wagner Models

This thesis uses two core models to accomplish its goal: the Kirkpatrick model for program evaluation [71] and the Wagner allophilia model [133]. The Kirkpatrick Model is one of the most widely adopted frameworks for evaluating the effectiveness of educational and training programs, particularly in professional and organizational contexts [16]. Initially developed by Donald Kirkpatrick in the 1950s, the model has since evolved into a foundational tool for assessing the impact of instructional interventions across various domains. Its structured, multi-level approach allows evaluators to systematically examine not only the immediate reactions of participants but also the deeper learning outcomes, behavioral changes, and long-term organizational results that stem from a given program [123].

The rationale for conducting such evaluations is threefold: providing critical feedback, ensuring knowledge transfer, and demonstrating tangible value [70, 72]. The versatility of the Kirkpatrick Model has led to its application in a wide range of disciplines, including medical education, corporate training, social sciences, and increasingly, computer science education and professional development [8]. Its adaptability makes it particularly useful in evaluating both traditional and technology-enhanced learning environments [71].

The model is structured into four hierarchical levels: Reaction, Learning, Behavior (Transfer), and Results. The first level, Reaction, assesses participants' immediate responses to the training experience, including satisfaction and perceived relevance. The second level, Learning, measures the extent to which participants have acquired the intended knowledge, skills, and attitudes. The third level, Behavior, evaluates the degree to which participants apply the desired behavior outcomes. Finally, the fourth level, Results, examines the broader impact of the training on organizational performance and a holistic perspective [72]. Each level builds upon the previous one, creating a comprehensive framework for understanding and enhancing the effectiveness of educational interventions [71].

The Wagner allophilia model was developed to assess changes in attitude between older and younger adults [134]. Lisa Wagner is a professor of psychology at the University of San Francisco. The model is adapted from Pittinsky, Rosenthal, and Montoya's allophilia measures [110]. Their work examined the creation of positive attitudes towards members of a minority [109]. Pittinsky argues for a multidimensional approach to positive and negative attitudes towards the ”other” [108]. Wagner built on these ideas and applied them to older and younger age groups [133]. The model was developed as part of a Generations to Generation course, which led to younger adults liking older adults more as a result of the course [134]. This course was held in the United States. The model looks at five themes: affection, comfort, kinship, engagement, and enthusiasm. This thesis draws directly from Wagner's work by utilizing the 18-question questionnaire that was developed. This model, in tandem with the Kirkpatrick model, has been used to assess Home Tech Care as an intergenerational intervention.

Chapter 3

Foundational Work

Home Tech Care built off two previous works: 1) Nature HCI Approach to Intergenerational Icebreaking [14] and 2) Ageism in the Computer Science Classroom. For the first previous work, published at Creativity and Cognition 2025, I led a team of four undergrads and two older adults in this study. The goals of this project was to examine intergenerational allophilia as two generations interacted using the Marco Polo application. The results are interpreted through the lens of a Nature HCI framework. The second previous work will be published at Frontiers in Education this year. It was an exploration of ageism in the computer science classroom. The results focus on the key insights from the study, ageist assumptions, and the origins of those assumptions. Each of these papers are summarized below. Both of these works informed the creation of Home Tech Care, its methodology, and the results from this masters thesis.

3.1 Nature HCI Approach to Intergenerational Icebreaking

Authors: Natalie Andrus, James Barber, Yiting Wen, Aaron Ye, and Austin Allen

Technology and nature are often viewed as separate domains, yet their integration has the potential to foster deeper connections between generations. In this study, we explore how asynchronous video storytelling using the Marco Polo app can help connect older and younger adults while enhancing engagement with nature. Over a two-week period, participants recorded and exchanged short outdoor video reflections, creating discussions on personal experiences and memories tied to natural settings. Through analysis of participant diaries, interviews, and video interactions, we found that storytelling served as a useful icebreaker, with nature acting as a catalyst for meaningful intergenerational communication. Our findings highlight the role of place, time, and community in shaping these experiences, revealing both the benefits and limitations of asynchronous communication in fostering emotional connections. These insights inform the design of future digital tools to integrate storytelling, nature, and intergenerational engagement, ultimately strengthening social bonds through technology.

3.1.1 Introduction and Background

In today's tech-driven world, two key questions guide our work: How does nature-based AVS icebreaking influence intergenerational allophilia, and how can our tools better foster it? These questions are vital to advancing inclusivity and sustainability in human-computer interaction (HCI). To explore them, we used Marco Polo, an asynchronous video app, to connect with two older adults (65+). Our nature-based storytelling method accommodated differing schedules: on odd days, we shared outdoor video reflections; on even days, we responded, sparking dialogue around nature and technology. This approach reduced digital barriers for older participants and deepened our understanding of tech's role in connecting people to nature. Marco Polo proved effective in blending technology with natural experiences while strengthening intergenerational bonds.

We build off previous Nature HCI, icebreaking, video sharing, and sociology research. Our aim is to contribute a unique approach to intergenerational icebreaking that will prompt future research. The goal of this research is to break down intergenerational bias through a combination of nature, icebreaking, and storytelling. While previous researchers have explored this topic [136], we uniquely use the medium of asynchronous video sharing to accomplish this goal.

Many researchers have developed technologies that engage with nature [61]. Our contribution to HCI is a Nature HCI approach to icebreaking, guided by the Jones et al. framework [60], which categorizes Nature HCI into three domains with subcategories (see Fig. 2). Rooted in Borgmann's philosophy that technology can diminish real-world engagement—especially with nature [22]—this model evaluates whether tech enhances or reduces natural experiences, such as solitude. We used it to interpret our findings and position our work within Nature HCI.

Social isolation negatively impacts well-being [53], making tools that promote connection essential. Icebreaking accelerates group bonding and improves collaboration [58]. We explored its overlap with storytelling, both known to foster connection [58, 89], and built on work examining their intersection [76]. Effective icebreakers reduce formality and hierarchy [7], a dynamic supported by technologies like wearables [62], mobile apps [103], and touch-based devices [93]. Our work contributes to Nature HCI research on story-driven icebreaking [136].

Unlike typical icebreaking studies, we measured success using a Nature HCI lens and the concept of allophilia—positive intergenerational sentiment. Biases persist: older adults often view youth as antisocial [111], while younger adults see elders as incompetent [23, 73]. These stereotypes are harmful [125]. Though tech can divide generations [84], it also fosters connection [79] and reduces bias [20]. We applied Wagner's allophilia model [133], adapted from Pittinsky et al., to assess affection, comfort, kinship, engagement, and en-

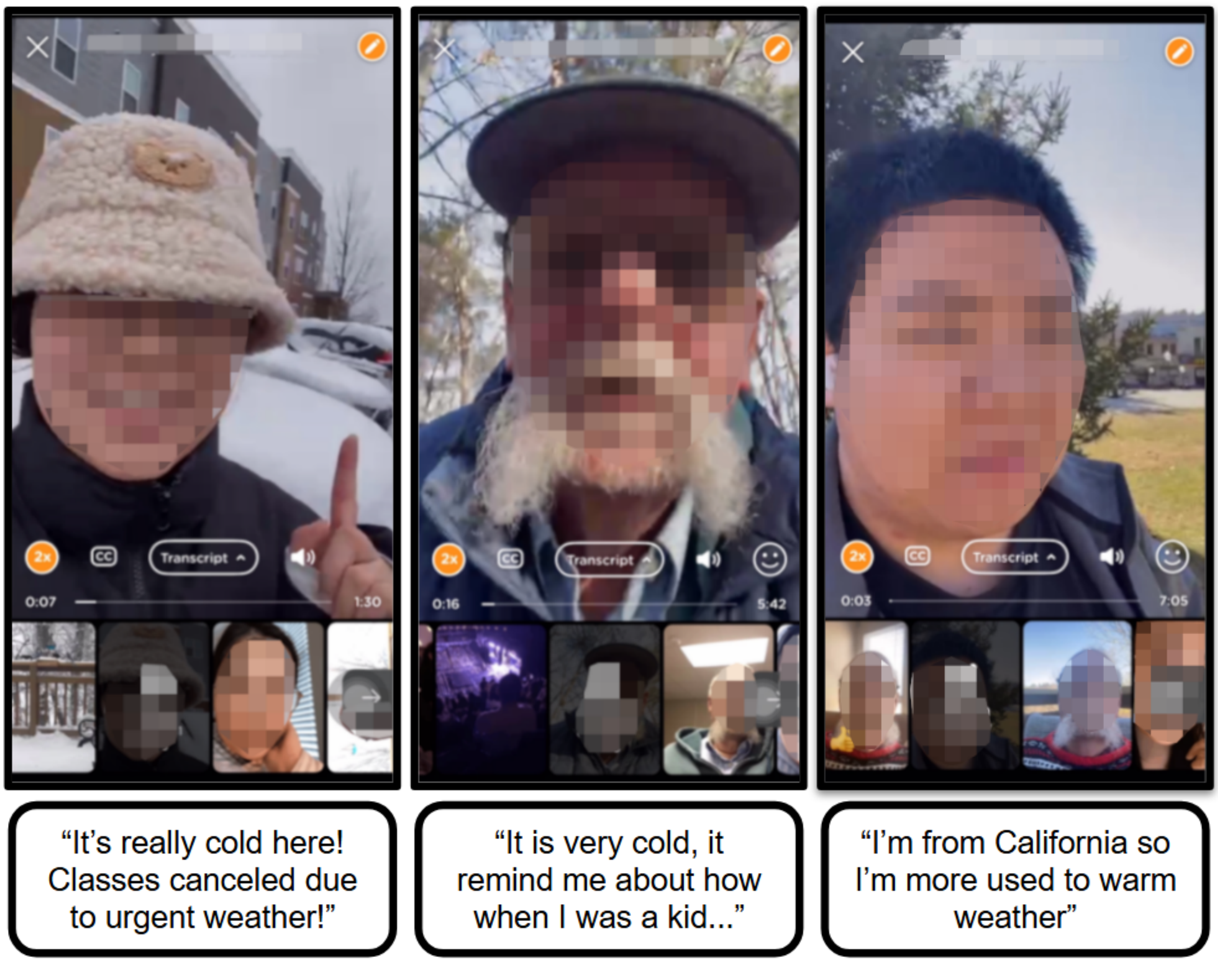

Figure 3.1: We divided the six participants into two groups, each consisting of two younger adults and one older adult. The members of each group engaged in a Marco Polo group chat, as illustrated above. Group members were prompted to describe the nature around them and tell a story. The text beneath each image is paraphrased from the video transcripts.

thusiasm between younger (18–25) and older (65+) adults. While our sample size limits statistical power, the model informed our analysis.

Video sharing is now routine, both publicly (e.g., YouTube) and privately (e.g., FaceTime). HCI research explores user-tool interaction [15], including loading symbols [68], accessibility [31], voice navigation [26], and latency reduction [42]. It also examines human-human dynamics: speech patterns [120], long-distance relationships [95], and AI-mediated conversations [30]. Our study blends AVS user experience with sender-receiver relationships.

The Marco Polo app is an AVS platform for sending video messages to individuals or groups. Responses are limited to emojis or video replies, with emojis visible only after sending. These appear on the video thumbnail. Most interface features (e.g., 2x speed, note-taking) are paywalled, though participants could access voice mods and filters.

3.1.2 Methods

Our study used Marco Polo, an asynchronous video chat app, to explore nature-based icebreaking between older and younger adults. We recruited two older adults (65+) and four younger adults (mid-20s), forming two teams of one older and two younger participants. Consent was obtained, and participants were anonymized using codes: YA1–YA4 and OA1–OA2. Older adults received $25 gift cards; younger adults earned course credit. While we did not collect digital literacy data, we acknowledge its potential value.

Over two weeks, participants recorded 3–5 minute videos on weekdays. On Mondays, Wednesdays, and Fridays, they filmed outdoors, reflecting on nature and personal memories. On Tuesdays and Thursdays, they responded to their teammates' videos, fostering asynchronous dialogue. Videos were recorded before 8 p.m. to respect participants' schedules (see Fig. 1).

