

Game-based Learning & Co-Design with & for
Newcomer Children's Social Adjustment: A
Case Study of Arabic Speaking Tweens

by

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Abstract

The research reported here addresses the use of Game-Based Learning (GBL) and co-design methods in the social adjustment of newcomer children (the children of recent migrant families). Educational games have been shown to be an effective way of learning for adults and children. While the subject of newcomer children has been studied broadly, there are still many open research questions, including the role of emerging technologies (such as GBL) in the context of newcomer children's social adjustment. Also, the literature lacks a well-established digital technology framework in the context of newcomer children's social adjustment. Furthermore, there is almost no research investigating the role children can play in designing digital solutions to their pressing social problems. To bridge these gaps, we propose a social adjustment framework customized for newcomer children. It offers a comprehensive and interdisciplinary theoretical foundation, design guidelines, and a procedural model that consists of three elements (game-based learning, cultural inclusion, and co-design). Our research approach focuses on social adjustment problems faced by newcomer children to Canada aged 9–12 who are from Arabic-speaking countries, evaluating a solution using game-based learning, and engaging the children in co-designing such a solution.

Our research has three main contributions: 1) it is the first study of to apply or use of game-based learning in the context of newcomer children's social adjustment; 2) it introduces and implements a co-design approach to work with and for newcomer children; 3) it provides a customized educational game-based learning social adjustment framework including guidelines for cultural inclusion to help newcomer children in their social adjustment journey. Our first study identified the most pressing social adjustment problems through a fundamental survey study with newcomer children aged 9–12, their parents, and teachers. Our second study showed the effectiveness of game-based learning through a proof-of-concept game we created called the *New Beginning*. Finally, our third study revealed that newcomer children could contribute effectively as co-designers for creating social adjustment computer games for newcomer children. Also, we present educational game design guidelines, and other guidelines to work with and for newcomer children. Considering what we learned throughout this research journey, we conclude with a reflection on re-designing the proof-of-concept game *New Beginning*, and design a new game called *Together-WeCan*.

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CHAPTER 1: Introduction

1.1. Background

Every year, countries like Canada receive large numbers of migrants of different types, such as skilled workers and refugees. While this process is essential for social, cultural, economic, and humanitarian reasons, it raises many issues; among them, social adjustment (the process of adapting to the new society and its rules and structure) is of particular importance (Al-Srehan, 2020; Kirmayer et al., 2011; UNICEF, 2019). Different groups of migrants are affected by this problem at varying levels. For example, highly educated, skilled workers may find the adjustment process easier than refugees who are entering their new homes without proper preparation (Cortes, 2004; Donato & Ferris, 2020). Similarly, children are exposed to distinct forms of adjustment issues compared to adults as they may not have chosen the change or been prepared for it. Newcomer children¹ face a wide range of difficulties in their new way of living that are generally associated with a lack of social adjustment or a failure to adapt to the new environment. These adjustment problems in early childhood may affect children's future interactions, which could contribute to mental health issues, increased unemployment, criminal activities, or even radicalization. As a result, in multicultural societies such as Canada, there is a strong need to find innovative ways to help these vulnerable groups adapt to and integrate with the social fabric of their new multicultural environment.

Among newcomer children, different age groups also have specific social adjustment problems. Children between 9 and 12 years are generally known as *pre-teens* or *tweens*—a phase of human development following early childhood and preceding the teenage years (Fisher, 2015). The tween stage is a transitional one in which children need particular attention, especially newcomer children who experience extra difficulties when they relocate to a new place of living. We focus on this age group of newcomer children

¹ The term newcomer refers to a migrant who has been in Canada for a short time, usually less than five years, according to Immigration, Refugees, and Citizenship Canada (IRCC). For our study, we focus on newcomer children who have been in Canada for less than two years.

because it is an important transitional phase that is less studied within the context of migration (Dockett & Perry, 2001; Scott, 2014). The tween phase is essential in forming identities and involves various internal and external conflicts that will reflect on a person's personality and social life (Shenfield, 2017). Also, tweens may experience a high risk of pressure and anxiety since their thinking skills, emotional stability, and personality are forming (CMAS, 2015). Prior research has found that newcomer children have a different level of readiness than their families when trying to adjust to a new context (Liebkind, 1996). In the same vein, research has shown that the acculturation gap is negatively associated with children's adjustment (Birman, 2006; Kim, Zhang, Hou, & Shen, 2020; Weaver & Kim, 2008). A report of CMAS a non-profit organization identified some of the needs of newcomer children and looked at the factors contributing to their overall well-being (Valencia, 2015). These needs included the development of social networks, second language acquisition, and home language maintenance.

Social adjustment can also be defined as a two-way process involving newcomers and their host societies, affecting both (Strang & Ager, 2010). The size and composition of the population change, and new institutional arrangements come into existence to accommodate immigrants' political, social, and cultural needs. (Penninx, & Garcés-Mascareñas, 2016, p. 11). In Canada, it is argued that the immigration has tried to follow a *mosaic* model where immigrants maintain their distinctive identities while taking part in shaping the socio-cultural structure, while in many countries such as the US, the *melting pot* model is followed where the society is shaped through a process that doesn't maintain the original identities (Palmer, 1976). While this may be an oversimplification (due to factors such as many integration barriers for immigrants), the mosaic model is still an objective for Canadian society (Palmer, 1976) and used as an essential concept in this thesis. This two-way identity-preserving integration process aligns with a multiculturalism approach as a preferred way of integration compared to one-way assimilation. Such an integration process that allows adaptation while maintaining cultural heritage and original identities is specialty important for children who are in the process of forming their identities and finding their role in family and the society.

In recent years, researchers, practitioners, and entrepreneurs have been working on finding novel technology solutions to newcomers' integration problems (Benton & Glennie, 2016). One of these emerging technologies is Game-Based Learning (GBL), which has been shown to have strong educational potential, both for adults and children, as it increases the possibility of a total engagement or flow state (Barab, Gresalfi, & Ingram-Goble, 2010; Chen, Lien, Annetta, & Lu, 2010; Chen, 2012; Martens, Rinnert, & Andersen, 2018) and makes the learning process more attractive, entertaining, experiential, and potentially more familiar. The cohort under study are part of a tech-savvy generation who are more skilled in technologies in general, showing great interest and ability in using these to convey their ideas, adhere to structured tasks and generate solutions. On the other hand, collaborative design processes (a.k.a. Co-design) can engage users, particularly children, in designing products and services such as educational games to provide solutions that make sense to and are suitable for users (Melonio & Gennari, 2013). Co-design and game-based learning can overlap, whereas co-design is an integral part of game design. Co-design participants think aloud, negotiate, and rationalize different solutions (Gennari et al., 2017; Vaajakallio et al., 2010). As such, digital emerging technologies can be some of the most potent means of helping newcomer children in various ways.

Several attempts have been made to address newcomer integration needs. However, to the best of our knowledge, these efforts have been primarily focused on adult migrants, and there is very scarce work on using advanced digital technology in the context of assisting newcomer children. Despite the significance of newcomer children's social adjustment and the potential value of GBL and Co-design in helping to smooth the social adjustment processes, these possible solutions have not been investigated for use with and for newcomer children.

1.2. Problem Statement and Significance

The purpose of this thesis is to explore the potential of using game-based learning and co-design approaches to help newcomer children adjust socially. Our research focus on newcomer children is based on several reasons. First, there is an ongoing need to help newcomer children effectively integrate with the broader community while maintaining

their identities in a new environment and becoming active and productive members of their new societies. Second, children have a strong interest in learning via games and other digital media channels, as indicated by previous research (Buckingham & Willett, 2006; Charsky, 2010). Intrinsically, our study aligns with the new paradigm shift of providing edutainment for children using game-based learning and other digital storytelling technologies. Our argument is based on the premises of previous research—that children are social agents. As Christensen and Alison James put it: “...children are actors in the meaning-making of their everyday events...” (Christensen & James, 2017).

More precisely, the problem that we address consists of three levels:

1. **The overall problem:** There is a lack of social adjustment among newcomer children.
2. **Interdisciplinarity:** Contributions from other specialized fields are narrow, just addressing each specific discipline’s perspective. There is no comprehensive interdisciplinary framework to combine and leverage previous work and provide insights for newcomer children’s social adjustment.
3. **The core problem:** The role of GBL and co-design approaches in helping newcomer children overcome their problems has not been adequately investigated. Also, while the notion of culturally sensitive game design has been studied, the incorporation of cultural elements in the design of educational games for newcomer children has not.

While research on the social adjustment of newcomer children is evolving, there are limited studies of how existing digital technology, in particular game-based learning and digital storytelling, may help address newcomer children's continuing needs. We also identify that minimal published research has been conducted around involving newcomer children in the co-design process of educational, social adjustment games. Such an involvement is essential in the identity-preserving notion that we mentioned in the previous section as part of the mosaic model. The literature lacks a well-established theoretical and digital technology framework in the context of newcomer children's social adjustment.

To provide a context and considering the researcher's background and available resources, we focus on tweens from Arabic-speaking backgrounds. This choice limits our studies to a specific sub-set of newcomer children. Children of that age who are new to their environment have many shared characteristics that are reviewed in Chapter 2. But there are for sure some aspects that are specific to our focus group, for example due to cultural heritage. As such, our findings will be more suggestive rather than indicative for other groups. This is a limit that is common among research on newcomers that focused on one group (Pyke, 2000; Ho, 2010; & Tran, Wang, McLeod, Verdon, 2021).

While there are many ways for users to collaborate in the design process, we focus on co-design workshops which are commonly done with children ((Thabrew, Fleming, Hetrick, & Merry, 2018). To systematically investigate the effectiveness of using game-based learning and co-design approaches to help newcomer children in their social adjustment journey, our research aims to investigate the following research questions:

On the general issue of newcomer children's needs:

- **Q1.** What are the most pressing issues that newcomer children face during the transitional period when moving to Canada?
- **Q2.** To what extent these problems may overlap or differ across three target groups: children, parents, and teachers?

On the use of GBL:

- **Q3.** Can game-based learning be used to assist newcomer children with their social adjustment problems, and how does it compare to more traditional methods?

On the effect of co-design workshops with children:

- **Q4.** What do the participating children feel/think, i.e., can the workshops be engaging?
- **Q5.** What do children learn through the workshop, i.e., can the workshops be educational?

