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32	Abstract	We implemented a five-session family program called <i>Family Quest</i> where parents and children ages 9 to 13 played Quest Atlantis, a multiuser 3D educational computer game, at a local after-school club for 90-minute sessions. We used activity theory as a conceptual and an analytical framework to study: the nature of intergenerational play, the collaborative activity between parents and children in the context of role-playing virtual game environment, and the opportunities and challenges of bringing parents and children together around an educational video game. Our analyses of five parent-child dyads revealed that the nature of intergenerational play is different for different parent-child dyads, but has positive outcomes. Implications of the study for supporting family learning and bonding through video games are discussed.
33	Keywords separated by ' - '	Collaborative problem solving - Informal learning environments - Intergenerational play - Parent-child interaction - Video games
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## Using activity theory to understand intergenerational play: The case of family quest

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**Abstract** We implemented a five-session family program called *Family Quest* where parents and children ages 9 to 13 played Quest Atlantis, a multiuser 3D educational computer game, at a local after-school club for 90-minute sessions. We used activity theory as a conceptual and an analytical framework to study: the nature of intergenerational play, the collaborative activity between parents and children in the context of role-playing virtual game environment, and the opportunities and challenges of bringing parents and children together around an educational video game. Our analyses of five parent-child dyads revealed that the nature of intergenerational play is different for different parent-child dyads, but has positive outcomes. Implications of the study for supporting family learning and bonding through video games are discussed.

**Keywords** Collaborative problem solving · Informal learning environments · Intergenerational play · Parent-child interaction · Video games

### Introduction

Family relations undergo major transformations to accommodate the cognitive, behavioral, emotional, and social changes that children go through during adolescence (Eccles et al., 1993). Adolescence is often marked with disagreements and conflicts between parents and children (Smetana, 2005). For the new generation, it is also marked with a shift from outdoor to indoor activities (Crosnoe, & Trinitapoli, 2008), which often involve technology use such as video gaming and the Internet (Lenhart and Madden 2005). The typical ways of engaging with these technologies create situations where children and parents do not have to interact. In fact, parents and children engage in different activities with technology. Parents use cell phones and the Internet to facilitate communication with their children and to coordinate activities and daily life routines (Kennedy et al. 2008). Children, on the other

Q1

Q2

Q3

Q4

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hand, spend extensive time online, multitasking (e.g., chatting, downloading music, Internet surfing), and connecting with their friends (Ito et al. 2010). Too often, parents are encouraged to monitor their children's online activities and video game play to protect their children from the perils of these technologies (Wang et al. 2005) when in fact this might be an opportunity for them to connect with their children in new and powerful ways.

Many argued that there is a generational gap between children and their parents in engaging with computers, the Internet, and video games (see Palfrey and Gasser 2008; Papert 1995; Prensky 2001; Tapscott 1998 for discussion). The few studies completed on parent-child interaction around video games reported video games promoting positive interactions between parents and children (Aarsand 2007; Mitchell 1985), and in particular, between fathers and sons (Ito et al. 2010). Previous studies examine parent-child interactions around commercial video games. This study explores whether a game space for intergenerational play could be designed such that it brings family fun and learning together. While children might be advanced in their use of technology, they continue to benefit from adult guidance, such as that of parents who can engage with information more critically. A game environment when designed with intergenerational concerns can create a context where both the parent and the child bring their expertise to a shared family experience.

In this paper, we report our findings from a five-week family program called *Family Quest*, where we observed parents and their children (ages between 9 and 13) play Quest Atlantis<sup>1</sup> (QA) at a local after-school site. QA is a multiuser 3D educational computer game designed to engage middle school children in educational, personally and socially relevant tasks called *Missions*. Missions are collections of tasks designed around interactive storylines and require drawing upon academic subjects like language arts, mathematics, the sciences, geography/social studies, and arts. Through an avatar that players manipulate with their keyboard and mouse, children travel around different virtual worlds as they work on assigned missions (see Fig. 1). For the current study, we repurposed the existing Missions already being used in classrooms for parents and children. As compared to commercial video games, what makes Quest Atlantis a viable gaming environment to study intergenerational play is that QA is intentionally designed to strike a balance between education and entertainment and allows us, as researchers, to make design changes to optimize the game space for intergenerational play for future work.

This study is guided by the following research questions:

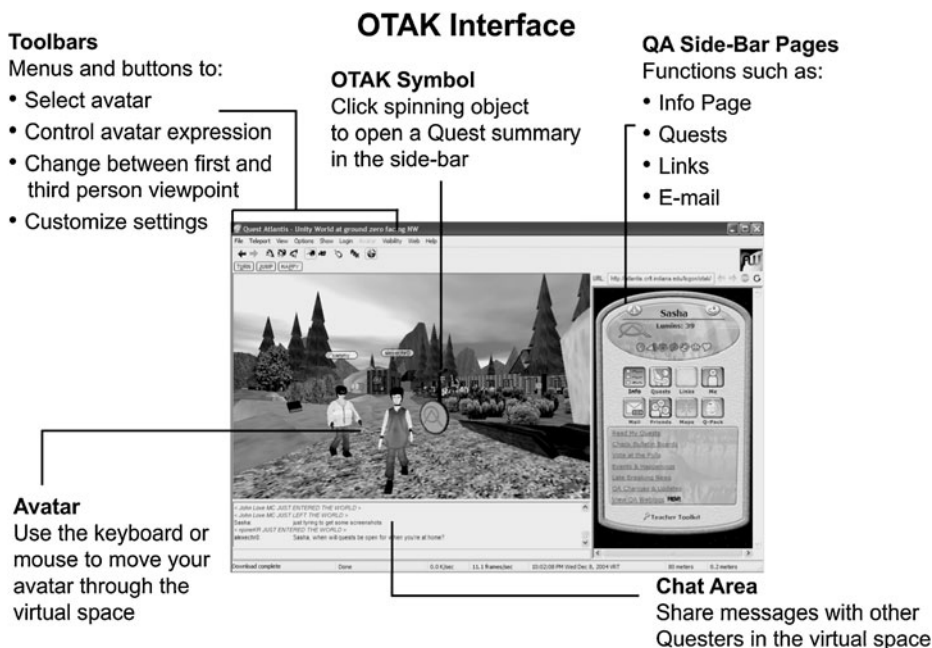
1. What is the nature of intergenerational play, the collaborative work that occurs when parent and child are immersed within a shared game space?
2. What are the challenges and opportunities of bringing parents and children together around an educational video game called Quest Atlantis?