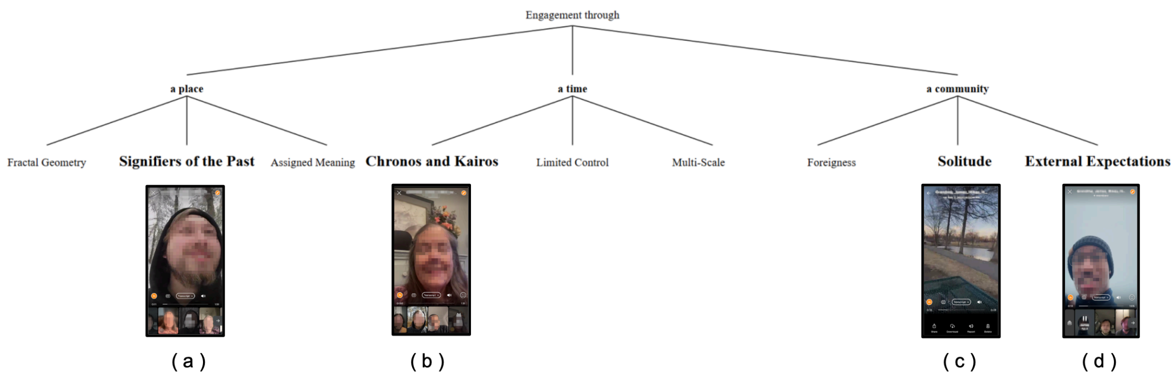

Figure 3.2: We used the Jones et al. Nature HCI framework to describe our results [60]. The bolded labels represent the main categories in our results. (a) This image shows YA2 telling a story about how an apple tree reminds him of his grandmother; (b) This image shows OA2 telling a story about how time seemed to stop on a trip to the beach; (c) This image shows YA1 recording an empty park and the feeling of being alone in nature; (d) This image shows YA1 discussing the external expectations of the study and how they interfere with his own expectations

Data was gathered through daily diary entries (by younger adults), allophilia surveys, group discussions, and semi-structured interviews with older adults—conducted by members of the opposite team to reduce bias. Diary templates distinguished between recording and response days, capturing duration and notable moments.

We analyzed the data thematically, organizing diary and interview notes into activity categories based on the Jones et al. Nature HCI framework [60]. These categories, along with survey results, guided our group discussions and addressed our core research questions: How does AVS icebreaking in nature affect intergenerational allophilia, and how can our tools and methods be improved?

3.1.3 Findings and Discussion

Our results show that "place" significantly shaped participants' experiences. Natural environments triggered personal memories and emotional responses. YA1 recalled, "Reminded me of my first year at Virginia Tech when I saw the [pond] and heard about it from tour guides." YA2 was reminded of time with his grandmother by an apple tree, while YA4 connected the warm climate to his California upbringing: *"Being someone from the California Bay Area, we basically have no weather besides clear skies and a full day of sun."* These landscapes served as symbolic anchors for memory and meaning.

Designs can leverage these symbols to deepen user engagement—for instance, by embedding personalized elements into virtual nature settings to evoke emotional resonance.

Time also played a key role, especially in its subjective form (Kairos). Participants often lost track of time while immersed in nature. YA4 noted, *"I got pretty into what I was talking about and realized while I definitely gone over 3 minutes, I didn't know how long I had been going."* YA1 shared, *"Watching the snowfall brought back memories of childhood excitement."* These moments suggest that natural environments promote mindfulness and temporal disconnection. To support this, designs should minimize rigid time cues and offer flexible time management, allowing users to engage without pressure.

Solitude emerged as a meaningful theme. YA1 said, "The quiet and calm atmosphere of the park helped me set the tone for my story." YA3, affected by snowfall, described laggy audio while watching videos: *"The sound of everyone talking was still very laggy."* Solitude enabled reflection but also posed emotional challenges.

Designs should balance solitude and socialization—offering distraction-free modes while also providing virtual companionship, such as an AI assistant. External expectations shaped user behavior. YA3 felt compelled to share nature stories: *"I think it's more of a natu-*

ral element than an outdoor one." YA2 was more drawn to others' stories than scenery: *"Wasn't an outdoor view but the events people talked about."* These expectations influenced both content and engagement.

Future platforms should respect user autonomy by offering diverse topic options (e.g., nature, literature, philosophy) and recommending communities aligned with personal interests. Design implications include managing time perception. YA4's quote—*"I didn't know how long I had been going"*—suggests a timer could help users stay within limits while preserving immersion. A 5–10 minute cap may be a reasonable compromise.

Participants also struggled with conversation flow. YA3 said, *"I didn't have time after a busy day to go anywhere else before 8:00 because I didn't have a car either."* This reflects time pressure and difficulty initiating dialogue. Icebreaker prompts and guided endings (e.g., summaries or reflections) can ease transitions and reduce abrupt endings.

Narrative support was also needed. YA3 noted, *"I mentioned natural selection... I think it's more of a natural element than an outdoor one."* Thematic prompts like "Describe a nature scene that moves you" can help users start recording. Multi-language support can further aid expression for non-native speakers.

3.1.4 Conclusion

We set out to explore AVS in natures impact on intergenerational allophilia. Over a period of two weeks we shared videos on Marco Polo with our older adult participants. Our results were described using the Jones et al Nature HCI framework. We found that our methodology was an effective icebreaker and served as a catalyst for intergenerational allophilia. Our implications for design and insights will inform future intergenerational Nature HCI research and prompt creative solutions to intergenerational bias.

3.2 Ageism in a Computer Science Classroom

Authors: Natalie Andrus, Alexa Smith, Hamid Tarashiyoun, Wei Lu Wang, Ihudiya Williams, and Scott McCrickard

3.2.1 Introduction and Background

The computer science education community emphasizes preparing future programmers [98, 144]. These students will not only build software but also shape policy, educate others, and influence civic engagement. Their potential impact can be amplified by addressing inherent biases. Prior research has explored gender [92, 94, 138], racial [48], and ability-based bias [127]. Given the widespread stereotypes about older adults [21, 97], it is critical to address ageism in computer science classrooms. Age-related bias has been documented in areas such as image generation [135], facial recognition [67], and sentiment analysis [38]. Our study contributes to this conversation by examining age bias among HCI university students.

To investigate ageist stereotypes held by future computer scientists, we conducted a week-long service learning case study in a graduate-level HCI course at a large public university. The course focused on foundational HCI principles and included lectures, activities, and reflective assignments. Students led sessions, engaged in discussions, and completed homework. We analyzed classroom observations and assignments using thematic analysis and affinity diagramming. Our findings offer recommendations to reduce ageism and promote an inclusive HCI community.

We build on socio-gerontechnology and computer science education literature. Socio-gerontechnology critiques mainstream gerontechnology [106], highlighting overlooked biases and the exclusion of older adults' lived experiences [105]. These biases result in designs that fail to meet older users' needs. Our study applies cross-disciplinary theories to contextualize student perceptions.

Cultural narratives shape student attitudes. In the U.S., media underrepresents aging individuals in roles like acting and influencing [86], reinforcing stereotypes. Socio-gerontechnology draws on theories to explain these dynamics. Stereotype embodiment theory suggests internalized societal views affect how aging is experienced [12]. Cultural lag theory argues that values evolve slower than technology, perpetuating outdated views [20]. Intergenerational conflict theory links ageism to resource competition [116]. Social identity theory explains how group membership drives younger individuals to distance themselves from older adults [12, 57]. Together, these theories reveal the complexity of ageism.

Bias is inevitable in diverse computer science classrooms. HCI researchers have long addressed gender [92, 94, 138], racial [48], and ability bias [127], yet ageism remains underexplored. DEI efforts in CS education face challenges, including limited theoretical grounding and low adoption [91]. Still, addressing bias is essential given the field's broad societal impact.

Service learning is a proven method for bias reduction [32, 112]. It blends education with community engagement, fostering social awareness [34]. Used in public health [141], healthcare [90], and civic education [33], service learning has also been applied in HCI design [88, 117]. Our study extends this legacy by using service learning to address age-related bias in HCI classrooms.

3.2.2 Methods

This service learning case study was conducted with graduate students in a Models and Theories of Human-Computer Interaction course in the university's Computer Science department. Our aim was to explore how computer science students perceive older adults when designing technology. In collaboration with two students and the course professor, we organized a two-day lecture and activity series based on Sergio Sayago's monograph, *Cultures in Human-Computer Interaction* [119]. Students wrote 250-word reflections examining how their identities and assumptions shape their views on older adults' tech use.

Thirteen students (N = 13) participated; 62% male (N = 8) and 38% female (N = 5). No additional demographic data were collected. As part of the course, students were divided into six groups to lead peer instruction on selected HCI theories. We partnered with the group presenting Sayago's work due to his focus on older adults in HCI [118].

The first session introduced cultural frameworks from the monograph, notably Hofstede's Cultural Dimensions [1, 3, 4], which outlines six dimensions influencing behavior and interaction. Students applied this framework to three studies: an ethnographic study in Spain by Sayago and Blat, Deng et al.'s survey on exergaming preferences [36], and Nurgalieva et al.'s work on health information design [100]. These papers helped contextualize cultural considerations in designing for older adults.

The second session involved group activities redesigning the telehealth app MyChart, using insights from the readings. Students then wrote reflexivity statements, a method from social science research that encourages critical self-examination [41, 43]. We emphasized reflexivity as a tool for working with marginalized communities and participatory design [77].

We analyzed classroom notes, student homework, and researcher observations to examine classroom dynamics and perceptions of age-related bias. Using open coding, we identi-

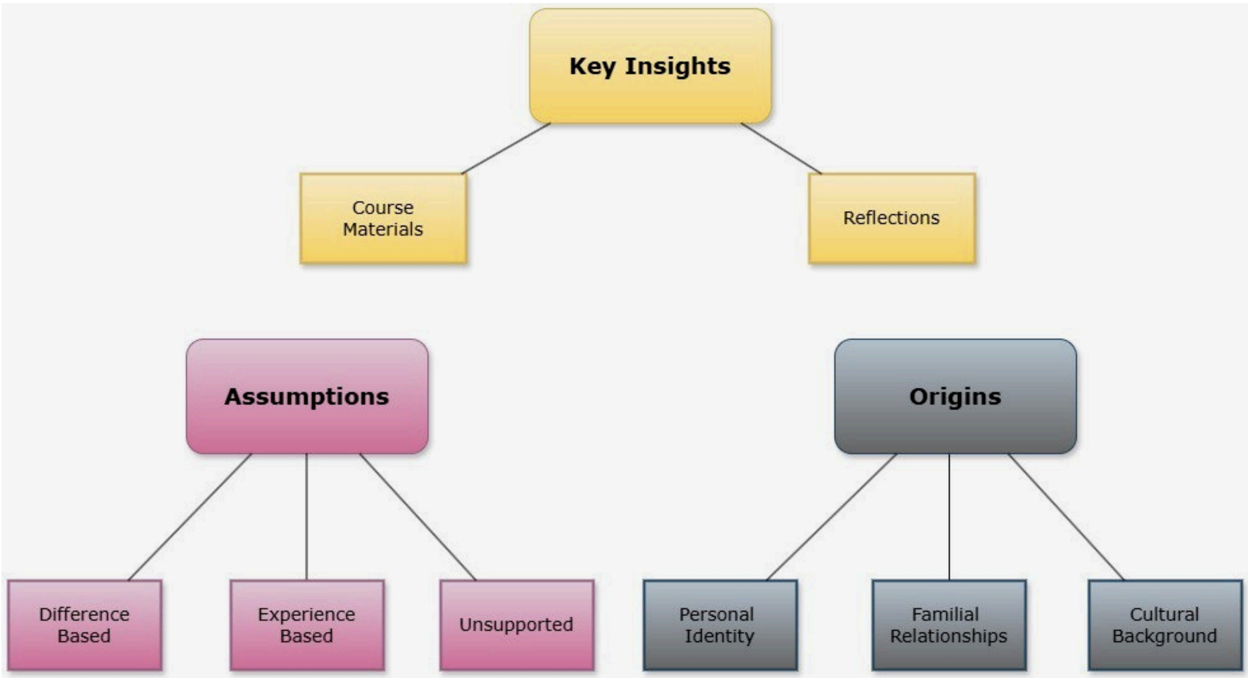

Figure 3.3: The results of our affinity diagram are organized into three main categories: Assumptions, Origins, and Key Insights. We identified three subcategories of Assumptions that students wrote: Difference Based, Experience Based, and Unsupported. Origins was divided into Personal Identity, Familial Relationships, and Cultural Background. We split Key Insights into two categories of takeaways that students reported in their reflections: Course Materials and Reflections. These categories represent computer science student's perceptions of older adults. These perceptions, while not inherently negative, serve as a foundation for future ageism interventions.

fied key themes in student discussions and written reflections, addressing a gap in the CHI community around ageism in HCI education. Thematic analysis produced 92 work activity notes, which were organized into an affinity diagram [52]. A third-party moderator with WAAD expertise provided feedback and corrections [18]. The final diagram revealed three major categories and eight subthemes, as shown in Figure 1.