- **Q6.** What game features and cultural aspects do the participating children use in the game design?
- **Q7.** What can we learn about the process of running co-design workshops through some examples with newcomer children?

Our work has been motivated by the belief that sharing effective social integration practices will better address the ongoing needs of newcomer families and their children. Successful social integration is fundamental for maintaining the social cohesion and economic growth of the host society and the mental health and growth of the migrants. Conversely, lack of social integration can result in isolation of the newcomers, and digital technologies have strong and un-explored potential to avoid this.

1.3. Research Approach

A customized educational game-based learning social adjustment framework for newcomer children is proposed to address the main research problem and answer the questions listed in Section 1.2. It offers a comprehensive and interdisciplinary foundation, design guidelines, a procedural model that consists of three elements (game-based learning, cultural inclusion, and co-design), and a three-phase research approach, as shown in Figure 1.1.

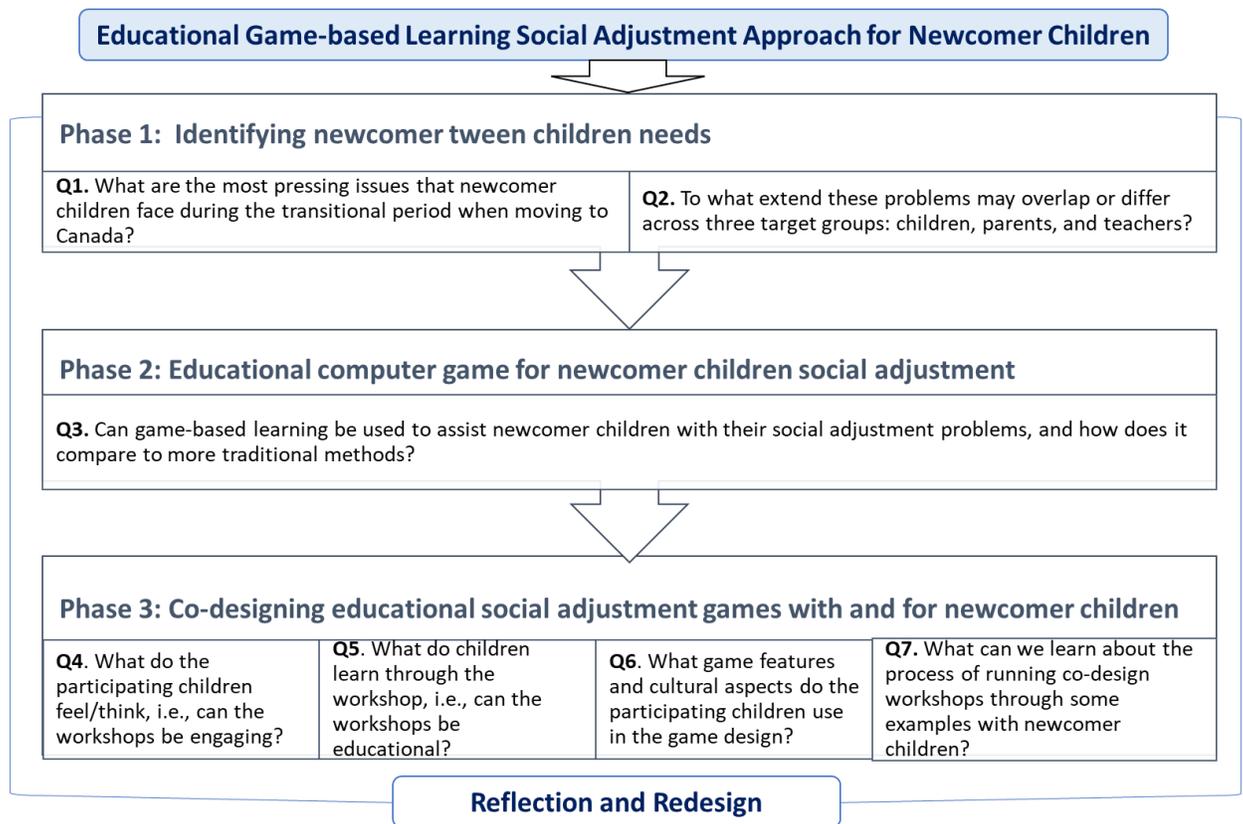


Figure 1.1. *Research Approach: Phases and Research Questions.*

Phase 1 is the foundation of our research, which is divided into two milestones. First, we conducted an extensive literature review of our research topic to map out any existing solutions before we attempted to tackle our study; this enabled us to identify gaps of knowledge and highlight the areas where additional research is required. Second, we followed the literature review by conducting a foundational survey to identify and determine the most significant social adjustment problems for newcomer children from an Arabic-speaking country. While the literature does provide a general understanding of what the children face and need, there has been little effort to contextualize that information and verify it for specific groups.

In phase 2, we conducted an experimental study of the effects of using game-based learning for newcomer children’s behavioural and social adjustment, including building a social adjustment behaviour computer game to test and validate the feasibility of using

game-based learning in the context of newcomer children's social adjustment (Bani-Taha, El Kouzi, Arya, & Taylor, 2019).

In phase 3, we conducted a series of co-design workshops to evaluate the impact of integrating cultural inclusion characteristics into our social adjustment game and investigate their feasibility in working with and for newcomer children. The findings of the workshops contributed to constructing design guidelines to work with and for newcomer children and developing educational, social adjustment games. Limited resources and scope prevented us from developing and evaluating more educational games based on the workshop findings. The primary contributions of the workshop were to investigate (1) what features and ideas are used by the participating children (and demonstrate how they can affect the design of our sample games), and (2) the learning and engagement that happens during the workshop by the participating children themselves. These were the basis of our research question 4-7 and address some existing gaps in existing research. We recognize that further research is needed to develop more educational games based on these ideas and evaluate their effectiveness.

Due to the COVID-19 restrictions, and because our thesis is based on user studies and to comply with our ethics board guidelines, we needed to adapt the study to a remote mode. As such, we converted the workshop into a virtual event in which participants had to convey their experiences and game ideas through the limited sight and sound capabilities offered by online platforms such as Google Meet and Google Jamboard.

Our studies focused on relatively small group of children from Arabic-speaking countries who were recruited through our partner groups (as discussed in the related sections). While our sample was comparable to many other research studies, we acknowledge its limitation both in size and ethnic origin. Newcomer children coming from other countries and cultures share many of their characteristics with our participants as discussed in Chapter 2, but they do have difference resulted form their culture and background. This limitation was necessary as we could not afford to investigate many different ethnic groups or larger population sizes. But the limitation implies that the

findings are only suggestive of how the proposed methods could work in other ethnic groups.

1.4. Contributions

Our research contributions include:

- 1) Offering an interdisciplinary insight on how to work with and for newcomer children and keep them engaged and motivated in their social adjustment when transitioning to a new way of living
- 2) Investigating and contextualizing the most pressing social adjustment problems that face newcomer children, and their parents and teachers
- 3) Designing and verifying the effectiveness of games for social and behavioural adjustment of newcomer children, particularly through our custom-designed game, *New Beginning*, which was used as a proof of concept
- 4) Exploring and proposing guidelines for designing educational games for newcomer children such as ensuring a mutual benefit of children participation, paying attention to nonverbal communication, and having researchers involved with children prior to the co-design activities
- 5) Creating a conceptual framework called WeCan, which adhered to well-established children co-design research to guide phase three of co-designing with newcomer children aged 9–12
- 6) Exploring the effective methods of co-design with and for newcomer children
- 7) Reflecting and re-designing the proof-of-concept *New Beginning* game and designing a new game called *Together-WeCan*, considering the insights gained from working with newcomer children in the co-design study phase.

The content of this research has been the subject of the following research papers:

Bani-Taha, O., El Kouzi, M., Arya, A., & Taylor, D. R. F. (2019). Educational Computer Games for Social Adjustment of Newcomer Children. The 12th Annual International Conference of Education, Research, and Innovation. Retrieved from <https://library.iated.org/view/BANITAHA2019EDU>

Bani-Taha, O., Arya, A., & Taylor, D. R. F. (2020). The Role of Emerging Technology in Helping Newcomer Children in Social Adjustment. Presented at Ryerson Centre for Immigration and Settlement (RCIS) and the CERC in Migration and Integration at Ryerson University. Retrieved from <https://www.ryerson.ca/content/dam/cerc-migration/documents/bani-taha-abstract.pdf>

In progress:

Bani-Taha, O., Arya, A., & Taylor, D. R. F. (2021). Co-designing Educational Games with and for Newcomer Children Social Adjustment. In progress to be submitted to Child Computer Interaction (CCI) Journal <https://www.journals.elsevier.com/international-journal-of-child-computer-interaction>

Bani-Taha, O., Arya, A., & Taylor, D. R. F. (2021). Identifying Social Adjustment Problems Among Newcomer Tween aged 9–12 years: A Primary Analysis from the Perspective of Children, Parents and Teachers.

Bani-Taha, O., El Kouzi, M., Arya, A., & Taylor, D. R. F. (2022). Together-WeCan: Educational Cooperative Game-Based learning for Newcomer Children Social Adjustment through Teamwork Gameplay. In progress to be submitted to ACM CHI Conference 2022, Work in Progress track.

1.5. Thesis Structure

This thesis is structured as follows: Chapter 1 introduces the problem statement, research significance, motivation, and structure. Chapter 2 explores the background and state of the art of related areas and reviews relevant research studies. Chapter 3 explains the research approach and the proposed solution. Chapters 4 to 6 discuss the study phases 1 to 3, respectively. In Chapter 7, we reflect on the re-design of the initial proof of concept game and offer a design of a new game based on lessons learned from the co-design with newcomer children. Finally, in chapter 8, we provide future directions for research and some concluding remarks.

CHAPTER 2: Literature Review

Given the complexity and interdisciplinary nature of this topic, which has numerous perspectives, this review focuses on reviewing related work prominent to our research. We conducted two reviews. The first one was the primary review, which discussed several themes: Newcomer children social adjustment; frameworks related to the social adjustment of newcomer children; theoretical learning theories related to this research target group; the potential of using digital technology for newcomer social adjustment, game-based learning, digital storytelling; and game-based learning frameworks. Then we conducted a supplementary literature review to learn more about co-design with and for newcomer children, including a few overarching themes: co-design approach with children, co-design educational games and co-design frameworks. Then, we conclude with a critical gap analysis to precisely identify shortcomings in the existing literature and construct a few research questions based on the identified gaps. The questions formulated as a result guided this thesis.