In what follows, we first discuss activity theory, which guided us, as researchers, in conceptualizing and analyzing the nature of intergenerational play. We then share the findings of our study and conclude with a discussion of the implications of our study for designing video games that support intergenerational play and of the direction of future research.

## Theoretical framework

From the perspective of activity theory, an activity involves a subject who has a goal to transform an object and it is this unit that one should examine. The relations or potential of

<sup>1</sup> See [www.questatlantis.org](http://www.questatlantis.org) for more information.



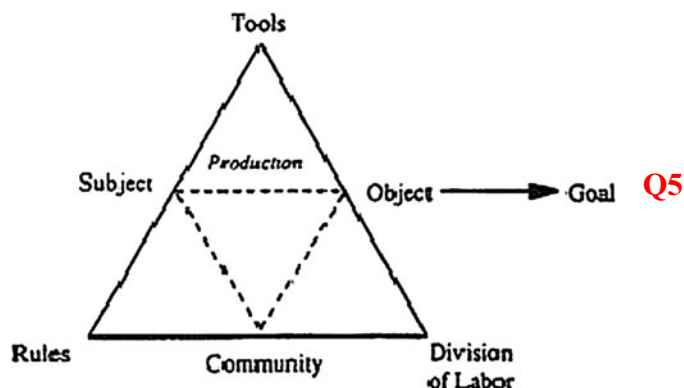
**Fig. 1** Screenshot of Quest Atlantis interface

the subject to transform the object is mediated by multiple components. According to Engeström (1987), an activity system includes (1) participants of that activity (subject), (2) the goals and intentions of participants, and objects or products that are being transformed (objects-goals), (3) the tools that are used to accomplish goals and transform objects or products (tools), (4) the rules and norms that circumscribe that activity (rules and norms), (5) the larger community in which the activity occurs (community), and 6) the negotiation of roles and responsibilities (division of labor) (see Fig. 2). Activity theory recognizes the dynamic nature of context where the components of activity such as tools, goals, norms, and rules are constantly changed, constructed, and transformed in relation to the outcome of the activity system (Cole 1996; Greenberg 2001).

We conceptualized intergenerational play, the collaborative activity between parents and children in the context of a role-playing virtual game environment, as an activity system. Actions are goal directed (Leont'ev 1978) and exist within a world context that involves tools that are available to achieve a goal and the physical conditions and communal norms that constrain and afford actions. In activity theory, a tool can be physical, mental, or semiotic in that it can be a physical object that the individual can use to transform another object (e.g., a hammer), it can be an heuristic that one follows to transform an object (e.g., applying order of operations to solve a math problem), or it can be a speech act that transforms a situation (e.g., apologizing, congratulating, explaining) (Cole 1996). A tool alters the activity in which it is used and in turn, is modified by the activity as the community evaluates the outcome of the activity.

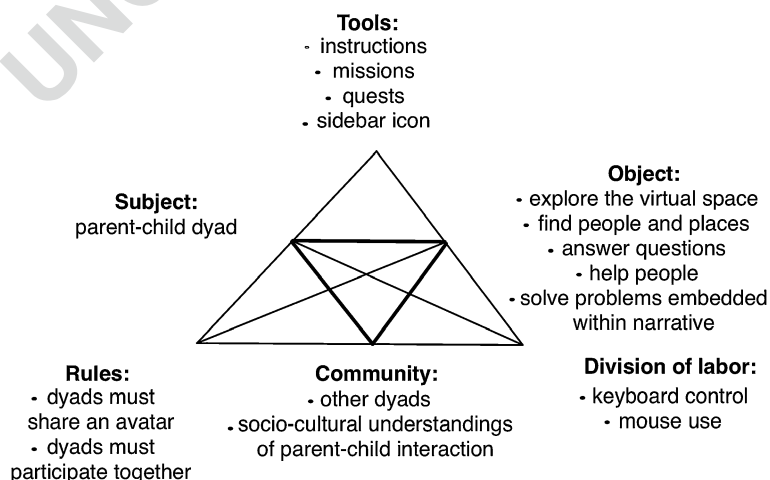
The activity system of intergenerational play involves the parent-child (the subject) who uses the virtual artifacts and structures that organize and support the game experience (tools) to act upon the interactive narrative-based game context (the object) within the larger context of the sociocultural model of how parents and children should interact and against

**Fig. 2** A model of an activity system (Engeström 1987)



which a particular parent-child dyad compares itself (the community). The interactive narrative-based game context affords and constrains the goal(s) of the parent-child dyads. However, family norms and game rules mediate the relation between the dyads and the interactive narrative-based game context. In addition, the interactive narrative-based game context can mediate the relation between the particular dyad and the community whose relation to the object is mediated through the roles and responsibilities the particular dyad share (division of labor), and can push both the dyad and the community to transform or develop (see Fig. 3).