3.2.3 Findings & Discussion

Our discussion centers on the categories identified through affinity diagramming, which reveal how university students perceive older adults' relationship with technology. These perceptions fell into three categories: difference-based, experience-based, and unsupported (see Fig. 3.3). While not inherently negative, they reflect assumptions formed without targeted educational intervention.

Students often framed older adults in contrast to their own generation. One wrote, *"At 22, I belong to a generation that has grown up immersed in technology... which can contrast with my observations of older adults who did not grow up with the same exposure."* This aligns with social identity theory, where younger adults may distance themselves from older adults to reinforce in-group identity.

Personal experiences also shaped student views. Many referenced grandparents, such as: *"Witnessing my grandparents' struggle with technology... I saw firsthand how frustrating and alienating technology could be."* Others cited cultural context: *"Due to my Indian heritage, I am familiar with the reluctance of many elderly folks to interact with anything they consider too new."* These micro and macro experiences suggest that broadening exposure beyond family and culture may foster age-inclusive design thinking.

Some assumptions lacked experiential grounding, reflecting broader societal narratives. For instance, *"They frequently prefer to have younger family members handle these actions,"* and *"This reliance appears rooted in their perception of technology as challenging or unfamiliar."* These generalizations mirror ageist stereotypes [112] and risk perpetuating bias if left unexamined.

In analyzing reflexivity statements, we found that students' assumptions stemmed from personal identity, familial relationships, and cultural background. These origins align with established research on bias formation [107, 128] and underscore the need for intentional interventions in HCI education. Students in our service learning case study came from diverse backgrounds, yet three themes emerged in their reflections on personal identity: work experience, educational motivations, and self-image. Many referenced professional roles, such as internships or research positions, to explain their views on older adults. One student noted, *"Since a significant part of my work is with disability... most work I've read focuses on older adults."* This highlights how professional exposure can shape perceptions.

Educational and career goals also influenced student perspectives. Although students had varied computer science emphases, all shared an interest in HCI. One student wrote, *"My research is related to generative artificial intelligence... most of my work aims to help people who work with generative AI (primarily a younger population)."* This underscores the need to prepare students to design inclusive AI systems.

Family relationships were another key influence. Many students described helping grandparents with technology, such as, *"The way I perceive older generations mostly comes from my experiences interacting with my grandparents,"* and *"From my experience helping my grandparents... older adults significantly struggle with technology."* Unlike generalized assumptions, these reflections were grounded in personal experience, suggesting that family dynamics could inform future ageism interventions.

Cultural background also shaped perceptions. One student reflected, *"My identity as someone within the Western world... has limited my ability to interact with older adults outside of this cultural bubble."* This shows cultural humility and supports findings that ageism varies across cultures [96]. Addressing ageism in computer science education must consider these cultural nuances.

Finally, we identified two types of key insights from students: those tied to course materials and those emerging from personal reflection. These insights reveal what resonated most—whether from lectures, readings, or activities—and how students internalized the experience. Students completed their reflexivity statements after receiving over an hour of instruction on Hofstede's cultural dimensions and Sayago's research on older adults in HCI. Surprisingly, course materials were the least referenced in student reflections. Most mentions focused on stories from Sayago's papers, suggesting that narratives from older adults are particularly effective in prompting student reflection.

In contrast, personal reflections revealed deeper engagement. Students acknowledged shared desires across generations, identified design implications, and began dismantling biases. One student wrote, *"This reflective approach helps me bridge the generational gap... the desire to connect and understand remains mutual."* Others emphasized the need for inclusive design: *"I need to be careful not to promote stereotypes about older adults' capabilities or reinforce ageist design approaches."* Reflections also addressed age-related ableism, such as, *"I must be mindful that [my experience] might lead me to overlook individual preferences and capabilities among older adults."* These insights reinforce prior research on the value of reflection in reducing bias in computer science education.

3.2.4 Conclusion and Future Work

By 2050, the global population of older adults will reach 2 billion. The computer science community must address age-related bias among today's university students, who will be responsible for designing and supporting technology for this growing demographic. This study examined biases held by HCI students through analysis of their reflexivity statements, focusing on assumptions, origins, and key insights. Findings suggest students need broader exposure to older adults' lived experiences beyond familial relationships. We recommend that HCI curricula adopt a more holistic view of aging and technology use. These insights reveal how students conceptualize older adults and raise important questions about early intervention—could bias reduction begin in high school or earlier? Our themes offer a foundation for developing preventative strategies. Future research can expand on these findings to deepen understanding of ageism in computer science education and foster a more inclusive and prepared HCI community.

Chapter 4

Methodology

This chapter puts forward this thesis's research questions: 1)How can Home Tech Care practices foster intergenerational allophilia as measured by the Wagner et al model?; 2) How do Home Tech Care's educational card game, Icon Recognition Go Fish, influence intergenerational icebreaking and social dynamics?3) How do qualitative feedback themes (e.g., empowerment, frustration, confidence) map across the four tiers of the Kirkpatrick model? To answer these research questions, Home Tech Care, an intergenerational tech support program, was developed. As part of the program, older and younger adult participants played Icon Recognition Go Fish to explore ice-breaking and social gameplay. These methods generated a large dataset of both qualitative and quantitative data.

4.1 Research Questions

This study was designed to answer three research questions that contribute to the broader goal of enhancing Home Tech Care through intergenerational engagement and evaluating its impact on allophilia and user experience. Specifically, the research questions aim to explore how Home Tech Care can foster intergenerational allophilia, as measured by the Wagener et al. model [133], icebreaking and social dynamics through Icon Recognition Go Fish, and program effectiveness, as measured by Kirkpatrick's program evaluation model [16]. The data collected informs how participants, both student volunteers and older adult recipients, respond to Home Tech Care's intergenerational tech support sessions. The connection between each methodological component and the corresponding research question is outlined in the following section.

1. (RQ1): How can Home Tech Care practices foster intergenerational allophilia as measured by the Wagner et al model?

   This master's thesis explores how Home Tech Care practices can foster intergenerational allophillia, i.e., positive attitudes towards members of another group. In this case, positive attitudes towards members of a different age group. The study aims to understand how intergenerational tech support can promote meaningful connections between older adults and younger volunteers. To assess these dynamics, a mixed-methods approach was employed. Quantitative data were collected through participant and volunteer surveys based on the Wagner et al. model for assessing allophilia. Additional qualitative insights were gathered through session exit surveys and volunteer field notes, which captured participants' immediate reflections and perceived value of the interactions. Together, these measures provide a comprehensive evaluation of how Home Tech Care can enhance the quality of intergenerational relationships and thus contribute to more socially cohesive and effective tech support environments.

2. (RQ2): How do Home Tech Care's educational card game, Icon Recognition Go Fish, influence intergenerational icebreaking and social dynamics?

   This research question examines how Icon Recognition Go Fish influences intergenerational icebreaking and social dynamics. This game was designed as an interactive educational tool, and its associated paper is currently under review for presentation at GROUP 2027. This game-based intervention was developed to facilitate recognition and understanding of digital interface elements, thereby supporting intergenerational tech support experiences. While the card game has a strong educational element that aligns with the Learning tier of the Kirkpatrick model for program evaluation, it is also an icebreaker and social tool. To evaluate this game, exit surveys were administered at the conclusion of each gameplay session, and volunteers completed relevant field notes. These data collectively inform the efficacy of Icon Recognition Go Fish in fostering meaningful icebreaking experiences, intergenerational knowledge exchange, and positive social dynamics.

3. (RQ3): How do qualitative feedback themes (e.g., empowerment, frustration, confidence) map across the four tiers of the Kirkpatrick model?

   The third research question explores Home Tech Care from a holistic perspective by employing the Kirkpatrick model for program evaluation [71]. This model is divided into four tiers: Reaction, Learning, Behavior, and Results. It has been used extensively in the educational sphere and is applied to Home Tech care as a means to evaluate the program's effectiveness. Each of these tiers considers its own dynamic of the program. Relevant data were collected through pre- and post-allophilia surveys, session exit surveys, and volunteer field notes. These data were mapped across the four tiers of the Kirkpatrick model, and qualitative themes were generated. Each theme provides insight into both the overall impact of Home Tech Care and areas that could benefit from additional support. For each tier, this thesis emphasizes the importance of centering the participants' feedback and the survey and field note responses. In doing so, the thesis aims to contribute to a practical understanding of intergenerational tech support programs.

Each of these research questions plays a vital role in the overarching goals of this thesis. Home Tech Care aims to address age-related bias and support intergenerational social dynamics. This thesis's findings will guide other intergenerational tech support programs in supporting current older adults and equipping today's youth to assist the largest older adult population in history [122].

4.2 Study Design

This thesis centers on intergenerational tech support through the Home Tech Care research initiative. This initiative is centered on three research models: educational gameplay [39], the Kirkpatrick evaluation model [71], and the Wagner et al. model [133]. It also builds on the results of three of my previously published and in review research papers: A Nature HCI Approach to Intergenerational Icebreaking [14], Ageism in the Computer Science University Classroom: A Service Learning Case Study, and Byte by Byte: Exploring Icon Recognition Go Fish as a Tool for Intergenerational Tech Support. Each of these models and papers' results contributed, in varying degrees, to the methodology of this thesis.

4.2.1 Home Tech Care Program Design

The Home Tech Care program had been operational for one year and was initially modeled after existing technology caregiving initiatives, with plans to operate in a group setting at a local community center. However, during early recruitment efforts, qualitative feedback from nine residents of Warm Hearth Village (W.H.V.) revealed critical barriers to participation, including rural geographic isolation and the impracticality of transporting bulky computer equipment. These findings aligned with existing research, which highlighted the unique challenges faced by rural older adults, such as limited mobility and socio-economic constraints [59]. Additionally, older participants expressed a preference for receiving assistance from individuals outside their close personal relationships. In response, the Home Tech Care program was redesigned to deliver tech support directly within participants' homes, eliminating the need for travel and enabling support from student volunteers who served as friendly acquaintances rather than intimate contacts.

Home Tech Care was developed as a cross-disciplinary initiative in partnership with Virginia Tech's Departments of Human Development and Family Science, Computer Science, and the Center for Gerontology. The program operated in 8-week cycles at W.H.V. in Blacksburg, Virginia. Each cycle included six weeks of in-home technology support following two weeks dedicated to recruitment and training. A cohort of 4 from Human Development and Family Science served as volunteers. These students were matched with W.H.V. residents. A session included a 15-minute Icon Recognition Go Fish gameplay, followed by 45 minutes of personalized assistance with daily-use technology. Volunteers received training on the curriculum before each cycle, and complex technical issues related to W.H.V.-specific devices (e.g., televisions, Wi-Fi) were referred to on-site IT personnel.

Home Tech Care was designed not only to improve digital literacy but also to foster intergenerational connection and combat ageism. The program's dual focus on tech support and interpersonal engagement supported the development of allophilia, positive attitudes toward outgroup members, through mutual learning and shared experiences.