2.1. Literature Review

2.1.1. Primary Literature Review

We used the following terms to search databases: The games terms were: (*“computer games” OR “video games” OR “serious games” OR “simulation games” OR “games-based learning and immigrant children” OR emerging technology and newcomer children OR “social integration” OR “social adjustment” and storytelling and “newcomer children”*).

The electronic databases searched in this review included: Google Scholar, ACM (Association for Computing Machinery), Scholars Portal, SpringerLink, ScienceDirect Journals, IEEE Xplore Digital Library, Child Development & Adolescent Studies, Taylor & Francis Journals Online, Design & Applied Arts Index (DAAI), The International Journal of Game-Based Learning (IJGBL), the International Journal of Computer Games Technology, and the Journal of Child and Family Studies. Using these databases ensured

that we accessed various theoretical and empirical studies on newcomer children's social adjustment across several disciplines, including technology, computer games, Human-Computer Interaction (HCI), education and other related fields.

The search also included reviews of research specifically focused on newcomer children's adjustment (Bode, 2004; Lori-Ann & Brown, 2014; Burgos, Al-Adeimi & Brown, 2018; Chuang et al., 2011; Colbert, 2018; Li, Doyle & Lymburner, 2016; Li, Doyle, Lymburner & Ghadi, 2016; Shakya, Khanlou & Gonsalves, 2010; Valencia, 2015) Articles related to learning theories and social adjustment concepts were also included, as they were essential to understanding the main learning paradigms that we address in this review. Other articles related to technology design and evaluation for newcomer children were also included.

Our search was intentionally interdisciplinary and drew on using gamification and game-based learning as a way of engaging digital natives. We believe that several different fields offer fundamental research on the use of technology in the context of newcomer social adjustment. We included research papers with projects that: a) investigated the role of technology in helping newcomers; b) discussed the needs of newcomers' children; and/or c) used various technologies such as game-based learning, digital storytelling and emerging technology. We also included articles with phrases such as "game-based learning," "newcomer children adjustment," and "integration" in our analysis.

We included articles that met the following criteria: (a) defined the results of empirical research; (b) addressed game-based learning and digital storytelling; (c) focused on social adjustment, newcomer children, emerging technology and newcomer children or technology and newcomers; and (d) was published in English since 2005 to include more recent work.

The first collection of papers was completed based on the abstract and the title. Then we thoroughly read, compared, described, and methodologically evaluated the selected articles so that we could more precisely apply the inclusion criteria and ensure the relevance of selected articles. When evaluating the quality of research articles, we

considered whether the research question was evidently defined and whether the research methods, design, and results were clearly described. The data synthesis process consisted of reading the selected articles and writing down and summarizing all relevant results for each article. Then we identified the similarities and differences among the selected articles, which led to the first categorization of articles into groups. Several discussions with co-authors resulted in the final data synthesis.

After evaluating the titles, abstracts, and keywords of the articles collected from our initial search, 105 papers were selected based on their relevance, date and number of citations. We tried to have as diverse an assortment as possible with respect to authors, publishers and subjects. We continually pursued additional potential leads, assessing papers in the reference lists of our selected articles and those that had cited our articles. Our search generated more than 800 distinctive titles, of which 186 articles and books were considered relevant following an analysis of the titles, abstracts and full article text. Some of these references were in the form of theoretical papers (46), while others referred to actual user studies (109) and several were review papers (31). Figure 2.1. illustrates the study identification process.

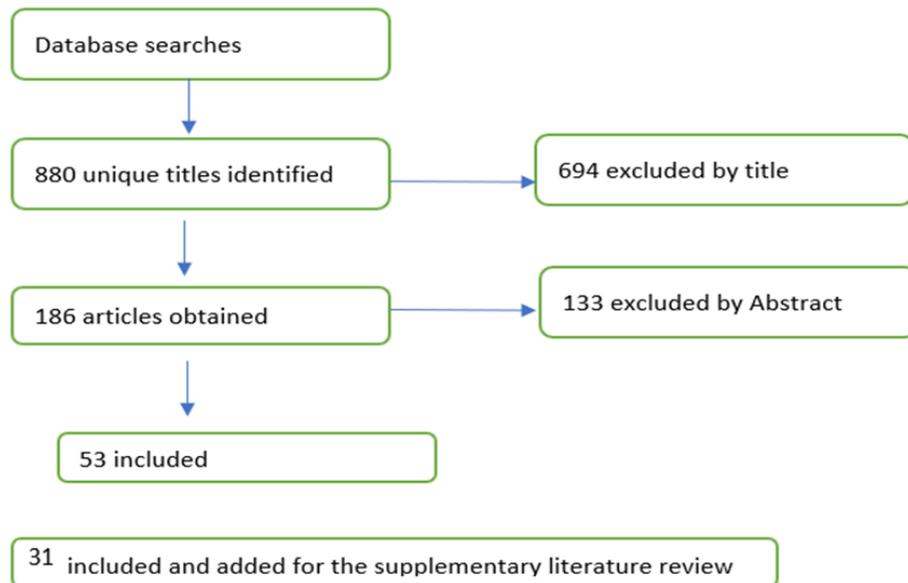


Figure 2.1. *The study identification process*

Among the projects addressing emerging technology and newcomer children, social adjustment studies were considered appropriate for the scope of this review. As such, we identified 53 articles (41 journal articles, 18 conference papers, four book chapters) as typical instances of work on the subject matter of game-based learning and digital storytelling. While all papers were examined, they were subjected to a more thorough discussion (Appendix A). The collection of 53 typical papers had been published between January 2008 and August 2020 and showed the most common trends in newcomer children's social adjustment support and strategies.

2.1.2. Supplementary Literature Review

Similarly, we conducted a specific literature review about the potential of using a co-design approach in the context of newcomer children. We discovered the importance of using the approach of adding and expanding on the co-design review from our previous literature on game-based learning and our two experimental studies, which point out the potential of engaging newcomer children to be part of designing our social adjustment solution.

As such, and following the same procedure of the previous central review, we ran a Google Scholar search for the terms “*co-design and children*” OR “*co-design and migrants*” OR “*co-design, and games*” OR “*newcomer children co-design*” OR “*immigrant children co-design.*” Also, we searched different digital libraries such as ACM, Sage, etc., to look for any co-design studies that are mainly focused on newcomer children, but we could not find any study that uses a co-design approach with our target research group of newcomer children.

We included articles that met the following criteria: (a) defined the results of empirical research; (b) addressed co-design or participatory design with children; (c) focused on techniques and ways of co-designing with children; d) focused on or were very close to our study research target group aged 9–12 years; and (e) published in English in the last decade.

The first collection of papers based on the abstract and title was completed similarly to the process for the primary literature review. To ensure the selected articles were relevant, we read, compared, described and methodologically evaluated all selected papers thoroughly. Examining the research article quality involved determining whether the research question had been clearly defined and whether the methods, design and results were described clearly. To synthesize the data, we read the selected articles and summarized all relevant research findings for each article. Afterward, we identified the similarities and differences between the articles, which led to our first classification of articles into groups. Final data synthesis was determined following several discussions with co-authors.

When we searched for the term “*newcomer children co-design*” OR “*immigrant children co-design*,” we could not find results under these specific phrases. Then we removed the word “*newcomer*,” and the search yielded 67 items without limiting the search to any specific time. Then we used the synonym keywords “*children participatory design*,” and we found 90 articles; similarly, the term “*children co-design*” yielded 93, and when we added the phrase “*newcomer children*” to the search phrase, the search yielded zero results. The total number was 250 articles. We evaluated these articles based on titles, and after removing the overlapping articles, we had 175 articles. Next, we screened these articles based on the abstracts, and by applying our inclusion criteria, we retained 63 papers. Then we read these papers fully and applied our present research inclusion and exclusion criteria, and we kept only the most relevant articles, totalling 31; these were aligned with our research target group.

2.2. Children Social Adjustments

Ager & Strang mentioned that *integration* is not used systematically and is a quite chaotic concept (Ager & Strang, 2008). Also, the definition of integration is flexible, and it can mean different things. For example, Heckmann and Schnapper state that integration is the inclusion of new populations into existing social structures of the immigration country (Heckmann & Schnapper 2003). However, integration can also be defined as a two-way process involving newcomers and their host societies (Strang & Ager, 2010).

This thesis adopts the mosaic model of immigration (Palmer, 1976) and Strang & Ager's definition as it recognizes both parties as active players, jointly responsible for building a society that enables equal access to employment, education, housing, healthcare and much more. We also stress the importance of facilitating the collaboration between newcomer children and non-newcomer ones, which can be achieved through engaging both groups in social adjustment activities and games held in schools and local community centers. In additions, newcomer children are subject to the critical issue of forming identity. This identity formation is complex as several social, cultural, emotional and economic elements impact their transition processes and shape their identities. For example, some researchers note that the integration of minorities and socioeconomic inclusion within the Canadian social fabric are critical matters that still need to be addressed for the current migrants and newcomers (Madibbo, 2008). Several scholars have shed some light on the identity formation problems among newcomer adolescents (Ngo & Schleifer, 2005; Sarros, Reed & Hartican, 2006). Likewise, in order to adjust to a new environment, children need to establish relationships, networks, and connections (Colbert, 2013; Onchwari, Onchwari, Keengwe, 2008). Newcomer children, in particular, usually feel a great need to achieve a sense of belonging in their new home. Love and attention are of equal importance to young children both at home and outside the home. In the absence of either of these resources, they will not be able to establish a secure base either at home or outside it (Onchwari, Onchwari, Keengwe, 2008, Valencia, 2015).

A review of related literature reveals the wide usage of the term *social integration* in different contexts. These contexts include social adaption, social functioning, social skills, social adjustment and social integration. Also, the concept of social integration has several forms, such as social skills, including prosocial behaviours, behavioural problems, peer relationships and peer problems. Social integration denotes the extent to which newcomer children can get along with native-born children; the nature of this engagement comprises children's ability to immerse themselves in proper and adaptive social behaviour (Lobel et al., 2017).

Likewise, prosocial behaviour refers to actions taken to help others by a motivated individual who possesses the proper perspective and empathy (Bierhoff, 2002). In other words, people need to recognize others' worldviews, a skill demanded in environments of growing diversity and complexity. Prosocial skills, developed in childhood, are crucial, and involve the ability to sympathize and empathize with other children and individuals. The research found a positive relationship between prosocial skills and emotional intelligence amongst preschool children (Denham & Couchoud, 1991). There is a strong relationship between children's emotional intelligence and whether they internalize their problems; this connection can be moderated by culture (Doan & Wang, 2018).