We did not simply reuse the existing QA curriculum, but reorganized the Missions to create specific opportunities for intergenerational play. Expanding Vygotsky's (1978) sociocultural theory of learning, Newman et al. (1989) discussed *the construction zone*, referring to the shared psychological space where two minds meet—for example, that of a parent and a child—during problem-solving activities. They argue that this non-material space is neither solely created by the instructor nor by the learner, but rather emerges through a process of joint constructive interaction mediated by common goals. In a shared conceptual space, the introduced tasks facilitate intentions that constrain and give substance to the conceptual space—a space that both parent and child come to define and work within



**Fig. 3** Activity system of intergenerational play

as they attempt to solve particular challenges (Barab et al. 1999). In the current study, we leveraged real-world-like tasks and dilemmas to give legitimacy to the participation of both the parent and the child in game play.

The power of activity theory is that it allows researchers to identify the factors that mediate intergenerational play. However, in applying activity theory to our particular object of inquiry, we identified the subject as the dyad as opposed to the standard conceptualization of the subject as an individual (e.g., the child) in activity theory. In addition, we mainly focused on the mediation between the subject, the community, and the object in our analysis as opposed to tool mediation. Therefore, activity theory functions more like a guiding as opposed to being strictly an explanatory framework.

Below, we first describe the context of Family Quest program and seven parent-child dyads that participated in the five-week program. From there, using an ethnographic interaction analysis, we present examples from five parent-child dyads that are illuminative of several interesting phenomenon regarding intergenerational play. We conclude with a discussion on our findings and the direction of future research.

## Family quest

### Context

We implemented a Family Quest program at a local after-school club that served low and middle SES children. The age of the club members ranged from 6 to 18, which made the club a site for us to recruit children at the targeted age group (9 and older). Additionally, the club members had a diverse ethnic background, where 39% of the members were from minority families. The club had various youth programs that allowed us to introduce our family program as one of the activities that children and their parents can participate in as part of their membership. They also had Internet-connected computers available to run the implemented video game. Finally, the club was open between 3 p.m. and 8 p.m., which made it convenient to set a program for parents and children where parents could attend after work hours.

### Implementation

Flyers and posters were prepared to inform parents and children about the program. Registration forms were located at the front desk at the club where other club-related information was displayed. Two researchers gave a short presentation about the program during the parent information session in the beginning of the semester. Initially, nine parent-child dyads registered in the program. However, two parent-child dyads had to drop out because of the time conflict with their schedules. We declined four parent-child dyads because the age of children were younger than 9. Parents registered for one of the two possible days of each week to come to the computer lab between 6:00 p.m. and 7:30 p.m. They were contacted via phone by a researcher 3 days prior to the date the parents indicated that they would begin participating with their children, reminding them of the time and date of the program.

In their first session, parents and children were provided with (a) a list of mandatory and optional missions, (b) a manual that summarized the structure of Quest Atlantis (e.g., different virtual worlds within QA), (c) a list of tips for navigating within QA, and (d) a list of names that they can chose from for their shared avatar. There were three introductory missions (Intro, I-Burst, and Shard flower) that orient players to the QA environment and backstory, which had to be completed before the dyads were able to work on their choice of

missions (see Table 1 for the mission list). We expected that dyads would spend the first two sessions on the introductory missions, and then move onto the mission of their choice by the third session.

The three mandatory missions introduce the meta-narrative of Quest Atlantis and position players as “questers” in Atlantis, a world with many problems. As the late emperor’s children Mara and Nakal took over as leaders of Atlantis, in their push for “progress,” they destroyed the ancient Arch of Wisdom, an interactive embodiment of the essence and spirit of Atlantean history. The Arch’s destruction, and ensuing loss of knowledge and guidance contributed to environmental, moral, and social decay in Atlantis. In reaction, a group of six Atlanteans form a secret group called “The Council.” They build the OTAK, a virtual portal that allows them to communicate and ask help from people on Earth with the hope that their suggestions will help resolve problems both on Atlantis and Earth. We expected that working on mandatory missions would immerse parents and children in the game narrative and position them as co-Questers, not simply as parent and child.

After completing the mandatory missions, game play involved the parent-child dyads working on various tasks ranging from finding a special location to analyzing water quality and uploading a report. For example, players might talk to a non-player character designed by our team who tells them that she is worried about her fictional friend who has been picked on by the class bully. Then, as the player talks with the class bully and others, she might gain a different perspective on the problem and make decisions reflecting her opinion that changes what the game characters say next. In another scenario, dyads work on finding

**Table 1** Mission list

	Missions	Task description
Mandatory missions	Intro	Players watch a 3 min video about the history of Atlantis where they are introduced to the meta-narrative. Their first task is to visit and gather information about two virtual worlds (Unity & Ecology) in Quest Atlantis and report their findings to OTAK, a virtual computer that greets users when they first log in.
	I-Burst	Players talk to one of the council members and learn about the etiquettes of participating in Atlantis.
	Shardflower	Players talk to social commitments trainers and learn about the seven values that are cherished by the council members and are represented by the different shards of the destroyed Arch of Wisdom.
Optional missions	Linser & Susie (Social Cognition)	Players help Jeni who is upset that Linser, a student in her school, is teasing her friend, Susie. First, players talk to other students, and teachers who witnessed the instance. Second, they talk to Linser and then finally decide whether Linser is a bully or not.
	Sally’s Journal (Language Arts)	Players help Potter, a school counselor in Atlantis, who is trying to understand the metaphors and similes Sally, new student, used in her journal. Players first talk to Sally’s schoolmates to learn about Sally. Second, they read Sally’s journal to understand how she is feeling and then report Mr. Potter about the meaning of the similes and metaphors Sally used.
	Getting a Handle on Taiga (Science)	Players help Ranger Bartle to find the cause of fish decay problem in Taiga National park. First, they talk to three groups of people (indigenous people, loggers, and boat racers) to decide who might be causing the problem. Then, they collect and analyze water samples from the river. Players also analyze reports on fish sales and decide the responsible party for fish decay.