4.3 Icon Recognition Go Fish Game Design

Icon Recognition Go Fish was created to support older adult's icon recognition and to assist intergenerational social dynamics. Icon Recognition Go Fish was designed in four phases (see Fig 4.2). The first phase was selecting an icon system. Two options were con-

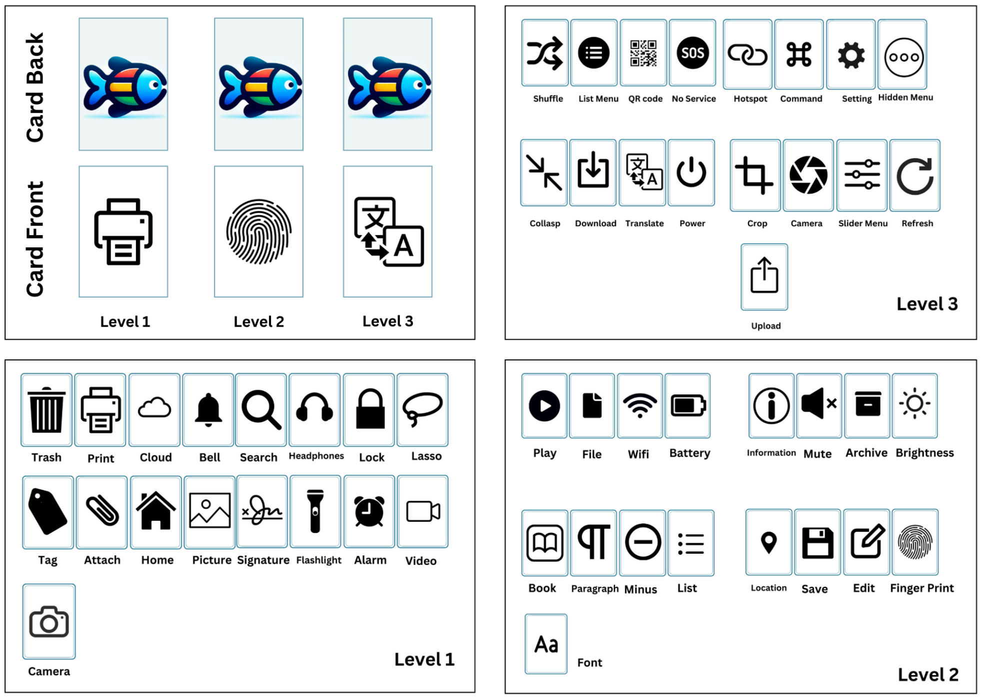

Figure 4.1: Game Materials and Protocol: Icon Recognition Go Fish utilized a custom deck of 68 playing cards, with four cards representing each selected icon. To support recognition, all participants were provided with an icon reference sheet. This preliminary study focused on refining the game protocol and evaluating participant engagement. In future iterations, the reference sheet will be removed to position the game as both an icon training tool and a social icebreaker.

sidered: Windows or Mac OS. Both of these icon systems would be useful to residents but I wanted to pick one to ensure that all participants were using the same icons. The deciding factor in the decision was user preference. The majority of Home Tech Care participants used Mac OS, consequently, this system was selected.

With the Mac OS system selected, phase 2 began. Mac OS developers icon database was used to select the icons that would be used in Icon Recognition Go Fish. To do this, I relied on functionality and frequency of use to select appropriate icons. The selected icons were then subject to collaborator review.

The finalized icon list was then ranked into three decks. The decks were divided based on

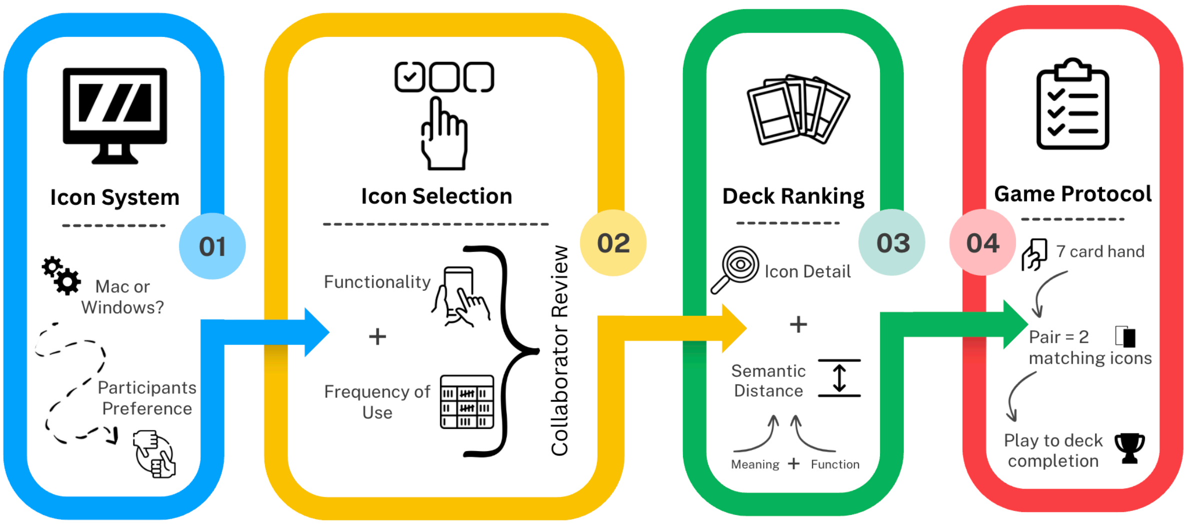

Figure 4.2: The MacOS icon system was selected due to its familiarity among the participants. Icons were chosen based on functional relevance and usage frequency, refined through iterative selection and collaborator feedback. Following Ganor et al.'s definitions of semantic distance and abstraction [45], icons were categorized into three difficulty levels. Both younger and older adult participants engaged in multiple rounds of Go Fish using the finalized decks to refine the game protocol.

icon detail and semantic distance [51, 64, 140] (see Fig. 4.1). With the decks segregated, I prepared the game protocol and was ready to access the usefulness of the game.

4.4 Quantitative Variables

This study incorporated several quantitative variables to support its analysis. These included: (1) scores on the allophilia questionnaire; (2) the performance levels in the Icon Recognition Go Fish; (3) technologies for which older adult participants requested assistance; 4) older adult participants' technological comfort, anxiety, friendliness, self-efficacy, and overall attitude and 5) post session survey results. Collectively, these variables provided a multidimensional perspective that informed Research Question 1, Research Question 2, and Research Question 3. The allophilia questionnaire was lifted from the Wagner et al model [134]. This questionnaire included eighteen questions focused on five metrics of intergenerational allophilia: 1) affection, 2) comfort, 3) kinship, 4) engagement, and 5) enthusiasm. This survey is in the appendix. Icon Recognition Go Fish was divided into three levels based on icon abstraction and relevance. For example, the first level showed a printer icon because it was closely linked to a physical object, and the older adults had a higher chance of interacting with it. The third level showed a QR code icon, which has less of a connection to a physical object, and the older adults might've interacted with it less than a printer icon.

At the end of each session, student volunteers made notes of what technologies the older adults wanted help with. The field notes contained four five-point scales assessing anxiety, friendliness, self-efficacy, and overall attitude. For technological comfort, the older adults were categorized using the six-tier confidence scale from Tyler et al. [132], which includes: non-users, reluctant users, apprehensive users, basic users, go-getters, and savvy users. This information was incorporated into the older adult personas covered in 4.6. The personas were created to add insight into this thesis's results and discussion. The older adults filled out a post session survey which can be found in the appendix. Each of these quantitative variables plays a unique role in addressing this thesis's three research questions.

4.5 Qualitative Variables

Qualitative variables were collected from the student volunteers' field notes and the older adults' survey results. The field notes included four questions to prompt the student volunteers. The first question built off the quantitative scales by asking the volunteers to write additional comments on the older adult's personality, comfort level, attitude, or behavior. The second question prompted the student volunteer to describe the older adult's technology needs. The third question concerned the overall experience with tech support. This question included the following qualifiers: teaching the lesson, providing tech support, and socializing. The fourth and final question asked the student volunteers how they would improve the tech support sessions. The template for volunteer field notes can be found in the appendix. Qualitative variables were also collected from the older adults. At the end of each session, they were asked if they had comments on the tech support sessions. They were provided with space to include any comments they had. Some of the older adults also provided feedback through email. The combination of older adult and younger adult data helped inform this thesis's three research questions.

4.6 Older Adult Personas

Over the course of Home Tech Care, a large amount of both qualitative and quantitative data was collected regarding the older adults and their experiences. To better understand the findings, older adult personas were developed. Ten variables were taken into account when creating the personas: age, living situation, devices owned, tech experience, tech comfort, learning style, motivation, barrier, emotion, and need. The age of personas ranges from 65 and above. Living situation represented the older adults' household living arrangements. Devices owned were based on the technological devices used by older adult participants in the Home Tech Care sessions. The tech experience and Tech Comfort variables were pulled from the quantitative scales outlined in the Quantitative Variables section. The learning style was inferred based on the younger adult's field notes, including visual, hands-on, auditory, and reading/writing. Motivation referred to the self-reported primary need for participating in Home Tech Care. Emotion was informed by the quantitative scales outlined in the Quantitative Variables section. Need referred to the technology that the older adults asked for help with. These personas helped to inform this thesis's results and allowed for a general description of older adult participants without violating their anonymity.

4.7 Participant Recruitment

Two distinct groups were recruited for the Home Tech Care study: older adults aged 65 and above, and younger adults aged 18 to 30. These age ranges align with established literature on intergenerational technology interventions; however, I acknowledge that such categorizations can unintentionally introduce or reinforce ageist stereotypes [23]. Younger adult volunteers were recruited from a Virginia Tech's Department of Human Development and Family Science capstone course. Older adult participants were recruited through the volunteer coordinator at W.H.V, who identified residents interested in receiving in-home technology support. In addition to this connection with the volunteer coordinator, an independent email campaign was sent to W.H.V. residents. Recruitment emphasized inclusivity, welcoming both returning participants from preliminary Home Tech Care cycles and new residents regardless of their prior technological experience or literacy. Participants' cognitive or physical abilities were not recorded, following the precedent set by other HCI researchers [46], who found such data to be irrelevant to the outcomes of similar studies. This decision also helped to maintain a respectful and inclusive research environment, avoiding unnecessary categorization or medicalization of our older adult participants. The participating older and younger adults provided valuable insights into the effectiveness of Home Tech Care and informed this thesis's research questions.

Chapter 5

Results

To answer this thesis's RQs, a multi-layered evaluation strategy was employed. Both quantitative and qualitative data were collected as described in the previous section. These data provided a narrative account of each session, capturing contextual details, interpersonal dynamics, and reflections on the Home Tech Care experience. The following results enrich this thesis's goals by offering a deeper understanding of the program's social and educational dimensions.

5.1 Participants

Four undergraduate students enrolled in a Human Development course at Virginia Tech were recruited to participate in the study. These students came from diverse personal and academic backgrounds but shared a common interest in assisting older adults with technology. Aged 20-25, they were categorized as younger adults and presumed to have a working knowledge of everyday digital technologies. Before their involvement, the participants received training in volunteer safety procedures, W.H.V. service standards, basic scam recognition techniques, and Icon Recognition Go Fish. This training was meant to inform their participation in Home Tech Care and maintain a standard of tech support for the W.H.V residents.

Twelve older adult participants were recruited via email and flyer distribution, with assistance from the W.H.V. Founders Forest committee and the W.H.V. volunteer coordinator. Three older adults opted out of the program before completion, and their data were removed. These older adults lived in the W.H.V. retirement community and were aged 65+. This group of older adults represented a diversity of technological backgrounds. Some of the participants had worked in the technology industry before retirement, while others had recently received their first smartphone. At the end of each session, younger adult volunteers categorized the older adult participant using a technological confidence scale [132]: non-users, reluctant users, apprehensive users, basic users, go-getters, and savvy users (see 5.1). This categorization was coupled with the five older adult personas to describe the older adults without violating their anonymity.

Participant	**Description**
Older Adult 1	Apprehensive User
Older Adult 2	Go-Getter
Older Adult 3	Apprehensive User
Older Adult 4	Apprehensive User
Older Adult 5	Reluctant User
Older Adult 6	Basic User
Older Adult 7	Savvy User
Older Adult 8	Basic User
Older Adult 9	Apprehensive User

Table 5.1: Summary of technological confidence scale across older adult participants. While most participants were identified as “apprehensive user” on the technology confidence scale, the older adult participants represented a wide spectrum of technological confidence. All categories were represented except the ”non-user” category.