Deficiencies in children's peer-relationship skills refer to the inability to manage shared attention, control emotions, emulate another child's behaviour or actions, prevent impulsive actions and, most importantly, understand the relation between cause and effect (Bornstein & Lamb, 2011). Prosocial and peer-relationship skills are fundamental to social adjustment. Peer relationships can support and encourage newcomer children and play a central role in childhood development. By the time children grow older, they become more competent at initiating and maintaining social changes. Simultaneously, children develop adaptation skills and establish common connotations, arming them with the ability to resolve interpersonal difficulties and attain their social goals (Lerner, 2015; Beazidou & Botsoglou, 2016).

In a recent study about Syrian refugee families with young children, Yohani, Brosinsky and Kirova (2019) examine the psychosocial adaptation of families with young

children in Western Canada by using the RAISED² Between Cultures framework to discuss their strengths and challenges through early resettlement. Their study involved focus groups and semi-structured interviews with 10 Arabic-speaking cultural advisers who were working with Syrian refugee families for the duration of early resettlement. They analyzed the collected data thematically, and they found the following overarching challenges: language, ongoing safety issues, equitable access to services and social isolation. They also identified the following strengths: language, social connection as common strength and individual/family resilience.

Social networks ease newcomer children's transition processes and integration, thus contributing to the children's happiness and well-being. Additionally, advanced language competency aids children in feeling less nervous and more comfortable during their transition to a new atmosphere (Ren, 2015). Children who do not feel comfortable participating in social activities may experience social withdrawal, a condition in which children often forgo social activities in the presence of peers. Socially withdrawn children are foreseeably at danger of a broad range of undesirable adjustment outcomes, such as socio-emotional complications (e.g., anxiety, low self-esteem, symptoms of depression and internalized problems), peer complications (e.g., rejection, victimization and lack of quality friendships) and school complications (e.g., poor quality teacher-child relationships, academic problems and school circumvention) (Rubin, Coplan & Bowker, 2009).

Newcomer children may be subject to social withdrawal because they have left all their friends, family, original lifestyle, languages and traditions behind; they miss their relationships in their previous homes (Scott et al., 2016; Valencia, 2015b). In addition, the relocation process introduces confusion, anxiety and may generate negative perceptions and feelings towards the new way of living. As such, children need special attention from their families, schools and new communities to motivate and encourage them to be part of

² RAISED stands for R: Reveal culture, A: Acknowledge pre-migration experiences, I: Identify post-migration systemic barriers, S: Support family and community strengths, E: Establish connections between environments and D: Determine child outcomes together with families.

their new society, thereby preventing or lessening the negative consequences of the migration and integration processes.

Social adjustment is one issue that needs to be addressed. Dockett and Perry (2001) define social adjustment as “involved children being able to operate as part of a large group, through sharing the teacher's attention, demonstrating independence as required, and being able to follow directions” (Dockett and Perry p.5). One could ask, how is social adjustment an issue or challenge for newcomer children? In previous research (Scott et al., 2016), newcomer children were found to be potentially shy and cautious of strangers. They might find it hard to express their feelings or show their emotions. Newcomer children might have been taught to show respect for their teachers and other adults in their home countries by lowering their voice and averting their gaze. They might have been discouraged from expressing their opinions (Judith, 2013). These behaviours might be misunderstood in a culture that values maintaining eye contact and the freedom to express one’s thoughts.

2.3. Frameworks Related to Newcomer Children Social Adjustment

Our research identified some theoretical frameworks directly related to newcomer families and their children. This thesis takes into consideration the following frameworks to examine and provide solutions for newcomer children's social adjustments.

2.3.1. The Ecological Systems Model

Ecological systems theory concentrates on the environmental facets of development with a specific emphasis on youth (Bronfenbrenner, 1994). According to Bronfenbrenner’s ecological systems theory, children usually find themselves entangled in different ecosystems, from the most personal and smaller home ecological system to the more extensive school system, and then to the vastest system, which comprises society and culture. Likewise, each of these ecological systems predictably interacts with and impacts each other in all attributes of the children’s lives.

Likewise, the family ecology concept emphasizes the interrelation between family and other ecological systems such as school, neighbourhood, and peer network. Applying

ecology as a holistic theoretical approach is vital as newcomer families do not live in a vacuum but are surrounded by a greater social structure interrelated with other social organizations and social contexts. Explicitly, Bronfenbrenner's ecological model entails five sub-systems that cannot be identified without reference to the other. Expanding Bronfenbrenner's ecological systems theory to the study of newcomer children's social development places them in the core of a collaborative system that comprises the microsystem, mesosystem, exosystem, macrosystem and chronosystem, as described in Figure 2.2 (Bronfenbrenner, 1994).

In a new example, Paat (2013) draws on Bronfenbrenner's ecological systems theory and underlines the vital function that family social ecology plays in how immigrant children will fare over their teenage life course. By providing a thorough picture of how the newcomer family process occurs, Paat suggests how understanding the ecology of immigrant families can strengthen social work service delivery and, of course, generally help these families.

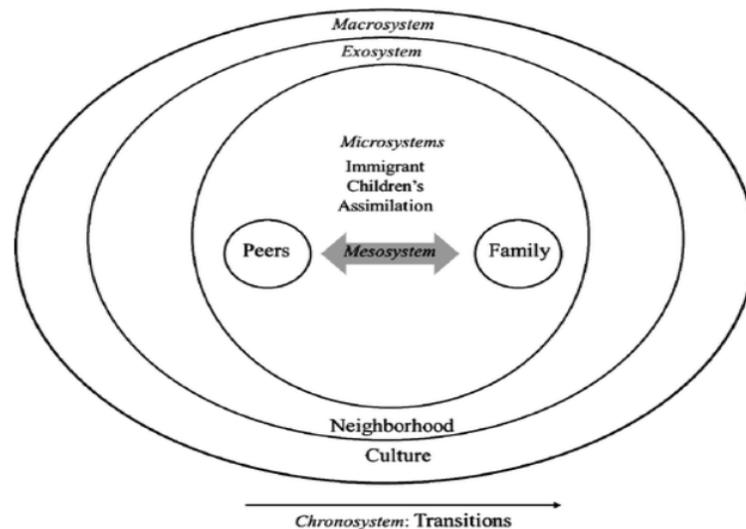


Figure 2.2. *Conceptual framework of family ecology paradigm (Paat, 2013)*

In our research, we draw on the insights of Bronfenbrenner's ecological systems theory. We believe that newcomer children are faced with various ecological systems that

are expected to be shaped or influenced by their cultural differences and the diversity of family surroundings.

2.3.2. The RAISED Between Cultures Model

The RAISED model focuses on understanding the interaction between individuals and their surroundings as key aspects in influencing their experiences and associated outcomes (Brosinsky, Georgis, Gokiert, Mejia & Kirova, 2018). This model, as illustrated in Figure 2.3, is essential when helping or working with newcomer children and families.



Figure 2.3. *The RAISED Model, adapted from Brosinsky et al. (2018)*

The RAISED model outlines six essential factors that make up the RAISED acronym: R: Reveal culture, A: Acknowledge pre-migration experiences, I: Identify post-migration systemic barriers, S: Support family and community strengths, E: Establish connections between environments and D: Determine child outcomes together with families. The RAISED model was built based on ecological systems theory. It was created to support teachers and practitioners in performing their work more comprehensively with immigrants and refugee children from immigrant backgrounds. Also, the model serves as a collaborative and supportive approach among academics and immigrant service providers, working directly with multicultural and ethnic communities, and educators and policymakers who have a similar aim of supporting the development of best practices for

working with this specific population (Brosinsky, Georgis, Gokiert, Mejia & Kirova, 2018).

Recently, a group of researchers applied the RAISED model in the context of examining the psychosocial adaptation of Syrian families with young children in Alberta, Canada (Yohani, Brosinsky & Kirova, 2019). Our research draws on the RAISED framework when identifying social adjustment needs, as explained in Chapter 5. Also, we use this model together with other existing frameworks to develop a comprehensive framework tailored to our research target group: newcomer children to Canada and, in particular, children from Arabic-speaking countries. We start by discussing their strengths and identified barriers during early transition settlement.

2.3.3. Asset-Based Approach vs Deficit Model

An asset-based approach is an alternative approach that focuses on strengths as opposed to weaknesses; it is an assets as opposed to deficits approach. In other words, some professionals—e.g., Scales & Leffert, 2004; Villarruel et al., 2003— use an asset-based approach as a substitute for a deficit-based approach with children and youth (Rose, 2006). As such, the emphasis is on what children can do or the target group's strengths and competencies. Based on this model, there are 40 assets categorized into two areas, external and internal assets. The external assets comprise subgroups of support, empowerment, boundaries and expectations, constructive use of time. These external assets exist in the microsystems that children and youth inhabit, such as family, school, neighbourhood, community organizations and religious institutions, where children and youth who report having these assets feel cared for and cared about more than other children. The internal assets include a commitment to learning, positive values, social competencies and positive identity. The internal assets are found within the individual child or youth, and they imply a positive, healthy, pro-social orientation on the part of children and youth. These assets make children and youth feel good about who they are and what they can do (Scales, Benson, Leffert & Blyth, 2000).

Although the assets approach contributes to essential assumptions in child and youth studies, we cannot ignore the limitations of this approach concerning children and youth in care. For instance, studies (e.g., Benson et al., 1998; Scales & Leffert, 2004) do not entirely represent children and youth in care, and undoubtedly the assets approach overestimated the developmental assets of those in care. We suggest, however, that the asset-based approach is both relevant and valuable in formulating interventions that target positive development for all children and youth—including those in care (Rose, 2006; Agdal, Midtgård & Meidell, 2019).

While these models are not specific to newcomer children, they are meant for children and youth in general and particularly in Western cultures. As such, we consider both assets models in our study, even though our research focuses on addressing social adjustment problems. However, still, we believe that the proposed solution can take into consideration the strength points of newcomer children and invest in these strengths to solve and mitigate weakness points. In other words, we used a mixed approach of asset and deficit models components in our current research framework and digital proposed solution.