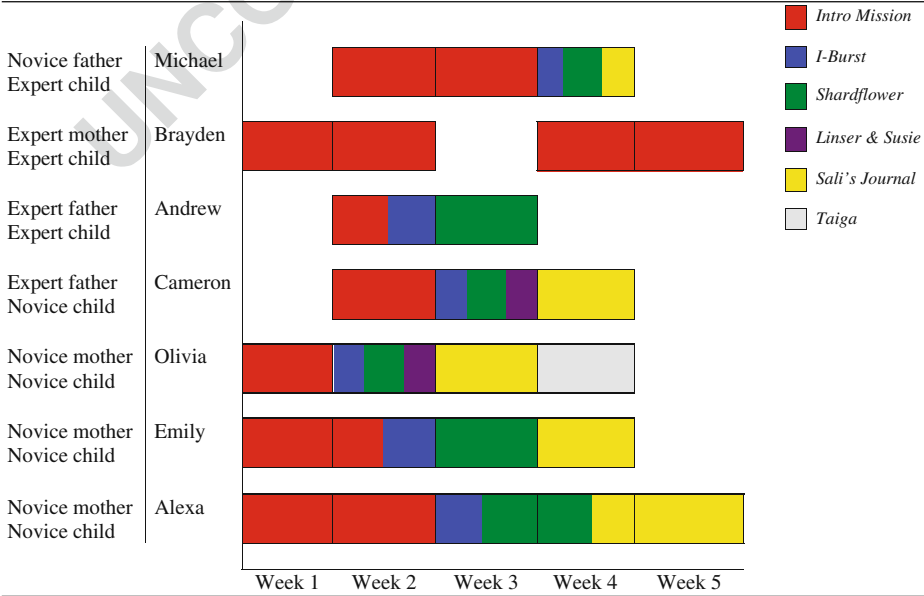
a solution to a fish decay problem in a park where they have to collect and analyze data. These fictional storylines are designed to be narratively rich and to avoid simplistic answers so that differences between parents and children might be elicited and be equally valid from each of their perspectives.

Dyad profiles

Two father-son dyads (children: Cameron, and Michael, age 10), 3 mother-daughter dyads (children: Olivia, age 13, and Emily and Alexa, age 9), 1 mother-son dyad (child: Brayden, age 11) and 1 boy who attended the program once with his mother and once with his father (child: Andrew, age 12) participated in the program. Cameron and Olivia were siblings who attended the program on different days with different parents. Olivia, Brayden, Alexa, and Emily and their parents started participating in the first week of the program. Andrew, Cameron, and Michael and their parents started in the second week of the program.

Parents held various jobs such as small business manager, nurse, payroll system manager, chemist, and administrator accountant. All parents were familiar and comfortable with computers except Michael’s father who rated his comfort and familiarity with computers lower than his son. However, parents and children had different levels of familiarity with video games, Cameron’s father, Andrew’s father, and Brayden’s mother being the highest. Olivia, Brayden, Alexa, and Emily and their parents started participating in the first week of the program. Andrew, Cameron, and Michael and their parents started in the second week of the program. At the end of the five-week program, all parent-child dyads completed all three required missions (Intro, I-Burst, & Shardflower) except Brayden and his mother (see Table 2). We conducted our data analysis on five parent-child dyads only because we were able to triangulate survey, observational, and interview data to understand the nature of intergenerational play.

Table 2 Dyad profiles



Data collection	207
Before parents and their children started playing Quest Atlantis, parents filled out the informed-consent form and a 12-item questionnaire. On a 5-point-Likert scale, parents rated their own and their child's familiarity and comfort level with computers and video games. During sessions, two researchers took thick-description notes (Geertz 1973), where they typed their observation of parent-child dyads (focusing on each dyad for 10 min at a time) on their laptops and noted down any instance that was important for researchers to look at later. One of the researchers was also the instructor of the program, therefore, she was in the role of a participant observer (Jorgensen 1989) interacting with participants when they first arrived and asked questions, needed help, or started a conversation. All sessions, except the first session, were audio-and-videotaped and later transcribed. Audio-recorders were positioned in front of each parent-child dyad. Video cameras were set up on different corners of the room to provide visual cues and were adjusted according to the number of dyads in the room and how they were positioned. At the end of five weeks, five parent-child dyads (two dyads being a family) were interviewed about their experiences.	208 209 210 211 212 213 214 215 216 217 218 219 220 221
Data analysis	222
In analyzing the video recordings of parent-child interaction, we used techniques from interaction analysis (Jordan and Henderson 1995). We analyzed the data in several passes where we shared our analysis with our research group and discussed our interpretations after each stage of analysis. First, we went through the video recordings of each week to understand the evolution of the Family Quest program, taking notes of emerging themes across different dyads and unique instances that illuminate interesting phenomena. After this initial coding, we carried out a more focused analysis of five parent-child dyads that we had both interview and observational data on. In conversations, a person's utterances position the hearer(s) or the person in certain ways in relation to what is being said or done (Goffman 1981). As we went through the data, we identified different episodes and analyzed the intentions of parents and children, and the roles parents and children have taken in their utterances (e.g., learner/instructor, expert/novice, collaborator, etc.) to understand the meditation between the dyad (the subject), the interactive narrative-based game context (the object), and the norms of parent-child interaction (the community). In addition, we noted when these utterances took place in parent-child game play, and how often they occurred.	223 224 225 226 227 228 229 230 231 232 233 234 235 236 237
Results	238
In this section, we first describe five cases of parent-child dyads (2 father-son, 2 mother-daughter, and 1 mother-son dyads) and provide illuminative examples of the mediation between the dyad (the subject), the sociocultural model of family interactions (the community), and the interactive narrative-based game context (the object). Then, we summarize the outcome of intergenerational play and provide an instance that is indicative of what intergenerational play can achieve and the direction of future research.	239 240 241 242 243 244
Divergence of intentions, failure to transform the object	245
<i>Andrew and his father</i> Among all five parent-child dyads we analyzed, Andrew's father was the parent who used directives to control the activity of his child the most. There were probably	246 247