5.2 Older Adult Personas

Five older adult personas were created based on the quantitative and qualitative data collected: Connected Cynthia, Frustrated Fred, Impatient Irene, Curious Charles, and Appreciative Alice. These personas are intended to ground these results by describing the older adults participants without violating their anonymity.

Connected Cynthia Cynthia, age 70, lives with her spouse in a single-family home. A retired elementary school teacher, she enjoys reading and crafting. Having recently moved to a new neighborhood, she is eager to stay connected with her family, especially her grandchildren. Her primary goals include building confidence with basic devices like tablets and smartphones, and using video calling to maintain family ties. Cynthia's tech comfort is low, she's unfamiliar with touchscreen gestures and digital terminology. She prefers clear, step-by-step written instructions that she can refer to later, and often writes notes on printed guides during tutorials. While she appreciates progress, she becomes frustrated if rushed. She uses her tablet weekly to check email and avoids online forms unless guided in person. Her representative quote: "*I couldn't ask for a better resource. It's exactly what I've been looking for.*"

Frustrated Fred Fred is 78 and lives in an assisted-living community with support staff available. A widowed former postal worker, he spends his mornings in the community woodworking shop and afternoons reading. Though he still keeps an old flip-phone, he recently acquired a basic smartphone. His goals center around simplifying daily routines, such as medication reminders—and using safety apps to reassure family and staff. Fred's tech comfort is intermediate, but he's often frustrated by ever, changing interfaces and complex menus. He experiences tech fatigue and feels he's "lived too much life" to keep relearning systems. He clips appointment reminders to his refrigerator calendar, relies on staff to update his apps, and occasionally uses his smartphone camera for practical tasks. His representative quote: "*I've been around the block more times than I can count. There's just too much change to keep up with now.*"

Impatient Irene Irene, age 68, lives alone in a condominium. Divorced and an active church volunteer, she suffers from mild arthritis in her hands. Her prior computer experience is limited, she used Disk Operating System early in her career but has been tech-avoidant for years. Irene's goals include learning at her own pace without feeling scrutinized, using voice-activated assistants to accommodate her dexterity issues, and managing basic tasks like setting timers and checking the weather. She labels herself as having "zero patience" and struggles with anxiety and low tolerance for trial and error. Irene prefers her landline and avoids her smartphone unless necessary. She occasionally uses voicemail but never recordings, and shies away from touchscreens, often asking others to type for her. Her representative quote: "*I have absolutely no patience when things go wrong. My frustration climbs if I can't get it done fast.*"

Curious Charles Charles is 75 and lives in a multigenerational home with his daughter and young granddaughter. A former accountant fluent in English and Mandarin, he keeps up with local news but often bemoans "all these acronyms." While comfortable with numbers, he struggles with digital concepts. His goals include understanding core ideas like the difference between Wi-Fi and data, using his smartphone for banking and health tracking, and enabling his family to remotely view his health data. Though his tech comfort is intermediate, he's shaky on terminology and needs conceptual clarity before proceeding. Charles checks his banking app several times a week and uses a basic health-tracking wristband, though he cannot sync it without help. He watches YouTube tutorials but stops them if they move too quickly. His representative quote: "*I don't know how Wi-Fi and data differ. How do I check which my phone is on?*"

Appreciative Alice Alice, age 72, lives alone in a townhouse and receives regular visits from her adult children. A retired librarian, she enjoys virtual book clubs and online puzzles. She joined a community tech-training program six months ago and values her autonomy while appreciating occasional hands-on help. Her goals include continuing her tech progress without feeling stalled, using smart-home sensors for safety, and accessing telehealth services for routine check-ups. Alice's tech comfort is beginner level, she's gained momentum but still needs periodic check-ins. She feels overwhelmed when introduced to too many apps at once and struggles to remember sequences like scanning QR codes and opening the correct app. She logs into her telehealth portal monthly, follows a printed checklist for smart-home routines, and subscribes to a weekly newsletter about senior-friendly tech tips. Her representative quote: "*Since December, your guidance has made all the difference, day by day I'm more confident.*"

5.3 Icon Recognition Go Fish Results

Icon Recognition Go Fish results indicate meaningful engagement with the game, which is a critical first step toward establishing its educational and social value. A key component of the methodology was the collaborative relationship between participants and researchers. During playtesting sessions, participants were engaged in open-ended discussions about their experiences with the game. These conversations, along with detailed field notes, allowed for the capturing of both verbal and nonverbal indicators of engagement, comfort, and social interaction. Participants were not only attentive to the game itself but also to one another. This mutual engagement is essential, as one of the primary goals was to create a successful intergenerational icebreaker. The second goal, supporting icon recognition among older adults, was also reflected in participant behavior. For example, a younger adult noted, "*We played all three levels of the icon game, but she [the older adult player] began to struggle remembering the icons as the game progressed.*" While formal learning metrics were not collected in this phase, curiosity, repeated attempts at recognition, and a desire to improve were observed. These behaviors suggest that Icon Recognition Go Fish holds promise as both a social and educational intervention. The game offers older adults a unique opportunity to interact with computer iconography in a low-stakes, socially engaging environment, an important combination for building digital confidence [132].

The diversity of the participants required multiple rounds of playtesting to understand how different group compositions influenced gameplay. As described in Methodology, the game was tested with three distinct groups: younger adults only and mixed-age groups. Each configuration produced different dynamics. When younger adults played together, the game leaned heavily toward social banter, with less focus on the icons themselves. In contrast, when in mixed groups, the gameplay and conversation centered more directly on the icons and their meanings.

At the end of gameplay, the group's highest level was reported (see Table 5.2). These final levels represent how far each group of participants was able to go in the three-level structure. Advancement from level to level was determined by the older adult participant of the group. Consequently, the final level is positioned as an evaluation of the education component of Icon Recognition Go Fish. This is especially insightful when contrasted with the older adults' technological comfort scale (see Table 5.1). The student volunteers adapted the gameplay to adjust for the older adults' comfort levels. For example, one student volunteer reported, ”*[She] won every round. We stuck to level one because that was the level [she] felt comfortable with, and just reviewed level two for general knowledge.*” The majority of groups stuck with levels 1 and 2, which highlights one group pushing for level 3.

While the final levels achieved during Icon Recognition Go Fish varied, the social aspect of the game was a consistent through line. Icon Recognition Go Fish was just one aspect of Home Tech Care’s educational approach to tech support sessions. It added a valuable ice-breaker and social dynamic to the tech support sessions. The thesis explores the broader implications of this success in the Discussion section.

Participant	**Final Level**
Older Adult 1	Level 2
Older Adult 2	Level 2
Older Adult 3	Level 3
Older Adult 4	Level 1
Older Adult 5	Level 1
Older Adult 6	Level 2
Older Adult 7	Level 2
Older Adult 8	Level 1
Older Adult 9	Level 1

Table 5.2: Summary of final levels achieved during Icon Recognition Go *Fish* gameplay. The majority of groups hit either Level 1 and Level 2 with just one reaching Level 3. The advancement in levels was determined by the older adults personal confidence in recognizing the icons. With each advancing level, icon abstraction increased with Level 3 being the most abstract.

5.4 Intergenerational Allophilia Results

Wagner et al. identify five distinct dimensions of allophilia: affection, comfort, kinship, engagement, and enthusiasm [133]. A central objective of the Home Tech Care initiative was to cultivate intergenerational allophilia between older adult residents of W.H.V. and their young adult volunteers. To evaluate the program's impact, older adult participants and the younger adult volunteers completed pre- and post-intervention surveys designed to measure changes across these five categories (see Table 5.3). While some sampling error was observed, specifically, instances where participants uniformly selected the highest rating ("7") across all items, this pattern is interpreted as a well-intentioned response rather than a reflection of precise sentiment. More nuanced insights emerge when examining category-specific shifts in allophilia, revealing both increases and, in certain cases, decreases in reported sentiment (see Table 5.4). Multiple older adults reported an increase in positive attitudes towards their younger adult participants, while the decreasing attitudes are isolated to one participant. All younger adult participants showed increases across multiple domains, with no decreases.

Another interesting aspect of the collected data is what specific categories increased and decreased across the responses that saw change. Each of the 18 questions represented one category of the Wagner et al model of allophilia [133]. Questions 1-4 dealt with affection; Questions 5-7 dealt with comfort; Questions 8-10 dealt with kinship; Questions 11-15 dealt with engagement; Questions 16-18 dealt with enthusiasm. Thus, we see the biggest increase was in the areas of affection and engagement. The areas that decreased were kinship and enthusiasm. These results point to an overall positive impact and indicate where Home Tech Care can be improved.

Resident	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**
Pre-Survey																		
Older Adult 1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 2	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 3	6	5	6	6	7	5	5	6	6	6	7	6	7	7	7	7	7	7
Older Adult 4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 5	7	5	6	5	6	6	6	7	7	6	7	6	6	6	6	6	7	6
Older Adult 6	6	5	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6
Older Adult 7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 8	7	5	6	6	7	6	7	7	6	6	6	7	7	7	7	7	7	7
Older Adult 9	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Post-Survey																		
Older Adult 1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 2	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 3	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 5	7	6	6	5	7	6	6	6	6	6	7	7	7	7	7	7	5	5
Older Adult 6	6	6	6	6	6	6	6	6	6	6	7	6	6	7	7	6	6	6
Older Adult 7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Older Adult 9	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Volunteer	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**
Pre-Survey																		
Younger Adult 1	7	6	6	7	5	6	5	5	5	6	6	7	5	7	7	7	7	7
Younger Adult 2	6	6	6	6	6	6	6	5	5	7	7	6	6	6	6	7	7	7
Younger Adult 3	7	7	7	7	6	7	7	6	6	7	7	7	7	6	6	6	7	7
Younger Adult 4	5	5	6	6	5	5	5	5	5	5	5	5	5	6	7	5	6	6
Post-Survey																		
Younger Adult 1	7	7	7	7	6	7	6	6	6	6	6	7	6	7	7	7	7	7
Younger Adult 2	7	7	7	6	6	6	6	6	6	7	7	6	6	7	6	7	7	7
Younger Adult 3	7	7	7	7	6	7	7	6	6	7	7	7	7	6	6	6	7	7
Younger Adult 4	6	6	6	6	5	6	5	5	5	6	6	5	6	6	7	6	6	6

Table 5.3: Pre- and post-survey scores for W.H.V residents and younger adult volunteers across the 18 questions outlined in the Wagner et al allophilia model [133]. The top section displays baseline responses included in the Home Tech Care pre-survey, while the bottom section presents post survey scores. Each of the 18 questions corresponds with a different aspect of allophilia: affection, comfort, kinship, engagement and enthusiasm.

Resident	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Older Adult 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Older Adult 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Older Adult 3	20%	50%	20%	20%	–	50%	50%	20%	20%	20%	–	20%	–	–	–	–	–	–
Older Adult 4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Older Adult 5	–	25%	–	–	20%	–	–	–16.7%	–16.7%	–	–	20%	20%	20%	20%	20%	–33.3%	–20%
Older Adult 6	–	25%	–	–	–	–	–	–	–	–	20%	–	–	20%	–	–	–	–
Older Adult 7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Older Adult 8	–	50%	20%	20%	–	20%	–	–	20%	20%	20%	–	–	–	–	–	–	–
Older Adult 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Volunteer	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**
Younger Adult 1	–	20%	20%	–	25%	20%	25%	25%	25%	–	–	–	25%	–	–	–	–	–
Younger Adult 2	20%	20%	20%	–	–	–	–	25%	25%	–	–	–	–	20%	–	–	–	–
Younger Adult 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Younger Adult 4	25%	25%	–	–	–	25%	–	–	–	25%	25%	–	25%	–	–	25%	–	–

Table 5.4: Percentage change in survey responses across 18 questions for W.H.V residents and younger adult volunteers. Dashes indicate no change between pre- and post-survey scores. Positive percentages reflect improvement in self-reported confidence or understanding.