2.4. Theoretical Learning Paradigms

Throughout the 20th century, researchers and psychologists have constructed numerous theories to explain how individuals learn. Psychological and learning theories used in an educational technology context can be categorized into some fundamental paradigms, such as behaviourist theory, connectionist theory, cognitive theory, constructivist theory and social theory (Seel, 2012; Merriam & Bierema, 2014). The connective learning theory is a more recent idea that recognizes our heavily networked digital and social cultures (Kathleen, 2011). We outline these theoretical learning paradigms in Figure 2.4. In this review, we found that the following theories were the most relevant for this review topic.

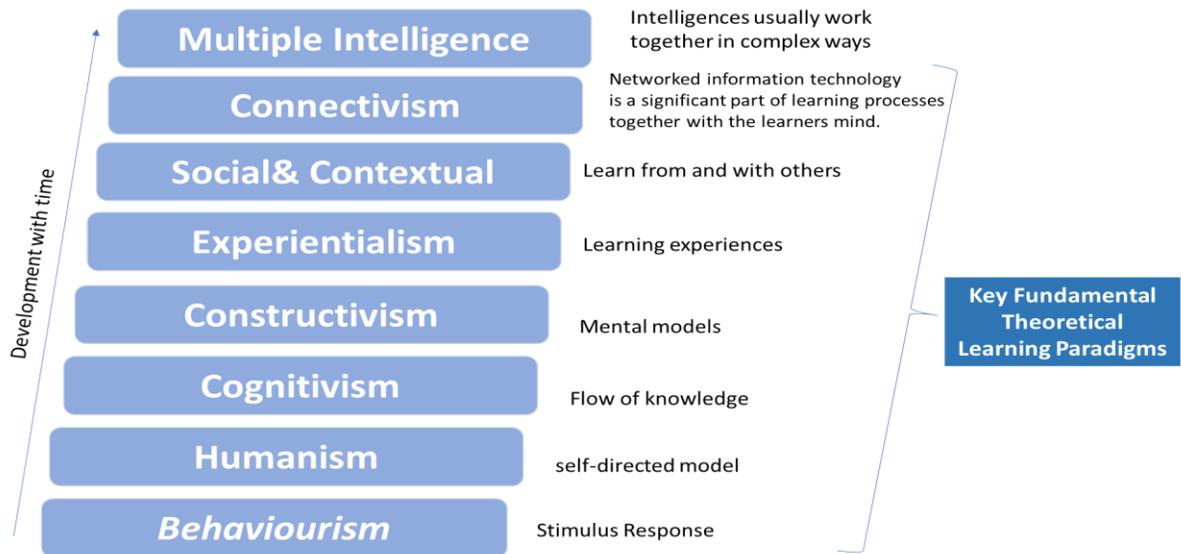


Figure 2.4. *Fundamental theoretical paradigms related to digital mediums technology*

2.4.1. Constructivist Learning Theory

The theoretical assumptions underlying the behavioural and cognitive theories are primarily objectivistic, based on a belief that the world is real and external to the learner. Instruction aims to map the structure of the world onto the learner (Jonassen, 1991). Some contemporary cognitive theorists have started to question this rudimentary objectivistic approach and instead implement a more constructivist approach to learning and understanding, where knowledge “is a function of how the individual creates meaning from his or her own experiences” (Ertmer & Newby, p.53, 2013). Constructivism emphasizes the significance of learners who are actively building their knowledge through an experiential approach. Dewey described it as “genuine education” (Dewey, p.199, 1997), while Vygotsky states that “this...is a social process mediated through a culture’s symbols and language” (Vygotsky, p.33, 1978).

2.4.2. Experientialist Learning Theory

Kolb states that experiential learning theory has been based on prominent 20th-century thinkers, including John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung, Paulo Freire, Carl Rogers and others. Those scholars paid particular attention to

“experience” as it played a pivotal role in their human learning and development philosophies. Their efforts were fundamental to advancing a comprehensive model of the experiential learning process and a multi-linear model of adult growth (Kolb, 1984).

The experiential theory is built on several concepts shared by the thinkers mentioned above. As summarized by Kolb & Lewin (2005):

- Learning is best comprehended as a process, not in terms of outcomes. As Dewey notes, “Education must be conceived as a continuing reconstruction of experience...The process and the goal of education are the same things” (1897: p. 79).
- All learning is relearning. Learning is best described through a process that leads a student’s thoughts and views towards a topic, where they can be evaluated and unified or combined with novel and more developed ideas.
- Learning necessitates resolving conflicts between the opposing modes of integration and coping with the world. It does not forget that differences, conflicts and disagreements are driving tools of the learning process where the learner is asked to move backwards and forwards between contrasting modes of reflection, action, feeling and thinking.
- Learning is an all-inclusive process of adaptation and coping with the world, not merely just an outcome of cognition; learning includes integrated functioning and qualities of the person as a whole (feeling, thinking, perceiving and behaving).
- Learning is a result of a collaboration between individuals and their environments. According to Piaget, learning happens through reaching equilibration through a talking process, integrating new experiences into existing concepts and accommodating those existing concepts to the new experiences.

2.4.3. Social and Contextual Learning Theory

Vygotsky states that social interaction influences both language and cognition, and he suggests that social interaction can aid students in making cognitive innovations (Garzotto, 2007). For example, he introduced the Zone of Proximal Development (ZPD), situated near the centre of the body or the point of attachment. The ZPD describes the gap between what individuals can perform with assistance and what they can do without help. According to the contextual learning theory, learning takes place only when learners tackle new material or information in a way that makes sense to them using their frames of reference—their inner worlds of memory, experience and response. Individual minds logically search for meaning in context by looking for connections that make sense and seem helpful. In addition, the contextual style describes learning as a complex and multifaceted process that goes far beyond drill-oriented, or stimulus and response, methodologies (Cord, 2016).

2.4.4. Psychological and Mental Health Models

Part of the integrative process is to help the newcomer adapt psychologically to their new home and overcome any obstacles that may form because of their adjustment difficulties and anxieties. One method or lens to look at these psychological conditions is through self-determination theory.

According to self-determination theory (SDT), humans have three basic needs: autonomy, competence and relatedness (Buckingham & Willett, 2006; Deci & Ryan, 2008; Mitchell, Schuster & Drennan, 2017). SDT “addresses such basic issues as personality development, self-regulation, universal psychological needs, life goals and aspirations, energy and vitality, non-conscious processes, the relations of culture to motivation, and the impact of social environments on motivation, affect, behaviour, and wellbeing” (Deci & Ryan, 2008,). Therefore, SDT relates directly to newcomer families and their children and integration because newcomers can achieve some of the components of SDT through integration. For example, integrating with the social environment, which would promote

better levels of newcomer mental health by their sharing in the joy of feeling part of something bigger.

2.4.5. Other Considerations

The brain research indicates that the physiological response to learning from screens is completely different from using more traditional media in terms of short-term and long-term memory. The previous research only refers to video gaming intervention that involves all age categories except for children (Denilson, Nouchi & Kawashima, 2019). This exception is due to a lack of intervention research using children as participants. The fundamental reason for this exclusion is that the brain is still developing until age 10–12 (Dong, Li & Potenza, 2017; Hahn & Curtis, 2016). Nevertheless, noncognitive-based video games have beneficial effects, which can be used in all age categories to improve the brain. However, effects on children remain unclear, which warrants specific medical research to fill this gap.

2.4.6. Why Does Understanding Learning Theories Matter?

Research shows that learning theories are pivotal in shaping the learning and teaching processes (Driscoll & Driscoll, 2005). Learning paradigms such as behaviourism, humanism, connectivism and multiple intelligences (Gardner, 2011; Duke, Harper, Johnston & Duke, 2013; Huitt, 2009) seek to explain and identify the processes of education, creating an important framework for instructional design in information literacy education and learning. These theories are essential in helping educators create a suitable learning environment that permits learners to get the most out of their instructional experiences (Grassian, Kaplowitz & Kaplowitz, 2009). Also, they can help connect observed performance variations with potential explanations for such changes (Driscoll & Driscoll, 2005). Fortunately, social development theories show that forms of play offer a positive environment to enhance children's social development (Slee & Shute, n.d.; Xinyin & French, 2008; Zhang, 2015).

Some might dispute that games can offer learning environments with unique features very different from other contexts and suggest that games should be placed into a

separate category. Other advocates further argue that game-based learning contains processes that diverge from other forms, stating that classroom instruction and games must be defined as separate modes or theories of learning (Prensky & Marc, 2003; Gee, 2005).

2.5. Potential Digital Technology and Newcomer Children Social Adjustment

Today's technologies are contributing so heavily to the diversity and intensity of international migration that they might be considered an inherent part of the process. Furthermore, using technologies facilitate migrants' migrations, including pre-migration preparations and post-migration reintegration: After migration, technology helps maintain contact with home and integrates migrants into host societies (Collin, Karsenti & Calonne, 2015).

Digital technology has created overlapping social networks that create “a more global, de-territorialized world” and help newcomers cope and integrate well into the host countries (Andrade & Doolin, 2016, p. 407). Many technological advances could benefit newcomers' social adjustment, including social media, blogs, virtual reality (VR), machine learning, game-based learning, Cybercartographic interactive atlases and digital storytelling. Social media platforms are popular among most newcomers, who prefer them over other internet applications (Alencar, 2018). Studies have found that regardless of age or gender, participants favoured platforms such as Facebook, YouTube, LinkedIn and Twitter (Alencar, 2018). Similarly, Dekker and Engbersen (2014) discussed social media use, pointing out that excessive consumption caused participants to feel disenchanting, even though this practice was important for integrating into a new country. Researchers analyzed blogs to determine how important they were in helping newcomers. The blogging system (including technology, bloggers, discussions and content) provides resources often accessed by expatriates. In a rigorous qualitative investigation, the authors describe how social contacts in a host country are crucial for expatriates. Expatriates are considered a different type of newcomer, and the Internet and other technologies influence how these individuals build new contacts and access social support (Nardon, Aten & Gulanowski, 2015).

In the remainder of this section, we focus on promising digital technologies that may address newcomer children's social adjustments. While there are different digital technologies that can be useful for children, we focus on Game-Based Learning (GBL) and digital storytelling because of their suitability and attractiveness to children and their relevance and capacity to solve children's social adjustment problems. Finally, in Section 2.6, we will consider the co-design of games with children.