several factors that mediated Andrew's father's action, however, the most obvious one was his strong sense of being an expert video game player. Andrew's father played first-person shooter video games like Counter-Strike. Compared to Andrew's mother who asked questions four times to the instructor-researcher (*Field Notes*, 10-04-07), Andrew's father, as someone who played video games regularly, preferred to "figure out playing" by himself. He occasionally mocked Quest Atlantis because the players "run around and do nothing" and commented that he preferred "running around and shooting people" (*Field Notes*, 10-09-07).

While the design goals created a shared space for Andrew and his father to work together through shared intentions, the sequence of interaction between Andrew and his father suggests that they shared different intentions:

---

Father: Turn around [reading the instructions out loud for himself] Click that. Ok, we gotta find Olivia. Where is Olivia at, ha? [sounds little sarcastic]

Andrew: I don't know.

Father: She is at the school, isn't she? Ok, click on. Oh, wait [skims the text] Ok, let's go and find her.

Andrew: I know where to find her.

Father: Turn left.

Andrew: There is a faster way to the portals.

Father: Turn right. Your other right, son. Run, run, run.

---

Here, Andrew's father dismissed Andrew's attempt to participate in finding the non-player character (NPC) Olivia as part of their mission twice. He ignored Andrew's comments like "I know where to find her" and "There is a faster way to the portals." By so doing, Andrew's father reinforces the existing communal norm of the father-expert being the figure of authority and control, resisting the transformation of the communal norms. Andrew, on the other hand, attempts to participate in this particular instance as an expert with his father as well, challenging the communal norms of the child-novice.

The roles of father-expert and child-novice switched to father-novice and child-expert once the activity changed from finding NPCs to answering questions. Andrew's father's referred to the activity of answering questions as "school time" where he waited on Andrew to complete so that they could move onto looking for people and places where he was the expert lead. In these activities, Andrew's father was the novice, a person who was unfamiliar and unknowledgeable about the task, while Andrew was the expert who can successfully complete the task without the help of others.

Andrew's father's role of father-expert was also reinforced with the existence of Cameron and his father on the day Andrew and his father participated in the Family Quest program. Cameron and his father, and Andrew and his father formed a community within which Andrew and his father measured their progress. However, the community in which Andrew and his father were measuring their progress was different. Andrew was comparing their progress in relation to QA game context and the norm of playing collaboratively with parents. Andrew's father, on the other hand, was comparing their progress in relation to an abstract competitive game context where they were "losers" while Cameron and his father were "winners." Andrew and his father accomplished very little during their game play. The divergence of intentions and the lack of exchange of expertise contributed to the failure of transforming the interactive narrative-based game context and the maintenance of the community.

*Brayden and his mother* Despite their frequent participation in the program, Brayden and his mother were the least successful dyad among the five parent-child dyads. Brayden's

mother shared the design goal, however Brayden's goal during game play was to run around. This created a tension between Brayden and his mother where they were unable to work together as a dyad. Specifically, Brayden's goal to explore the virtual world without having to do any reading and writing and his mother's goal to complete missions by following instructions characterized their interaction throughout the program. For example, during their second session, Brayden's mother suggested that they were "supposed to be working on the mission" four times when Brayden went off exploring the glowing crystals in the virtual world and tried to figure out how to put his name on the wall in Otak Hub. Brayden constantly resisted his mother's attempts to redirect his intention from exploring the world to finishing missions:

---

Brayden: ...I went through that portal.  
 Mother: What portal?  
 Brayden: [ignores the question] Look [referring to the screen]  
 Mother: But where are we?  
 Brayden: [ignores the question, keeps looking at the screen as he moves his avatar] Go up the stairs, up the stairs [in a singing voice]  
 Mother: Where are we? [Brayden ignores] Ok, teleport home.  
 Brayden: Why?  
 Mother: We got to finish this [mission] ...no, don't go there. Don't.  
 Brayden: Ok.  
 Mother: So, teleport.  
 Brayden: Where is teleport?  
 Mother: Up. Up. Teleport [Brayden can't see it] The word. Teleport. The word [getting frustrated] Read the word.

---

Here, Brayden dismisses his mother's attempts to participate in game play three times before he follows his mother's direction to the teleport. By so doing, Brayden challenges and resists the communal norms of parent-expert and child-novice. His mother, on the other hand, attempts to reinforce the communal norm of parent-expert and child-novice. In addition, Brayden's mother measures their progress in relation to other parent-child dyads as the community and finishing missions as a parent-child as the communal norm. The sequence of interaction between Brayden and his mother shows that Brayden almost always ignores his mother's suggestions at first and then follows what his mother has said or suggests something else in response. This suggests that the community that Brayden is part of and is trying to transform is the sociocultural model of parent-expert and child-novice as opposed to other parent-child dyads. In fact, Brayden's participation suggests that he is making bids to be treated as an equal participant in a parent-expert-novice with child-expert-novice.

Considering that both Brayden and his mother had a Nintendo DS and played together regularly (especially *Zoo Tycoon*), it is possible that both Brayden and his mother participated in intergenerational play as expert gamers who are familiar with game mechanics. Perhaps the divergence of intentions between Brayden and his mother is also related to Brayden's attempt to reinforce agency in game play within the constraints of a shared avatar. The roles of parent-expert and child-expert might have created a context, especially during the activity of finding NPCs, where Brayden and his mother failed to progress in the game.