5.5 Kirk Patrick Model Results

	Q1	Q2	Q3	Q4	Q5	Q6
Survey 1	6.4	6.8	6.8	6.5	7.0	6.8
Survey 2	7.0	7.0	7.0	7.0	7.0	7.0
Survey 3	6.6	6.9	7.0	7.0	7.0	6.8

Table 5.5: The results of the post session survey administered to the older adults. The questions were aimed at accessing the overall effectiveness of the session: (Q1) Home Tech Care met my technology needs; (Q2) The volunteers are qualified to teach me about technology; (Q3) The volunteers methods kept me engaged and interested; (Q4) I was satisfied with my Home Tech Care session; (Q5) I was comfortable communicating with my volunteers; (Q6) I am satisfied with Home Tech Care coordination.

The first level of the Kirkpatrick Model for evaluation is Reaction [71]. This was measured by the older adult participant's reaction to the recruitment process. The younger adult volunteers were receiving course credit for their work, so they were excluded from this tier of results. The recruitment of older adult participants was through the W.H.V. volunteering network and an email campaign. Sixteen older adults responded to the email campaign and wanted to participate in Home Tech Care. One participant said, "*Thank you so much for running this program. Many of us here need help with our computers.*" This sentiment was echoed by several others, indicating a strong initial interest and positive reception.

Overall, the Reaction level of the Kirkpatrick Model demonstrated encouraging support for Home Tech Care among older adult participants.

The second tier, Learning, was measured in two ways: Icon Recognition Go Fish results and qualitative field notes. Icon Recognition Go Fish results are covered in a previous section. The qualitative results were illuminating and showed a positive trend towards learning for the older adults. One younger adult volunteer reported:

"*[She] told us about how being a part of the program was very beneficial for her because now she felt the confidence to try different things. She stated previously that she would be nervous about messing something up by pressing the wrong button, but it's starting to become more comfortable trying things and learning. It seemed as the program went on, there was much less anxiety around technology use.*"

This quote highlights how, with time, the older adults became comfortable with the technology that the volunteers were helping them with. The third tier, Behavior, was evaluated using the Wagner et al model for measuring allophilia which was covered in a previous section.

The fourth tier, Results, looks at the overall effect of Home Tech Care. This goes beyond the Learning evaluated by Icon Recognition Go Fish and the Behavior evaluated by the Wagner et al model for measuring allophilia. This tier looks at Home Tech Care's organizational performance and impact. Table 5.5 shows the results of the post-session survey, which evaluated the effectiveness of the session. The responses were measured on a 7-point scale. All questions saw a positive increase over the course of the program. The two questions with the largest improvement were, "Home Tech Care met my technology needs" and "I was satisfied with my Home Tech Care session". Notably, the older adults also saw improvement in their answers about their relationship with their younger adult volunteers.

These responses support the overall positive outcome of this program, characterized by one older adult's comment:

"Thanks so much, [the volunteers] were so helpful and pleasant...they helped with the brand new computer and how to transfer phone pics to computer, also the difference in how to take a video pic and a regular pic on the phone. I think I'm making some progress because of you and the program, and it's invaluable to have help at home!"

At the end of the program, the older adult participants were asked if they would participate if Home Tech Care were run again. Eight out of the nine participants reported that, yes, they would continue in the program if it were run again. This numeric data was supported by the positive feedback that accompanied it. For example, one younger adult volunteer reported:

"It was very gratifying to see the joy on [the older adult's] face when she learned new skills that will support her writing endeavors. She was very grateful for this program and hopes for it to continue in future semesters."

In the last question of the post-session survey, the older adults were asked how they would improve Home Tech Care. The two most popular responses were extending the session times and increasing the number of sessions. One older adult wrote, "*I could use their knowledge when I run into another problem? Are they on call, 24-7?*". These responses indicate a positive response to the sessions, as the older adults wanted to extend Home Tech Care. The rest of the responses from older adult participants can be found in the Appendix. At the end of the surveys, many older adult participants made additional notes commending the younger adult volunteers and thanking the researchers for running Home Tech Care at W.H.V.

Chapter 6

Discussion

Building on the positive outcomes of the Home Tech Care initiative, this discussion section explores the program's findings through the lens of the thesis's three research questions. By examining the results through established models such as Wagner et al. for allophilia [133] and the Kirkpatrick evaluation framework [71], this section highlights key themes and areas for future development. The following discussion synthesizes these findings to assess Home Tech Care's broader impact and its potential as a scalable, age-inclusive intervention.

How can Home Tech Care practices foster allophilia as measured by the Wagner et al. model? par The results of the Home Tech Care initiative suggest a generally positive shift in intergenerational allophilia between older adult residents and younger adult volunteers. Notably, the strongest improvements were observed in the dimensions of affection and engagement, indicating that participants felt more emotionally connected and actively involved with their younger counterparts following the intervention. This is promising, especially given the variety of older adult participants represented. For example, an older adult aligned with the Frustrated Fred or Impatient Irene personas was still able to connect positively with the younger adult volunteers. These findings align with the program's core objective of fostering meaningful relationships across generations.

However, the data also revealed isolated declines in the dimensions of kinship and enthusiasm, specifically among one participant. This outlier invites further exploration into individual experiences and contextual factors that may have influenced their perception. It raises important questions about the variability of interpersonal dynamics and suggests that a one-size-fits-all approach may not fully address the needs of every participant.

The consistent gains in affection and engagement point to these areas as program strengths. They reflect the initiative's success in cultivating warmth and active participation, which could serve as benchmarks for future iterations. Notably, the younger adults saw only positive increases across the allophilia dimensions. This suggests that intergenerational tech support programs like Home Tech Care can be particularly successful with younger generations, given their age-related biases, specifically those around older adults and technology. In contrast, the more modest or negative shifts in comfort and kinship suggest opportunities for improvement. These dimensions may benefit from targeted strategies such as informal social activities [143], shared storytelling [27], or cultural exchange [65] to deepen familiarity and ease.

One methodological consideration is the presence of ceiling effects, where some participants selected the highest rating ("7") across all items. While this pattern is interpreted as a well-intentioned gesture rather than a precise sentiment, it limits the survey instrument's sensitivity. For example, an older adult like Appreciative Alice would want to show appreciation for the program by marking the highest rating across the board. Incorporating more nuanced tools, such as open-ended questions or scaled responses with descriptive anchors, could enhance the accuracy of future evaluations.

Finally, the positive trends across the categories of allophilia support the potential for scaling the Home Tech Care model to other communities. However, the variability in kinship and enthusiasm highlights the importance of local adaptation and thoughtful participant matching. These insights not only validate the program's impact but also offer a roadmap for refinement and expansion.

How does Home Tech Care's education card game, Icon Recognition Go Fish, influence intergenerational icebreaking and social dynamics?

To better interpret the Icon Recognition findings, the older adult participants were described using the six-tier confidence scale from Tyler et al. [132], which includes: non-users, reluctant users, apprehensive users, basic users, go-getters, and savvy users (see Table 5.1). The participants were not allowed to self-identify their confidence level during gameplay to preserve the natural flow of the sessions and avoid distractions or self-consciousness that might interfere with engagement.

This classification revealed a noteworthy disconnect between participants' assigned confidence levels and their actual gameplay behavior. Specifically, the majority of participants, regardless of their categorized tech confidence, chose to remain within Levels 1 and 2 of the card decks. This pattern suggests a more complex relationship between perceived technological confidence and task-specific performance. It also highlights the importance of designing tools that accommodate a wide range of comfort levels, even among those who may appear confident on paper.

Participants, regardless of age or confidence level, were more drawn to the social aspects of Icon Recognition Go Fish than to the educational challenge of icon recognition. The game's structure, which emphasizes conversation and collaboration, likely contributed to this preference. The inclusion of intentional icebreaking techniques played a key role in fostering this social engagement. These findings reinforce the value of designing educational tools that prioritize relational dynamics alongside cognitive goals, especially in intergenerational contexts. There is a natural rhythm to icebreaking in social settings, but it can also be thoughtfully supported through intentional design.

As outlined in the methodology, the interest in icebreaking stems from two key motivations. The first is straightforward: fostering a positive social experience for participants. Icebreaking is a well-established method for reducing anxiety and encouraging engagement, particularly in intergenerational contexts where initial unfamiliarity may exist [14]. The results revealed that even without formal icebreaking prompts, both younger and older participants naturally adjusted their behavior to foster connection. While the older adults could have been encouraged to engage with Level 3 icons if the sole objective were educational, the goals extended beyond skill acquisition. Prior research emphasizes that older adults are more receptive to technology support when they feel intrinsically motivated and socially supported [19, 132]. For example, a Curious Charles persona would be self-motivated to engage with the educational aspects of Icon Recognition Go Fish. The organic icebreaking and lighthearted competition embedded in the game would support this motivation, making the experience both enjoyable and meaningful.

The second, more nuanced motivation is diagnostic. Icebreaking moments allow younger adult participants to informally assess the older adult's comfort with the included computer icons. Currently, this evaluation is entirely observational. For instance, if an older adult repeatedly second-guesses their choices or hesitates during gameplay, younger participants interpret this as a signal to slow down or offer additional support. One participant described this adaptive approach: *"[She] won every round. We stuck to level one because that was the level [she] felt comfortable with, and just reviewed level two for general knowledge."* These informal assessments are valuable, as they allow younger adults to tailor their support strategies in real time, without disrupting the flow of the game.

The iterative design and evaluation process revealed several key insights for designing icon-based intergenerational games that support older adult engagement and learning. The older and younger adults were able to interact with each other in a socially meaningful way, which contributed to the success of the tech support sessions.

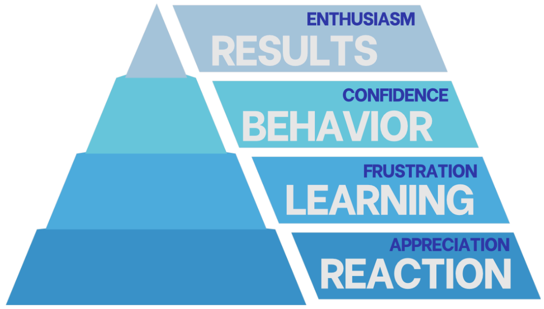

Figure 6.1: The four tiers of the Kirkpatrick model are mapped over four qualitative themes: appreciation, frustration, confidence, and enthusiasm. Each theme represents an aspect of the participant's experience with Home Tech Care.

How do qualitative feedback themes (e.g., appreciation, frustration, confidence) map across the four tiers of the Kirkpatrick model?

Home Tech Care, like other tech support programs, is an educational program open to evaluation by the Kirkpatrick model: reaction, learning, behavior, and results [71]. A large amount of qualitative data was generated during the Home Tech Care sessions and mapped across four qualitative themes (see Figure 6.1). While not an exhaustive list, these themes provide insight into participants' experiences with Home Tech Care.

The reaction of the older and younger adults to Home Tech Care was positive. One older adult responded to the program with, *"This is a much-needed service for us, as most residents here struggle with technology. I am going to have to buy a new computer with Windows 11 since Microsoft will no longer support Windows 10 after October."* Here, there is an appreciation of the educational service provided. In addition to this appreciation, the older adult was looking forward to continuing in the program for help with future technology needs. Another older adult responded with, *"[the volunteers] helped with the brand new computer and how to transfer phone pics to computer, also the difference in how to take a video pic and a regular pic on the phone. You got me started in dec...think I'm making some progress because of you and the program...invaluable to have help at home!"* This quote shows the theme of appreciation continuing to the end of the program.

When reviewing the learning results from Home Tech Care, there are themes of frustration. With the younger adult volunteers, it became frustrating when they weren't able to answer the older adults' technological questions. This could be because the volunteers were not recruited from computer science courses at Virginia Tech. Or it could be related to the specific device that the older adult wanted help with. For example, one older adult wanted help with a miniature printer that connected with their smartphone. After trying for the full 45 minutes, the younger adult volunteers were unable to connect the printer to the phone. One reported, *"It was frustrating that we weren't able to fix the issue even after staying for an additional 10-15 mins just working on it."* From a program evaluation perspective, the younger adult volunteer could have received more training. Alternatively, the program could be limited to more well-known devices to avoid difficult questions beyond the training of the younger adult volunteers.