2.5.1. Game-based Learning (Potential and Conceptual)

In 2003, Prensky coined the term "digital game-based learning" to reflect how the motivational components of games could be combined with educational goals and contents (Prensky & Marc, 2003). In other words, game-based learning borrows specific game elements and applies them to real-life situations to engage users and help them solve or learn about a problem (Isaacs, 2015; Meschede & Knautz, 2017). Throughout the game process, learners can discover how to overcome challenges such as solving well-made simulation problems and can compete with each other. The gaming process can enhance learner motivation and increase learning attainment (Prensky, 2007).

Scholars argue that integrating digital games into a learning environment requires considering many perspectives and details. Also, it necessitates an in-depth understanding of the design elements of games that enable learning by promoting learners' cognitive, behavioural, affective and social engagements (Plass, Homer & Kinzer, 2015; Prensky, 2007; Rooney & Whitton, 2016). Some researchers offer a more simplified conceptual model of game-based learning, stating that one of its most distinctive elements is how game creators focus on the quality of the learning experience. As a result of this consideration, digital games are capable of immersing game users or learners in an experience, engaging them on affective, behavioural, cognitive and social levels. Figure 2.5. illustrates these four foundations of game-based learning and how these diverse forms of engagement are supported through design features that lead to a playful experience (Plass et al., 2015).

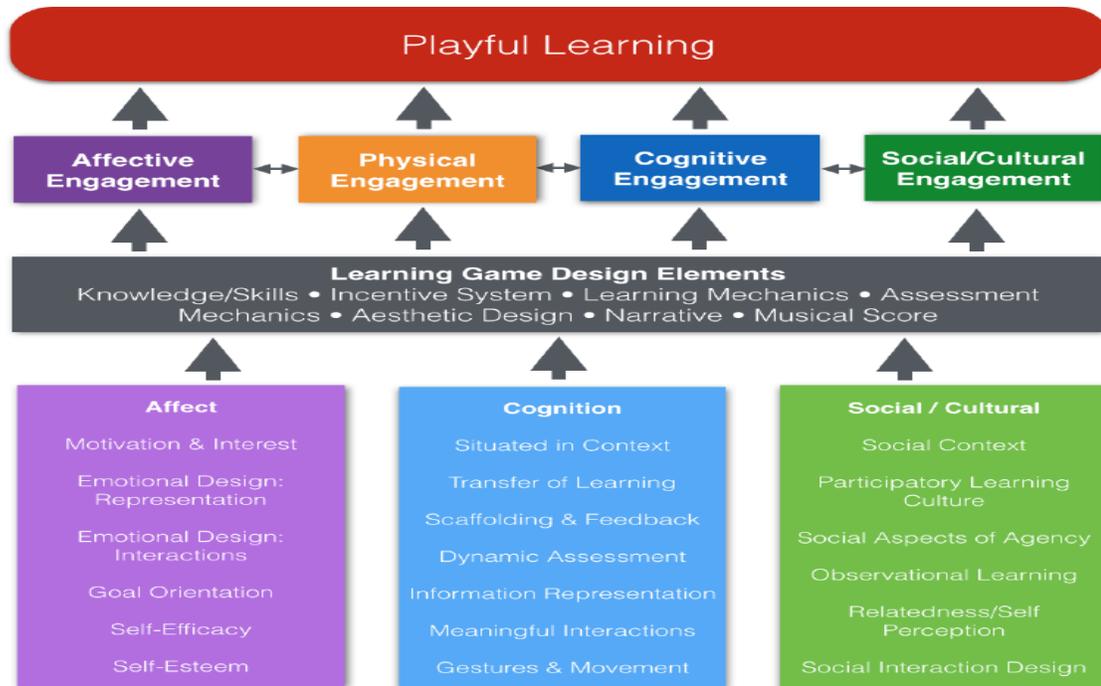


Figure 2.5. Combined design framework of game-based and playful learning (Plass et al., 2015)

A plethora of work has been published exploring educational games designed for early childhood and students in their tweens, teens and adulthood (Prensky, 2007; Brox et al., 2012). In addition, digital game-based learning has found increasing acceptance among different groups such as researchers, students, teachers and designers. The children’s digital educational game-playing phenomenon is increasing in popularity. Examples of the benefits of using game-based learning in different domains include *health, education and children with dyslexia* (Lee & Lau, 2018; Benton, Vasalou, Khaled, Johnson & Gooch, 2014; Vasalou, Khaled, Holmes & Gooch, 2017); *GBL news and journalism literacy* (Campos & Sardo, 2018); and *GBL in social and cultural perspectives* (Kirkland & Williamson, 2010; Hasler et al., 2017).

Additional research shows how educational games can help users learn about cultural components (Mortara et al., 2014). These games focus on educational objectives within a cultural context by examining the strong relationships among contexts of use, technological resolutions and education efficacy. Cultural consciousness games focus on

cultural heritage, including the languages, customs, traditions, spiritual beliefs, traditional stories and various behaviours in a society. Also, the authors recognize the key challenges that need to be addressed when designing and implementing educational games in the context of cultural heritage (Mortara et al., 2014).

For example, a project led by an international team of educators from Manchester Metropolitan University aimed to help to develop the digital, mathematics and linguistic skills of 12-13-year-old migrant children through educational games (“Migrant children to develop digital, mathematic and linguistic skills through educational games - Education Technology,” 2018). The children involved in this project used a game-based learning and innovative teaching method called “Content and Learning Integrated Learning” (CLIL). This approach teaches subject content—in this case, mathematics—through a second language. The educators hoped to close the accomplishment gap between learners from immigrant backgrounds and their peers from non-immigrant backgrounds.

While game-based learning is a serious way of teaching children in an engaging and impactful way, there are still some constraints that must be considered, as it can be adopted in an excessive or ineffective way (Eng, 2019; Mitchell, Schuster & Drennan, 2017; Hahn & Curtis, 2016). We summarise the overall advantages and constraints of games-based learning in Table 2.1.

Table 2.1. *Pros and Cons of Utilizing Game-Based Learning in Education**

Pros	Cons
Stimulate creativity	Cost of development
Encourage teamwork	The time required to develop creative educational games that meet specific learning objectives
Increase competitiveness	Lack of appeal to some students
Enhance the ability to detect patterns	Less physically active
Accommodate different learning styles	Can lead to eye strain, headaches, wrist, neck and back pain
Engage unmotivated learners	Requires technology that might not be available or accessible
Build confidence of ability to learn	May be difficult to monitor and assess progress
Develop literacy skills	
Develop mathematical skills	
Develop visualization skills	
Develop capacity for strategic and tactical decision making	
Develop critical thinking and problem-solving skills	

**Adapted from Hahn and Curtis (2016)*

As a best practice for successful games-based learning implementation, these mediums should be entirely aligned with learner needs, goals and outcomes. That alignment comes from getting the targets users onboard. Therefore, we plan a foundational study via surveys with newcomer children, parents, and children to understand their social adjustment problems and their insights around the notion of using game-based learning to help them overcome some of the social adjustments they experience. Likewise, the previous research and game-based learning examples demonstrate its effectiveness, efficacy and outcomes through past and current examples, case studies, and other interactive commercialized and educational digital games.

2.5.2. Digital Storytelling as a Way of Integration

Today's technology has made a broad range of interaction choices for interactive storytelling feasible, either for strengthening children's engagement with ready-made stories (e.g., listening, reading and active exploration) or for empowering them as active story authors (Garzotto, Paolini & Sabiescu, 2010; Niemi & Multisilta, 2016). The benefits

of engaging children as active storytelling creators have been evaluated by several studies, ranging from cooperative creations in large group or classroom settings (Di Blas, Garzotto, Paolini & Sabiescu, 2009; Menezes, 2012) to creations used within playful environments (Cavazza et al., 2008). These projects were designed to influence the behaviour of children and adolescents (Sawyer & Willis, 2011) and foster positive identity development in minority youth (Anderson & Mack, 2019).

Modern digital media technology has been a critical enhancement that supports storytelling and other narratives in several domains, including significant contributions to education. Today, children live in a digital era (Chen et al., 2010; Craig, Brown, Upright & DeRosier, 2016). Also, beyond being game consumers, they can also participate in the design and creation of digital technology such as games and digital storytelling. Cullen and Metatla illustrate this potential in their co-design study with children who used mixed visual capabilities to create a multisensory collaborative storytelling digital platform (Cullen & Metatla, 2018).

Technology such as digital storytelling can create a third space to bridge newcomers' transitional literacy problems and reformulate conceptions of what is acceptable in a new place of residence. The power of digital storytelling comes from the act of telling one's story using different multimodal components and languages, where newcomers can act as agents for their integration and learning process and can be the authors of their representation. In other words, digital storytelling can give newcomers a transitional voice to share their discrete histories, tell their own stories and follow their dreams in their new places of residence (Lotherington, 2011).

In a recent book, *Life Lessons Through Storytelling*, Donna Eder interviews elementary school children and investigates their responses to and thoughts about various forms of stories from diverse cultures. This study adapted Aesop's fables, in addition to Kenyan and Navajo storytelling traditions, for classroom use. The study revealed that digital storytelling has many benefits for children, such as engaging children in an in-depth and very descriptive manner regardless of the topic. Such digital storytelling has a unique role in discussing ideas and thoughts about power, equality, respect, justice, communities

and a sense of belonging with children. In addition, it helps frame their views of complex ethical matters within their societies (Eder, 2010).

Digital storytelling is an important medium for tackling many pressing issues within diverse cultures. In a relevant example, the authors proposed an original puppetry storytelling system based on hand gestures to empower children to develop a new form of narrative in a virtual story world (Liang, Chang, Kazmi, Zhang & Jiao, 2017). In addition, digital storytelling can help newcomer children address some of their current concerns, such as understanding the complexity of other cultures and norms and comprehending multidimensional identities. It might also deal with other multicultural priorities (Sell, 2017).

Similarly, in 1997 Taylor coined the concept of “cybercartography,” a holistic combination of several elements (multisensory, multimedia, highly interactive and engaging, informational, analytical and multidisciplinary), informed by the mutual interaction between theory and practice (Taylor & Lauriault, 2014). We believe that Cybercartographic atlases can be useful to newcomers and their children by helping them draw and visualize their relationships and memories from their places of origin and create new memories in their current lives. The focal points of using atlases in this context include the ability to visualize newcomer connections intuitively, the interactive ability of atlases to enable sharing newcomer stories and migrant stories, and the ability to empower newcomer children to stay united. Furthermore, given that Cybercartographic atlases use geo-narratives, where narratives and places are profoundly linked (Caquard & Fiset, 2014), this technique could be used to map and visualize the relationships newcomer children have with places where they live and empower them to tell their migration stories.