The constant reinforcement of parent-expert and child-expert roles by Brayden and his mother was observed during answering questions as well. As opposed to Andrew's father who perceived answering questions embedded in game play to be schoolwork and an

activity that Andrew is an expert in, Brayden's mother participated in answering questions and often disagreed and corrected Brayden's responses. In summary, the divergence of intentions and the lack of exchange of expertise contributed to the failure of transforming the interactive narrative-based game context. However, the communal norms were challenged and were in the process of changing.

Divergence of intentions, successful transformation of the object

*Alexa and her mother* Both Alexa and her mother had no previous experience with video games, but were somewhat familiar and comfortable with computers. Alexa and her mother worked consistently well, however shared different intentions that some times aligned and at times misaligned with design goals. Alexa's mother's intention was to help her daughter advance in the game while Alexa's intention was to succeed in the game (although sometimes she got distracted with other things). Alexa and her mother shared the communal norm of parent-facilitator and child-novice:

---

Mother: Ok. Click on Sali's journal mission. Alright. Let's review [reading quietly, to herself] Oh, that's right she is in a new school and she gave Potter her journal. So we are trying to find him and he was in certain coordinates and we have to talk other people. Ok. Go to learn more. Let's start writing stuff down [reads] Unity world.

Alexa: 15N 10W.

Mother: And it's Potter. Ok. And what's the next one [task] say?

Alexa: This one says talk to Danny, Alfred about their thoughts on Sali.

Mother: [writing down] Ok, next one [task]

Alexa: Simile. Metaphor [reads quietly] understand the difference [continues reading quietly]

Mother: Ok, so we have to find Potter in Unity world. Then talk to three people and then there is something about similes and metaphors. I guess we are going to find more about after we do these other things. Ok. So, now, before we do anything else...Ok, go ahead close that [mission page]. So, let's go to Unity world.

---

Here, Alexa's mother reinforced the communal understandings of parent-child interaction. She took the role of a parent-facilitator and made sure that Alexa understood the task goal (the list of tasks that they needed to do to finish the mission) before proceeding in the game. She also provided technical support for Alexa by taking over the task of writing down the relevant information (e.g., the coordinates, the name of NPCs) and typing. Alexa also shared the community norms since she followed her mother's suggestions and answered her questions.

There were several norms in relation to the model of parent-facilitator and child-novice that mediated the interaction between Alexa and her mother as subject and the interactive narrative-based game context. First, we observed Alexa asking permission "to explore" from her mother during their game play when Alexa's intentions diverged from her mother's. Second, Alexa's mother often provided Alexa with a choice during their game play. For example, when Alexa was distracted with something else, she asked: "Do you want to do that [the thing that distracted her] or keep looking for the temple? [the task]" Similarly, when they had to answer questions in comparing Unity and Ecology world, Alexa's mother asked Alexa: "Do you think you remember enough about to do that or should we go and visit them again?" In these two examples, providing choices function

differently, however, in both cases Alexa's mother took the role of parent-facilitator and tried to support her daughter to proceed in the game.

Convergence of intentions, successful transformation of the object

*Cameron and his father* Like Andrew and his father, Cameron and his father shared an interest in video games. However, Cameron's father reported that he did not allow Cameron to play video games like those that he himself regularly played (e.g., World of Warcraft). He valued playing Quest Atlantis with his son in that it provided a context for Cameron to develop the gaming skills that can later transfer to other similar type of role-playing games when he was developmentally ready to play.

The design goals created a shared space for Cameron and his father to work together. Cameron and his father shared the same intentions during their game play:

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Father: He [the NPC] said at the trading post. So, you have to find where the trading post is.  
 Cameron: He should be here. It was a big clock.  
 Father: Oh, virtual reality time. Hey, didn't we find a map once? Do we have a map somewhere? What's in the Q-Pack?  
 Cameron: Q-Pack, let's see. Yeah, Otak map [reading]  
 Father: Yeah, let's open that [looks at the open map]  
 Cameron: Trading post [reading] We are right here [points to the map]  
 Father: *The world entrance* [reading]  
 Cameron: So, we go here [points to the map]  
 Father: Yeah, because remember you typically [pauses] You know where to go let's go [Cameron goes to the trading post] Click on people to find which one is Keisha.

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Here, Cameron's father directs Cameron's attention to relevant information like the location where they needed to go, the tools that might help them to find the person, and how to figure out which person was the person they were looking for. By so doing, Cameron's father reinforces the communal norm of parent-expert-facilitator and child-novice. Cameron shares this norm as he accepts his father's support. At the same time, he actively engages with parts of the activity of finding the place (e.g., checking the map and finding the place that they want to go) and brings his knowledge to the situation. By so doing, Cameron reinforces the role of child-collaborator that his father acknowledges.

Cameron's father was the only parent who consistently and extensively drew his child's attention to coordinates while figuring out where to find locations. In fact, Cameron's father reported that this was the most enjoyable part of working together for him. However, Cameron's father became visibly less involved with navigation, letting Cameron figure it out by himself by using the tools available in Quest Atlantis such as the mission list and maps as well as with answering questions. During the third and fourth sessions, Cameron was observed getting frustrated and complaining: "we are supposed to be working together."

By reducing support, Cameron's father challenged the communal norm of parent-facilitator and child-novice and perhaps tried to transform it. Cameron, on the other hand, tried to reinforce his role of child-novice and his father's role as the expert-facilitator. Cameron and his father shared intentions that allowed them to transform the interactive narrative-based narratives in the beginning of their game play. However, the

gradual divergence of intentions and the changes in communal norms in the end of the Family Quest program made it so that Cameron and his father were less and less successful in transforming the interactive narrative-based game context towards the end of the program.