There was a positive increase in confidence as the participants completed the Home Tech Care program. This was noticeable across the behavior dimension of the Kirkpatrick model. This dimension is interested in how participants change as a result of the program. A common problem that older adults can face when it comes to technology is being targeted by scams [25]. One of the older adult participants had been previously targeted, and this had lowered her confidence. The younger adult volunteers reported, *"[She] spoke of previously being scammed and the worry brought on by it. I believe that it has lowered her confidence with technology and made her much more stressed about using technology and trusting anyone on the internet."* As this older adult moved through the program, her confidence grew with the final report stating, *"She was comfortable telling us her problems and pretty open with the experiences she has had in the past with tech problems."*

As stated in the results section, eight out of the nine older adult participants said that they would join future iterations of Home Tech Care. This shows an enthusiasm for the program and is a positive insight into the results dimension of the Kirkpatrick model. The results tier of the Kirkpatrick model focuses on the overall impact of the program. For example, some of our participants aligned with the Connected Cynthia persona and were able to connect more fully with distant family and friends. With the variety of experiences across the older adult participants, the majority saw a positive impact on their lives. The goal of Home Tech Care was to create an intergenerational tech support program that could address the larger societal issues of age-related bias in a technological context. The increase in intergenerational allophilia, combined with the positive experiences of icebreaking and socializing with different age groups, points to Home Tech Care's success.

Chapter 7

Future Work

To accomplish the goals of this thesis, this study was centered on three RQs: 1) How can Home Tech Care practices foster intergenerational allophilia as measured by Wagner et al's model? 2) How does Home Tech Care's educational card game, Icon Recognition Go Fish, influence icebreaking and social dynamics? 3) How do qualitative feedback themes (e.g., appreciation, frustration, confidence) map across the four tiers of the Kirkpatrick model? This study yielded positive results in these three areas. In addition to these positive results, feedback from both younger and older adult participants highlights areas for future work.

7.1 Longitudinal Potential

Given the promising outcomes observed during the initial cycles of Home Tech Care, there is strong justification for expanding the program into a longitudinal study. A longitudinal design would allow researchers to track changes in digital confidence and intergenerational attitudes over extended periods. This approach would provide deeper insight into the sustained impact of Home Tech Care, particularly as older adults continue to engage with evolving technologies and student volunteers cycle through academic semesters. Longitudinal data could also reveal patterns in retention, confidence, and social connection that are not fully captured in short-term interventions.

A multi-year study would further enable the refinement of program components, such as curriculum design, volunteer training, and gameplay mechanics. For example, repeated exposure to Icon Recognition Go Fish could be analyzed for long-term effects on recognition, while ongoing surveys using the Wagner et al. model could track shifts in allophilia across cohorts. Additionally, the Kirkpatrick evaluation model could be applied at regular intervals to assess growth in learning and behavior. By following participants across multiple cycles, Home Tech Care could evolve into a scalable framework for intergenerational tech support, offering valuable contributions to Human Computer Interaction

7.2 Measuring Intergenerational Connection

The allophilia results from Home Tech Care show a positive effect. However, the responses from both the older and younger adults showed areas that could be strengthened by future work. One key area for improvement lies in the methodology used to collect survey data. A notable pattern emerged wherein a majority of older adult participants selected the highest possible rating ("7") across all survey items. While this may reflect genuine positivity, it also introduces the possibility of sampling bias or social desirability effects, particularly in intergenerational contexts. To mitigate this, future studies should consider incorporating qualitative interviews or mixed-method approaches to triangulate findings and capture more nuanced shifts in sentiment. Researchers could also consider adding an attention checking question: "Please select this specific option for this question". Additionally, administering surveys in the absence of the opposite age group may reduce perceived pressure to respond favorably, thereby enhancing the authenticity and reliability of the data. A final addition to the data collection process would be having the older adults complete the same fieldnotes as the younger adult volunteers. This would open up the methodology to asset-based learning and dismantle the lecturer/learner dynamic. These adjustments would strengthen the interpretive validity of future evaluations and offer deeper insight into the emotional and relational dynamics fostered by programs like Home Tech Care.

Another promising direction for future research involves a deeper investigation into the specific dimensions of allophilia that showed a decline, particularly among older adult participants. In this study, one participant reported decreased scores in the categories of kinship and enthusiasm, suggesting a potential disruption in perceived relational closeness and emotional engagement. While the cause of this decline remains speculative, several plausible factors may have contributed, including interpersonal mismatch, unmet expectations regarding the level of care or interaction, or broader contextual influences such as mood, health status, or prior experiences with technology. To better understand these dynamics, future work could incorporate qualitative methods such as semi-structured interviews or ethnographic observation to uncover the underlying reasons for such shifts. Additionally, implementing pre-screening compatibility assessments or post-intervention debriefs may help identify and address interpersonal friction early in the process. By exploring the nuanced factors that influence kinship and enthusiasm, future iterations of Home Tech Care can be more intentionally designed to foster sustained emotional connection and mutual appreciation across generations.

7.3 Knowledge Transfer and Social Support

Future iterations of Icon Recognition Go Fish offer opportunities to deepen both educational and social outcomes. If the primary goal shifts toward knowledge transfer, future studies should explore how gameplay supports long-term retention and digital literacy.

Conversely, if social engagement remains central, additional facilitation, such as conversation prompts or designated social facilitators, may be needed to support older or mixed-age groups and balance cognitive and relational goals.

Intergenerational gameplay should continue to emphasize flexible pacing and collaborative learning. Younger participants can act as facilitators, adapting gameplay to meet the comfort levels of older adults. Framing icon recognition as a shared exploration rather than a test encourages curiosity, reduces anxiety, and fosters mutual respect. If future studies want to explore quantitative learning metrics, they should consider including a pre- and post-quiz. This quiz could show the participants' growth in icon recognition.

Finally, Icon Recognition Go Fish has the potential to serve as a model for reciprocal service learning. Future work should investigate how collaborative play challenges ageist assumptions and promotes empathy. By centering accessibility, curiosity, and intergenerational connection, designers can create inclusive tools that support both digital literacy and meaningful social engagement.

7.4 Conclusion

The Home Tech Care initiative demonstrates promising potential for fostering intergenerational allophilia and social engagement between older and younger adults. The goal of Home Tech Care was ultimately to address age-related bias when it comes to technology use. Through the lens of Wagner et al.'s allophilia framework [133], the program showed measurable gains in affection and engagement, validating its emphasis on relational warmth and active participation. While isolated declines in kinship and enthusiasm suggest that interpersonal dynamics vary across individuals, these findings offer valuable direction for refining program design, particularly through more personalized matching and culturally responsive activities.

The Icon Recognition Go Fish card game emerged as a powerful tool for facilitating ice-breaking and informal assessment. Participants gravitated toward its social elements, revealing the comfort and connection that can precede future cognitive engagement practices. The game's adaptive structure allowed younger volunteers to tailor their support in real time, reinforcing the importance of designing educational tools that are both socially intuitive and cognitively accessible. These insights affirm that intergenerational learning is most effective when it is relationally grounded and emotionally attuned [122].

This intergenerational program also showed positive results in reaction, learning, behavior, and outcomes, as measured by the Kirkpatrick model for program evaluation [71]. Evaluating the program through the Kirkpatrick model further highlighted the key qualitative themes of appreciation, frustration, confidence, and enthusiasm. These themes, coupled with the positive results across the tiers of the Kirkpatrick model, represent the variety of participant experiences.

Taken together, these findings suggest that Home Tech Care is a tool for bridging generational divides, fostering empathy, and empowering older adults in a digital age. Future intergenerational tech support programs should prioritize emotional connection, adaptive learning, and thoughtful evaluation to ensure the programs are responsive, inclusive, and impactful. The results of this thesis are a stepping stone towards an age-inclusive future.

Appendices

Appendix A

Icons for Icon Recognition Go Fish

This section includes the three deck levels of the Icon Recognition Go Fish.

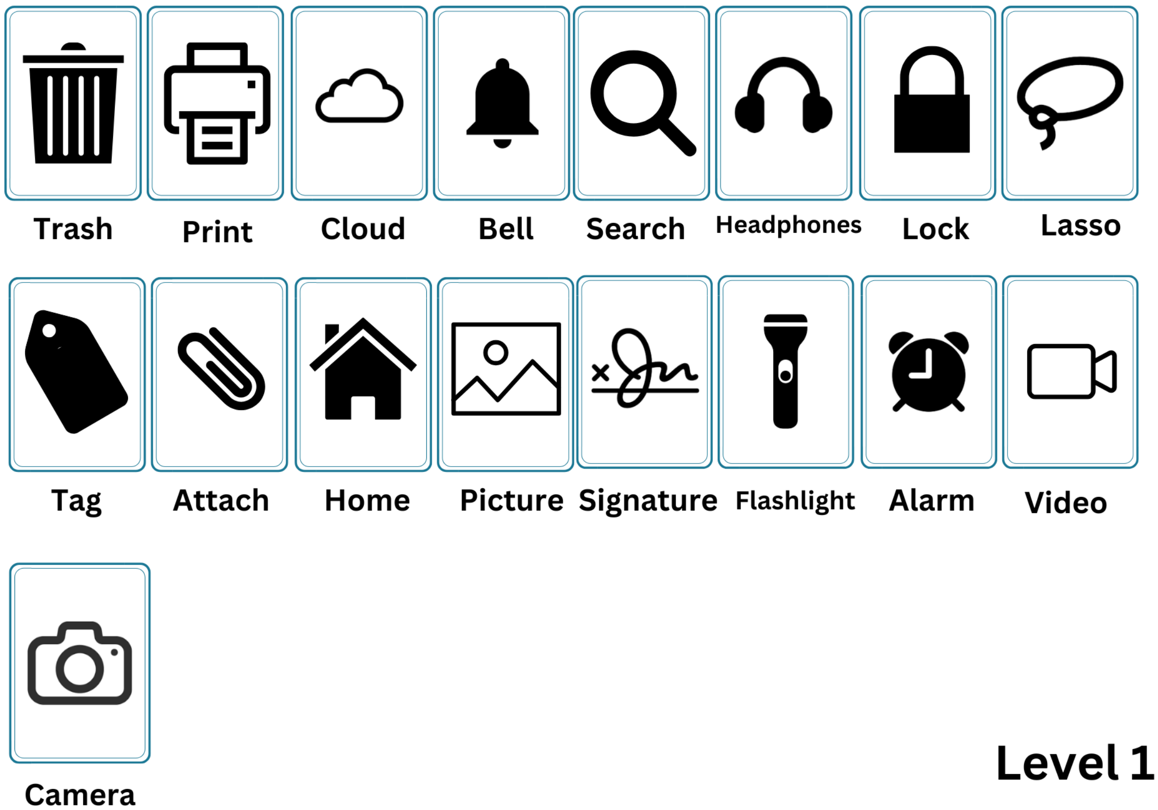

Figure A.1: Icons in the first level of Icon Recognition Go Fish.