In reviewing children's collaboration practices in storytelling environments, Glottal (2011) examined digital storytelling literature and found many case studies and systems that may potentially fulfil collaboration requirements, but these still require some improvement. He found three different understandings of storytelling within the reviewed papers (remote authoring, collocated authoring and enriched experiences). Interestingly, they each conclude that to meet all the benefits of traditional storytelling, future digital

environments should offer authoring tools that support children's co-design and collaborative practices to create, share and perform stories (Göttel, 2011).

Another study evaluated stories of digital lives and digital divides among newcomer families, as well as their thoughts on digital literacy (Gallagher, Di Cesare & Rowsell, 2019). They found that parents involved in the project had a more positive view of what their school district could offer when partnered with a higher education institution. This working relationship was integral to the success of the program. These newcomers' families shared their variable digital lives and how they struggled with parenting, employment, economic and linguistic challenges in a digitally-immersed world. The realities of their digital lives were driven by their need to understand and thrive within the boundaries of their new culture. They concluded that the presence of the family's digital resources does not indicate that family beliefs and practices incorporate full engagement with digital technologies (Gallagher et al., 2019).

2.5.3. Game-Based Learning Frameworks

In the following, we synthesize some relevant examples of game-based learning models.

The modular conceptual model (GREM—Game Rules Scenario Model) supports educational game design by providing a conceptual framework to specify the game. While it does not emphasize the specific challenges and problems related to any specific game genre, nevertheless, it does assemble wide-ranging game features that the literature shows are substantial in creating an engaging, fun and educational game experience (Zarraonandia, Diaz, Aedo & Ruiz, 2015).

The model assumes the principles of established learning theory that emphasizes the idea of learning as a context-dependent activity. The model was implemented by distinguishing two distinct and independent educational game design sub-models: 1) the game rule perspective and 2) the scenario perspective, as illustrated in Figure 2.6. The game rule perspective model explains the rules and how the game should be played, while the scenario perspective model describes the virtual environment where the game should

be played, user interfaces (UI) to interact with it and other services available. The educational game design is obtained by pairing elements of a certain set of rules with the elements of a scenario (Zarraonandia et al., 2015).

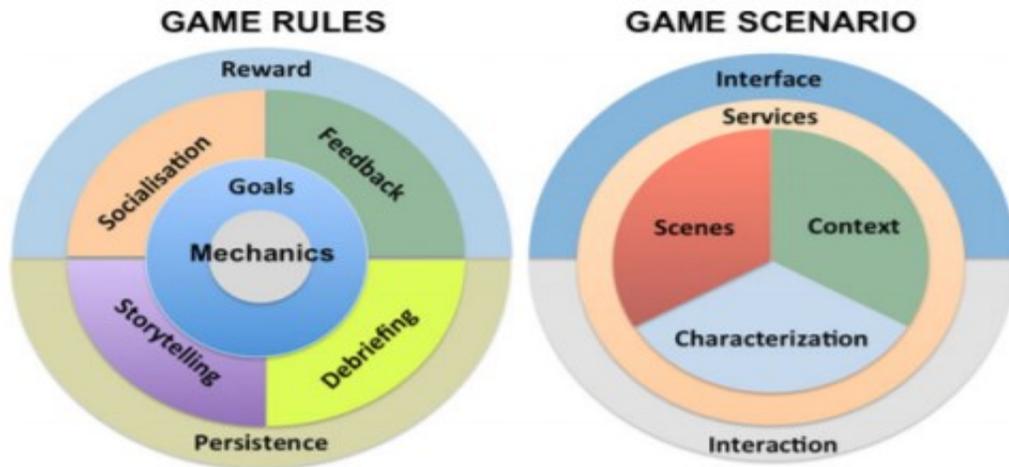


Figure 2.6. *Game rule model and game scenario model, adapted from Zarraonandia et al. (2015)*

Co-design Approach for Newcomer Children Social Adjustment

Technology users are varied; one category of users is children (from different age groups) who use technology for various purposes like entertainment and learning. When technology is designed for children, it is crucial to engage them in the design process to arrive at a useful and age-appropriate product. Participatory Design has been adopted for adult users, but children have also become key players in the design process, in particular for designing games (Andres, Lai & Mueller, 2015; Khaled & Vasalou, 2014; Smith, Iversen, Hjermitsev & Lynggaard, 2013; Stålberg, Sandberg, Söderbäck & Larsson, 2016). Newcomer children are a vulnerable group and require help navigating and adjusting to their new way of living. Digital games and digital storytelling are key tools to help them in their transitional journey. As such, we propose the idea of co-design to empower newcomer children to be a part of the design process and integrate their perspective for any proposed solution that aims to address their social adjustment problems.

Analyzing the selected papers on co-design with children yields the following overarching themes:

2.6.1. Co-design Concepts and Frameworks

Giving children a voice in the research and design process is a fundamental value for the Child-Computer Interaction (CCI) community, and it can be done by representing and respecting children's interests (Read & Markopoulos, 2013). Also, constructivism theory is at the core of empowering children to design the technologies that will impact their futures and the environments in which they will live and work (Van Mechelen, Laenen, Zaman, Willems & Abeele, 2019). In this paper, Co-design is defined as a method or approach that allows non-designer participants, such as children, to contribute to the design process by creating and attributing meaning to things. Co-design and Participatory Design (PD) are often used interchangeably, although PD is seen as an approach or design philosophy rather than a specific technique or technology (Spinuzzi, 2005).

Co-design approaches intend to work with and for children. The success of this approach counts on the active participation of children throughout the design process (Druin, 2002; Garzotto, 2008a; Hamari et al., 2016; Melo & Baranauskas, 2003; Sanders and Stappers, 2008). Several designers believe that if children can contribute to the creation of early design concepts profoundly, this may have a meaningful contribution to the whole design process (Fitton & Read, 2016). As Martens et al. (2018) put it, "...everywhere there are children, there are screens, and child-computer interaction is ubiquitous" (Martens et al., 2018, p. 1).

In co-design, child participants or co-designers are engaged in hands-on tasks that develop empathy, promote ideation, encourage active problem solving and construct a deep understanding with potential users of a product or solution (Paracha, Hall, Clawson, Mitsche & Jamil, 2019), (Sanders, 1999). Co-design has been used to create and implement game design experiences with children (Moser, Chisik & Tscheligi, 2014; Fitton & Read, 2016).

Previous works discuss co-design frameworks and children's different roles in the design process (Child as a user; tester; informant; design partner; co-researcher; and Child as a protagonist) all of which were adapted from Mazzone, Read and Beale (2011); Druin (2002); Guha, Druin & Fails (2013); Van Doorn, Stappers and Gielen (2016); and extended by a perspective of the child as the protagonist, adapted from Iversen, Smith and Dindler (2017). For example, Mazzone, Read and Beale (Mazzone et al., 2011) put together a framework for co-design sessions with children. They adopted a who-what-when-where-how (WH/HW) structure as an easy-to-remember way to group determinant factors.

While we could not find any specific study that employs a co-design approach to generate social adjustment games with and for newcomer children, we invest in other comparable co-design studies with children to guide and design our current study on the best participatory design practices with children in general. The current co-design study with newcomer children will adhere to a well-established best-practice framework called a manifesto (Kinnula & Iivari, 2021). The framework has five dimensions that describe the quality of the co-design workshop with children: Meaningful, Effective, Contextual, Political and Educational. We choose this framework for several reasons: 1) it is comprehensive and carefully designed to support all practitioners interested in empowering children and obtaining their genuine impact on digital technology's design process; 2) the framework has been constructed based on well-established research on Child Computer Interaction (CCI), where they present and evaluate the most important dimensions of genuine co-design engagement with children; and finally, 3) we envisage that this framework could be expanded to dig deeper and gather meaningful learning lessons for conducting a collaboration design with newcomer children.

2.6.2. Children's Roles in a Design Process

With the increasing demand to fulfil children's technology needs, since the 1990s researchers and designers have involved children in the technology design process, using customized participatory design methods. Druin devised a research framework that enables children to take part in the design process by developing techniques of cooperative inquiry (Druin, 1999). Children have been engaged in the design of a broad range of technologies

spanning from storytelling tools (Nilsson, 2008; Alborzi et al., 2000) and educational tutoring systems (Schodde, Hoffmann & Kopp, 2018) to augmented reality artifacts (Cassidy, Sim, Horton & Fitton, 2015).

A recent study by Benton, Varotsis and Vasalou (2019) explored the influence of design examples on children's creative ideation. This study examined an exploratory case study of two-game narrative design workshops that involved 37 children. Children's design ideas were thoroughly coded by two researchers using a deductive content analysis approach and inter-rater reliability (IRR), which is the degree to which two or more observers assign the same rating or label to a behaviour. Their study outcomes demonstrated that design examples are key to determining relevance to the design task. Although the choice and influence of these examples are rarely reflected in the child participatory design literature, design examples enable innovation through idea recycling and therefore are significant to scaffolding creative ideation; also, the space is fluid and can move between fixation, recycling and novelty (Benton, Varotsis and Vasalou, 2019).

Another study focuses on the role of the child as a protagonist (the leading character) in participatory political design (Iversen, Smith & Dindler, 2017). The objective here exceeds the goal of giving children a voice in design to recognize that the protagonist role of children is important, as it strengthens our understanding of how children can be empowered through design, and it is crucial to train children in 21st-century skillsets. The authors used a case study to illustrate how the protagonist role of children can alter the objective, process and measures when children are involved in the design process. Authors use the term “protagonist” to elucidate the idea that children are the core agents in the design process as they are involved with authentic design problems; and to propose that through their engagement in design, children develop skills in designing and reflecting on technology, and to enable them to make informed decisions about technology in their lives (Iversen et al., 2017).

Recognition of the child as a user in the design process of new technology means they can be engaged with various roles such as users, testers, informants, design partners, research partners, etc. Table 2.2 outlines these different roles with further explanation.