*Olivia and her mother* Unlike other parent-child dyads, both Olivia and her mother were “somewhat familiar” with video games. Throughout their game play, Olivia and her mother shared intentions that were aligned with design goals, and they exchanged expertise in achieving those goals:

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Olivia: Mom, can you write this down for me?  
 Mother: Ok. [pulls the keyboard towards her] Ok, you read the question [Olivia reads what said on the screen out loud]. What is an important action in diversity affirmation?  
 Olivia: Everyone matters. So probably paying attention to differences.  
 Mother: Well done [reads out loud] *I create* [Olivia writes down something on the notepad] This is like the Citrus Festival [referring to a local music festival]  
 Olivia: [reads out loud] *I exist*.  
 Mother: Ok. What type of art [pause] I think it's the sculpture, don't you think?  
 Olivia: Yeah. Right, sculpture. Cool.  
 Mother: So, we do social responsibility? [starts reading out loud]  
 Olivia: Social responsibility. Show dignity. It is one of the two. Yeah, it's show dignity [pause] What does show dignity mean?  
 Mother: Like if you were to [inaudible]  
 Olivia: Good gentlemen. Click it [the next social commitment]  
 Mother: [reading out loud] *Think Globally Act locally*. So, what is this? [sounds confused]  
 Olivia: It talks about pollution.

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Here, upon Olivia's request, Olivia's mother takes the role of a parent-assistant. However, Olivia's mother immediately requested that Olivia take the role of child-collaborator. Olivia's mother took up the role of a parent-facilitator when she requested an answer from Olivia to the question of “What is an important action in diversity affirmation?” and made a connection between a shared experience (the local music festival) and diversity affirmation (the content). However, Olivia's mother immediately took the role of a parent-collaborator when she said: “What type of art...I think it's sculpture, don't you think?” where she was requesting Olivia's input to make a collective decision on which answer to chose. Olivia's mother continued to take the role of a parent-collaborator when she said: “we do social responsibility?” where she again requested Olivia's input to move forward with the task. Olivia and her mother exchanged what they knew when they helped each other understand the concepts such as “dignity” and “think globally, act locally.”

Through their game play across different tasks, both Olivia and her mother reinforced the communal norm of parent-novice-expert and child-novice-expert. More specifically, the control of the task switched from parent to child and child to parent according to different (or relevant) expertise that both the parent and the child brought to the activity. Our interviews with Olivia and her mother suggest that the community and the communal norms of parent-child interaction are in the process of negotiation due to Olivia's increasing demands for autonomy and privacy. The nature of intergenerational play between Olivia and her mother was indicative of how a video game environment can support the transformation of the community.

# The outcome of intergenerational play

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A significant outcome of intergenerational play across five weeks is that parents and children spend quality time together (except for Andrew and his parents). Mothers, in particular, reported that the activity of intergenerational play in the context of Family Quest was one of the few times that they get to “spent uninterrupted quality time” with their children around academically and socially relevant issues. For children, the activity of intergenerational play helped them learn “how to help people.” For parents, on the other hand, the activity meant that they learned about “how their children react” and “how their minds worked” while spending time together as a family. Too often, mothers had very little opportunity to interact with their children one-on-one due to house chores and other duties. The fact that Olivia and Cameron downloaded Quest Atlantis at home but were never able to have their parents play with them is quite telling of the limited opportunities of quality family interactions in daily life and the importance of intergenerational play. Likewise, Olivia and Cameron’s parents report that their children, while playing Quest Atlantis alone, were not critically engaged with information; this is indicative of the potential role intergenerational play plays in children’s learning.

The case of Cameron is an illuminating example of the role intergenerational play can play in children’s learning. After finishing the three mandatory missions, both Cameron (age 10) and Olivia (Cameron’s sister, age 13) worked on the mission where they had to identify whether Linser’s (a student in the All About Us school) teasing of Susie (another fictional student) was bullying or not. Despite being siblings, Olivia and Cameron had different reactions to this scenario. Cameron reported that he had been involved in a bullying situation before where “there were fists involved.” On the other hand, Olivia was never involved in a bully situation, but she had “seen it before” where “a person was calling names and yelling.” Consistent with previous findings on gender differences in children’s beliefs about aggression (Crick et al. 1996), Cameron conceived bullying as involving physical hurt and disagreed that Linser’s teasing was bullying. Olivia, on the other hand, conceived the situation involving emotional hurt and agreed that Linser was a bully. During the interview with Olivia’s mother, we were informed that both she and her husband were surprised that Olivia and Cameron had completely different reactions to the same scenario. However, she was aware of Alex’s “tendencies to bully” others verbally and was trying to find a way to address it without being confrontational. She explained that the scenario gave them an opportunity to have a discussion at home after Cameron got back home from the program where both Olivia and Cameron shared their reasoning behind their stances on the issue. Here is an excerpt from the interview with Cameron’s father that captures the change in Cameron’s understanding of bullying prompted by intergenerational play:

...so it [Cameron’s response] was interesting even after having him read all those things, he came away with a little bit of different impression then what bullying is then what other people mean...and so...as a result of that, you know, as we were heading home that night I recall teasing him about something and he kinda got upset about that and I said: “So, am I bullying you?” and you could see that...that triggered...on his face as he goes...he thought...“aha...so ok that is a kind of bullying.”

Here, the experience of intergenerational play was a reference to an interaction outside of the intergenerational play experience and the Family Quest program. The fact that a shared family experience of a video game scenario opened up family conversations around topics that are personally meaningful and transformative is indicative of what video games can do for families when designed with intergenerational concerns.