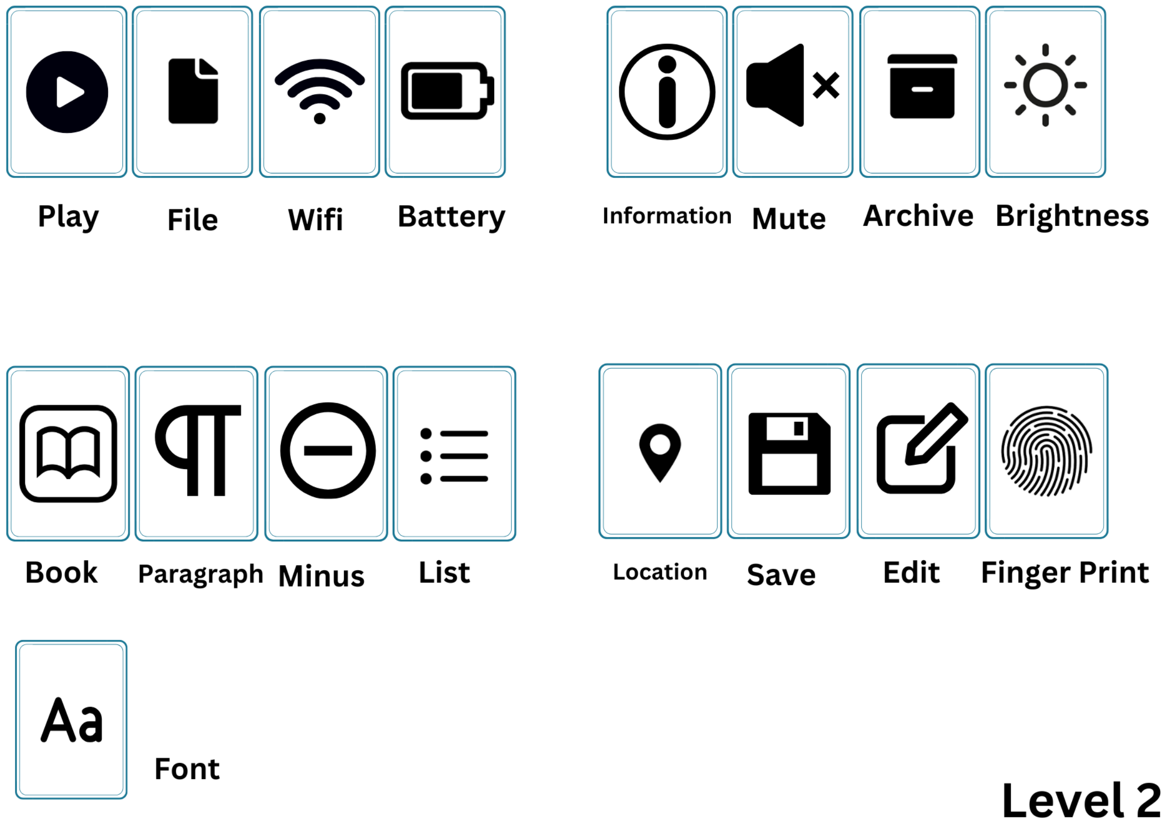

Figure A.2: Icons in the second level of Icon Recognition Go Fish.

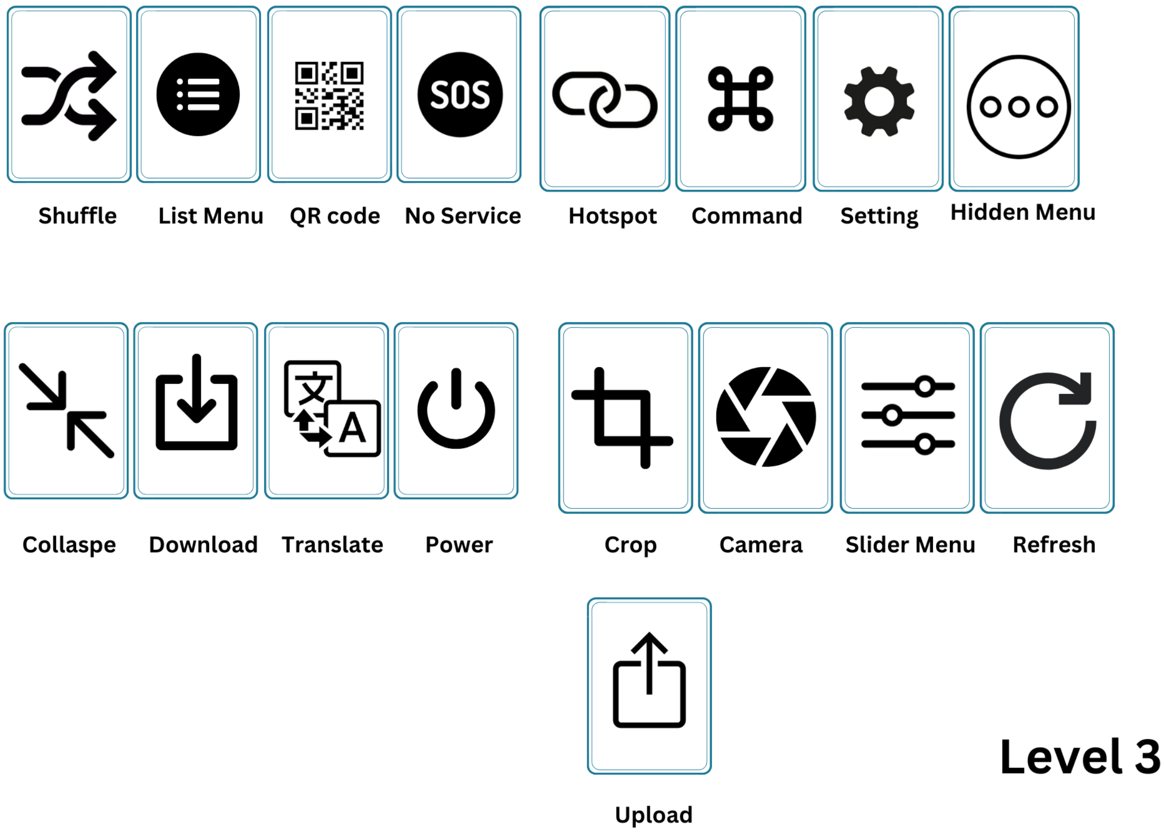

Figure A.3: Icons in the third level of Icon Recognition Go Fish.

Appendix B

Wagner Allophilia Survey

This section includes the pre and post survey questions for the Wagner allophilia survey [133].

1. In general I have positive attitudes about younger adults/older adults.
2. I respect younger adults/older adults.
3. I like younger adults/older adults.
4. I feel positively toward younger adults/older adults.
5. I am at ease around younger adults/older adults.
6. I am comfortable when I hang out with younger adults/older adults.
7. I feel like I can be myself around younger adults/older adults.
8. I feel a sense of belonging with younger adults/older adults.
9. I feel kinship with younger adults/older adults.
10. I would like to be more like younger adults/older adults.
11. I am truly interested in understanding the points of view of younger adults/older adults.

12. I am motivated to get to know younger adults/older adults.
13. To enrich my life, I would try and make more friends who are younger adults/older adults.
14. I am interested in learning about the experiences of younger adults/older adults.
15. I am impressed by younger adults/older adults.
16. I am enthusiastic about younger adults/older adults.

Appendix C

IRB Approval

This section includes the IRB approval letters for Home Tech Care and Asynchronous Video Sharing with Older Adults.

Division of Scholarly Integrity and Research Compliance
Institutional Review Board
North End Center, Suite 4120 (MC 0497)
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732
irb@vt.edu
http://www.research.vt.edu/sirc/hrpp

MEMORANDUM

DATE:	February 26, 2025
TO:	Scott McCrickard, Natalie Andrus, Wei Lu Wang, Jixiang Fan, Onyinye Faith Mbanefo
FROM:	Virginia Tech Institutional Review Board (FWA00000572)
PROTOCOL TITLE:	Home Tech Care
IRB NUMBER:	**25-176**

Effective February 26, 2025, the Virginia Tech Human Research Protection Program (HRPP) determined that this protocol meets the criteria for exemption from IRB review under 45 CFR 46.104 (d) category(ies) 2(ii),3(i)(B).

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit an amendment to the HRPP for a determination.

This exempt determination does not apply to any collaborating institution(s). The Virginia Tech HRPP and IRB cannot provide an exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

https://secure.research.vt.edu/external/irb/responsibilities.htm

(Please review responsibilities before beginning your research.)

PROTOCOL INFORMATION:

Determined As:	**Exempt, under 45 CFR 46.104(d) category(ies) 2(ii),3(i)(B)**
Protocol Determination Date:	**February 26, 2025**

ASSOCIATED FUNDING:

The table on the following page indicates whether grant proposals are related to this protocol.

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution

Figure C.1: The IRB approval for Home Tech Care.

Division of Scholarly Integrity and
Research Compliance
Institutional Review Board
North End Center, Suite 4120 (MC 0497)
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732
irb@vt.edu
http://www.research.vt.edu/sirc/hrpp

MEMORANDUM

DATE: June 21, 2024

TO: Scott McCrickard, Wei Lu Wang, Natalie Andrus

FROM: Virginia Tech Institutional Review Board (FWA00000572)

PROTOCOL TITLE: Asynchronous ice-breaking technologies for older adults

IRB NUMBER: **24-604**

Effective June 21, 2024, the Virginia Tech Human Research Protection Program (HRPP) determined that this protocol meets the criteria for exemption from IRB review under 45 CFR 46.104(d) category (ies) 2(ii),3(i)(B).

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit an amendment to the HRPP for a determination.

This exempt determination does not apply to any collaborating institution(s). The Virginia Tech HRPP and IRB cannot provide an exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

https://secure.research.vt.edu/external/irb/responsibilities.htm

(Please review responsibilities before beginning your research.)

PROTOCOL INFORMATION:

Determined As: **Exempt, under 45 CFR 46.104(d) category(ies) 2(ii),3(i)(B)**
Protocol Determination Date: **June 21, 2024**

ASSOCIATED FUNDING:

The table on the following page indicates whether grant proposals are related to this protocol.

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
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Figure C.2: The IRB approval for Asynchronous Video Sharing with Older Adults.

Appendix D

Field Notes Template

This section includes the template for the younger adult's field notes.

Volunteer Names:
Resident Name:
Session Number:
Date:

Please underline which of the follow best describes the resident:

Non user - no technology experience

Reluctant - basic, digital skills, low confidence, tended not to engage with technology despite having some skill

Apprehensive - low digital skills, experienced anxiety when using digital tools.

Basic User - more comfortable than apprehensive, have integrated a few online activities, and consider their skills good when compared to peers.

Go-getter - engaged in up to six online activities, displayed competence and curiosity regarding digital tools, valued gaining more knowledge

Savvy User - have a high level of digital skill, engage in a wide range of online activities, lack anxiety when using digital tools

Please rate this resident from 1-5 in the following categories:
1- Low | 2 - Moderate to Low | 3 - Moderate | 4 - Moderate to High | 5 - High

Anxiety:

Self-Efficacy (confidence):

Friendliness:

Please underline which of the following best describes their overall attitude:
Negative | Slightly Negative | Neutral | Slightly Positive | Positive

Additional comments about the resident's personality, comfort level, attitude or behavior:

Please describe their technology need:

How was your overall experience with this Home Tech Care session (5-7 sentences)? (teaching the lesson, providing tech support, socializing)

What would you do to improve the session format (2-5 sentences)?

Figure D.1: The template for the younger adult volunteer's field notes.

Appendix E

Home Tech Care Post Session Survey

This section includes the Home Tech Care post session survey administered to the older adult participants. All questions, with the exclusion of question 7, were answered using a 7 point scale.

1. Home Tech Care met my technology need.
2. The volunteers are qualified to teach me about technology.
3. The volunteers kept me engaged and interested.
4. I was satisfied with my Home Tech Care session.
5. I was comfortable communicating with my volunteers.
6. I am satisfied with Home Tech Care's coordination.
7. What can be done to improve Home Tech Care?

The following are the responses from the final question: What can be done to improve Home Tech Care?

1. The volunteers helped me successfully change my Google password but didn't tell me how to complete the process with macros. I did not know what macros were or what I was supposed to do with internet accounts. I kept getting security alerts and

alerts were even sent to my family in New York. I lost my mail on my computer and could not Zoom with my family over the weekend. An employee at Warm Hearth explained on Monday about macros and internet accounts and restored my mail.

2. It is fine. I appreciate it very much.

3. Would like more sessions thank you!

4. I wrote you an answer right after the session. The students were patient and helpful and respectful. It would help for them to know about both Android and iPhone. The students were more familiar with iPhones and I have an Android. It may help for the students to know which type of phone we have before coming to help.

5. So valuable to have help at home. Jacob and Tyler were able to give me amazing help today.

6. Great program please continue

7. Not a thing!

8. Great class and fantastic students, thank you.

9. None

10. Maybe have a way to extend sessions.

11. Longer sessions or more sessions

12. None that I can think of

13. More Questions later

14. I think things are going very well.

15. More frequent visits
16. Wonderful service
17. Nothing
18. It is great
19. Keep up the good work!
20. They were extremely pleased to work with and answered all my questions and shared their experience about my particular computer.
21. Keep going this is a great help. Keep reaching out for more people.
22. Absolutely nothing!
23. Give icons to clients, have knowledge of Android and iPhone
24. I could use their knowledge when I run into another problem? Are they on call, 24-7?

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