## Discussion and conclusion

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In this study, we explored the nature of intergenerational play and the challenges and opportunities of bringing parents and children together around a video game. Our findings suggest that the nature of intergenerational play was varied across our parent-child dyads. However, for several parents, our intergenerational play space provided a valuable way to engage with their children's thinking, character development, and learning.

There are several challenges we face as researchers and educators in designing for intergenerational play. As our findings suggest, the mediation between the interactive narrative-based context (the object) and the dyad (the subject) is mediated by the dyad's shared norms and by the community of dyads and parent-child relations against and within which they compare their own interactions. To create opportunities for transformative experiences like Cameron's for all children, we need to design interactive narratives that push back on the traditional roles of parents and children. Productive intergenerational play, collaborative work between parent and child around an interactive narrative-based game context, is characterized by exchange of expertise between the parent and the child around shared intentions. For example, Olivia and her mother take up the role of an expert and a novice at different times depending on their expertise in relation to different components of a task.

Our findings suggest that what did not work as well was when the parent or the child shared different intentions, stepped back, simply critiqued or directed, turning their participation into a compliance act and a frustrating experience. As an example of this, consider how Andrew and Brayden were not able to progress in the game as much compared to other parent-child dyads. The roles that Andrew and Brayden and their parents took made it so that both parent and child failed to utilize their expertise. Cameron's case suggests that opportunities for exchange of expertise were important in having a productive intergenerational play and for the experience to be transformative.

When designed with intergenerational concerns, the kinds of parent-child interaction that are afforded by an educational video game like Quest Atlantis can be different than those in other educational contexts (e.g., museums) where parents and children interact with static displays. The interactive narrative-based game context is dynamic in that the environment is changed by the actions of the dyads, and the kinds of changes they can make are suggested through the tools and narratives of the game. Thus, the game play can be designed such that the parent and the child come to share an intention to act upon the environment. Perhaps the transformative role of educational video games in supporting family learning and fun was best hinted by Cameron and Olivia's family experience around the bullying mission. This mission occasioned an opportunity for a shared context to mediate a whole family discussion, as a way for Cameron's parents to address his understanding of bullying. We can understand this as a specific case of what Ochs et al. (1992) found: that family conversations around daily activities (e.g., dinner table) occurred when family members engaged in argumentation practices where they provided evidence for their theories and challenged each other's claims and methods. However, some topics may not emerge in daily interactions of family members and not be easily discussed. For example, in the case of Cameron, bullying was a sensitive topic for family conversations where his parents were concerned about being confrontational. However, the fictional scenario mediated Cameron's understanding of bullying and allowed the family members to have a discussion where they engaged with argumentation. When designed in a way that involves issues that are meaningful to both parents and children, video games can open up family conversations that are transformative, and perhaps among families who are less likely to have family conversations that could have been difficult or less productive otherwise.

In her study of 21 urban parents and children in New York City and Boston, Gailey (1996) found that middle-class parents preferred what she calls “fantasy-odyssey and spatial relations type” games over “the urban-jungle and paramilitary sorts.” In our study, Cameron’s father was a middle-class white male who was an avid player of various fantasy role-playing games that involved an epic storyline (e.g., *World of Warcraft*) while Andrew’s father was a working-class white male who regularly played first person shooter games that involved military scenarios (e.g., *Counter Strike*). In contrast to Cameron and Andrew’s father, Brayden’s mother, an Asian American who held a white-collar job, played *Zoo Tycoon*, a game that can be categorized as “urban-jungle.” These differences in game preference may have mediated the observed intergenerational play. Cameron and even Brayden—despite a somewhat dysfunctional relation with his mother—completed the Family Quest program, while Andrew dropped out of the program after his father’s disappointing experience with playing Quest Atlantis. This suggests that one of the challenges in designing a game experience for intergenerational play in Quest Atlantis that does not involve violence is to engage parents and children, especially fathers and sons, who have a history of playing video games.

In conclusion, educational video games, like Quest Atlantis, can be used to facilitate parent-child relations and learning during early adolescence and beyond. Intergenerational play can be a productive activity where parents and children spend time together. It can also be a transformative experience when interactive narratives are designed around issues that are meaningful to the family. In addition, the interactive narrative-based context can be designed such that it pushes back on existing communal norms of the parent and the child regarding parent-child interaction. Especially, designing opportunities for the exchange of expertise between the parent and the child can turn intergenerational play into a productive one.

## Implications and future research

The theoretical framework offered and findings in this study expand our understanding of interaction between parents and children, and suggest a new way to support family learning and bonding during adolescence in the age of technology. Many have argued that there are intergenerational differences in the way parents and children engage with technology and video games. Rather than simply accepting differences between parent’s and children’s technology usage, this study suggests that we need to find productive ways to bring parents and children together around video games and create opportunities for exchange of expertise to facilitate family relations and learning.

One of the implications of this study is that video games can play an important role in engaging mothers and daughters with technology as in the case of Alexa and Olivia. Previous studies found that boys play video games more than girls (Roe, 1998). In our study, only boys were reported to be video game players as well. Also consistent with previous findings, we found that except for Brayden’s mother, all our participant mothers were novice video game players. However, the lack of significant prior video game experience of the mother, the child, or both had no observable impact on intergenerational play. It is important to note that father-daughter dyads did not participate in the *Family Quest* program. Future studies should explore the nature of intergenerational play between fathers and their daughters.

Future design will target the successful meditation of interactive narrative-based game context between the dyad as the subject and the community such that intergenerational play is a transformative family experience. To this end, we will design a game around dilemmas

that are of interest of families and that foster family dialogue such as the Bully Mission described above that one family encountered. We will design a game context where parent and child share different avatars and have to exchange information within the game as part of the game dynamics. This design, we believe, is more likely to set a shared intention and make it so that the parent and the child engage in learning.

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