Table 2.2. *An overview of children’s different roles in the design process**

Child role	Objective of participation	Participatory process	Outcome measures from participation
Child as a user	Researchers test a general concept that may help inform future technology or provide a better understanding of the process of learning, which may contribute to future educational practices.	Children are observed, videotaped or tested before and/or after technology use.	Knowledge of children’s technology use and learning.
Child as a tester	Researchers gain insights into children’s use of a particular technology and eventually improve that technology based on these insights.	Children test prototypes of a particular technology.	Knowledge about the usability, utility and experiential qualities of the proposed technology.
Child as informant	Researchers gain insights to inform the design at various stages of the design process by eliciting and including children’s expert knowledge.	Children may be observed with existing technologies, or they may be asked for input throughout the entire design process.	The knowledge provided by children that relate directly to the technology being designed.
Child as a design partner	Researchers give children a voice in the design process: children and researchers co-design new and meaningful technologies employing partnership.	Children and researchers engage in various design sessions with a shared goal of designing new technology.	Empowerment of children by giving them a voice in design. Development of meaningful technologies.
Child as coresearcher	Researchers and children gain contextual knowledge by jointly studying children’s practices	Children contribute to design by sharing, gathering and analyzing data from their use practice.	Knowledge about the design context and the possibility of incorporating this knowledge into new technology.
Child as protagonist	Researchers encourage children to be the primary agents in driving the design process and thereby develop skills to design and reflect on technology and its role in their lives.	Children carry out a complete design process in which process and product reflection is a central component.	Children’s new insights into design and digital technology and reflective stance toward technology in their life.

**Adapted from Druin (2002); Guha, Druin and Fails (2013); and Van Doorn, Stappers and Gielen (2016); and extended by a perspective on the child as a protagonist from Iversen, Smith and Dindler (2017).*

2.6.3. Co-Design Methods with Children

Considering the reviewed literature, we condensed the various co-design techniques with children in Table 2.3. Researchers in this field initially developed these methods, and I have had the opportunity to work in a few co-creation and co-design sessions that use some of these tools.

Table 2.3. *Summary of existing co-design with children*

1. Generative methods: co-design typical tool	
<ul style="list-style-type: none"> a. Collages children can create collages by choosing images from a large set of visual stimuli. b. Context mapping enables researchers to understand the children’s values or likes and perceive different aspects of their life or experience. c. Storytelling comprises many approaches (e.g., storyboards, simple drawings, image cards, role-playing, fantasy games and mixed-materials toolkits). It helps to understand future experience journeys and ideal processes as stories. d. Inspiration Cards' future scenarios and personas can be co-designed in the form of stories using inspiration cards. These are sets of cards made by the design and research team or purchased as a predefined deck. They contain a variety of images, words, or complete sentences. e. Modelling by using physical mock-ups of tangible products or experience journeys. Tools for modelling include collections of 3D shapes in a variety of different materials (e.g., Liz Sanders velcro modelling kits) (Sanders & Stappers, 2008), construction kits (e.g., LEGO). f. Paper prototyping and sketching can serve as the main elements for co-design activity. 	
2. Formative methods: conceptualization product	
<p>Cooperative inquiry</p> <ul style="list-style-type: none"> a. Contextual inquiry is performed to observe what children do with what technologies they currently have. The design team conducts one-on-one field interviews with users in their workplace to discover what matters in work, but these are not traditional question and answer interviews: adults and children observe, take notes and interact with child users (Melonio & Gennari, 2013). b. Low-tech prototyping and mock-ups Low-tech prototyping tools (e.g., paper, crayons, clay, string, LEGO bricks) provide material to sketch ideas. <p>Technology immersion is used to introduce children to the capabilities and possibilities of a particular technology and was created to understand how children use large amounts of</p>	<p>Variants of cooperative inquiry</p> <ul style="list-style-type: none"> a. Mixing ideas aims to involve younger children in a design brainstorming process by encouraging each child to generate ideas and combine them with the ideas of others in a group (Guha et al., 2004). b. Sticky-note frequency analysis can be used to evaluate a technology product or prototype with both children and adults. Each group member evaluates a product or prototype by writing what they like or dislike about using it on sticky notes, then placing the notes on a wall, where the researchers use affinity diagramming to find patterns and trends (Druin, 2010). c. Layered elaboration generates ideas through an iterative co-design process. This technique supports asynchronous co-

technology over a concentrated period and how a particular technology may fit children’s needs and abilities (Melonio & Gennari, 2013).	design and, at the same time, enables the creative expression of the children (Walsh et al., 2010).
<p>Expanded and Innovative methods</p> <p>a. Expanded layered elaboration is shown in the distributed co-design tool, DisCo (Walsh et al., 2012), which was designed to expand Layered Elaboration from a paper-based technique to an online environment that allows co-designers to work asynchronously and manages iterations of designs.</p> <p>b. Making tool introduced by Sanders (Sanders & Stappers, 2008) is one of the methods developed to amplify people's creativity and support their ideation in co-design. They make tool kit consisting of various blocks covered with fabric suitable for use with Velcro, which can be easily attached and detached. Those blocks can represent forms, buttons or displays and can be easily reconfigured into new combinations by potential users.</p> <p>c. Embodied narratives are an experimental co-design technique for the early stages of the design process. This technique stimulates dialogue and conversation through embodied interaction, promotes open and interchangeable roles and does not require a plot outline (Giaccardi, Paredes, Díaz & Alvarado, 2012).</p>	

2.6.4. Co-design Educational Games with Children

Children's participation in the co-design processes has been established for the last two decades. Recently, the discussion about children's engagement has been shifted towards rethinking children's traditional roles in the design process. To create genuine forms of children's participation and, in particular, the game-design process, child-centred interaction has been employed to design a Game for Social Skills Intervention (Tan, Goh, Ang & Huan, 2011). They developed a game called “SocialromeR”, which was intended to offer an engaging and educationally sensible learning environment for improving the social skills of primary school children between 9 and 12 years. The game aims to educate children to recognize and manage feelings, exercise self-control, resolve social problems and deal with conflict situations. The children tested the game prototype using a low-fidelity storyboarding prototyping method. The collected data were employed to establish design concepts and ideas that could be transformed into design instructions for the game's development and to evaluate the opportunities and challenges in having children participate as users, testers, informants and design partners (Tan et al., 2011).

Similarly, another study (Schepers, Dreessen & Zaman, 2018) explored children's role in a co-design process based on an empirical participatory study on a game called

“Making Things” with 60 children aged 6–10 and eight youth workers. The case study showed that engaging with children provides a way of making sense of children's interactions with each other, designers, tools and their context, which led to the emergence of the children's role as a “process designer,” which involves collaboration with children for co-designing in the participatory design process.

Several attempts have been made to help newcomers and their children through various initiatives; examples of these efforts include working with refugee students in classrooms (Roxas, 2011), (Mozyah Nofa, 2017); applying participatory visual research methods with newcomer children (Brown, Spencer, McIsaac & Howard, 2020); conducting workshops in school (Rousseau, Lacroix, Singh, Gauthier & Benoit, 2005); and exploring potential roles for technologies to alleviate some of the challenges faced by child refugees (Hourcade et al., 2019).

A recent scoping review of participatory visual research (PVM) methods with newcomer children (Brown et al., 2020) aimed to uncover what is known about participatory visual research with newcomer children. The review searched nine databases, screened 692 articles and included 21 articles for synthesis and analysis. When envisaging, planning and conducting this research with newcomer children, five common and connected areas were identified as necessary. The researchers synthesized the reviewed literature and acquired the following findings: PVM offers an opportunity for children to communicate complex feelings and disrupt discrepancy discourse; participation in PVM research is vastly reliant on varying cultural, economic and relational factors; and offering a variety of data collection activities enables deeper engagement and good quality data. Also, the analysis showed the need for more researcher reflexivity with specific attention to hypotheses, values and ethical considerations, and recommends opportunities for scholars to guarantee newcomer children can reveal and shape their own stories.

Based on the reviewed literature and our experimental studies, we found great potential and benefits of employing a game-based learning and co-design approach when designing any solution for newcomer children. We understand this potential based on several reviewed studies (Frauenberger, Good & Keay-Bright, 2011; Garzotto, 2008; Melo

& Baranauskas, 2003; Melonio & Gennari, 2013; Stålberg et al., 2016; Vaajakallio, Lee & Mattelmäki, 2009; Van Doorn et al., 2016).

As such, we leverage some of the existing co-design tools to guide several co-design activities that we plan to conduct with newcomer children aged 9–12 years and support our intention to create a customized co-design tool for newcomer children. The co-design approach is the core of human-centred design. It is a participatory, practical, repeatable method used to achieve an innovative and helpful solution. In the context of newcomer children, we perceive that the co-design methods can serve as a step-by-step or walkthrough guidebook to encourage newcomer children’s creativity, engage them at the centre of the design process, and work with and for them to solve or mitigate some of the social adjustment problems they face in their new ways of living.

We argue that applying co-design is pertinent and beneficial for several reasons:

- a. It ensures that our offered solution is aligned with its potential users, newcomer children, to ensure its success.
- b. It empowers newcomer children and gives them a voice to participate in projects and solutions related to their life and interests.
- c. It is an inclusive approach to working with newcomer children in a welcoming culture without leaving anyone behind.
- d. It can offer the joy of creation to newcomer children, allowing them to be happy with what they create, build their confidence, and help them collaborate with other children. A previous study suggested that when designing, children become inspired and generate more ideas (Vaajakallio, Mattelmäki & Lee, 2010)
- e. It overlaps with game-based learning and is an integral part of the game design. Also, the gamifying idea is a major component of the co-design approach.

Co-design educational games with and for newcomer children can help immerse them in the social adjustment topic, establish ideas about their life and pave the road for

more procreative activities in the future. During our first experiment (Bani-Taha et al., 2020), we had the opportunity to run a few experiments with newcomer children and their families. The participating children were very engaged in playing the study game, and we observed their joy and immersion in the game. We also heard some students speaking and critiquing the design of the game. At the end of the session, we gave them the opportunity to give their feedback in the study post-survey, where we collected several comments on improving the design of the game, such as “I wish you could change the layout” and “maybe the game should start with a short demo help children grasp the idea of the game”, while others said, “I hope I can be part of drawing the game characters”. All of this opened our minds to the notion of co-design as part of our proposed solution to engage newcomer children in revising the first version of the game “New Beginning” and other elements of our proposed solution. In Chapter 7, we will expand our reflection on the process of working and doing research with newcomers to synthesize all learnt lessons and highlight what works well and needs to be improved.

The following section provides a critical gap analysis highlighting some of the pressing issues and shortcomings found in the reviewed literature.

2.7. Gap Analysis

2.7.1. Discussion

Our review includes evaluating formal academic work, government reports, statements from non-profit organizations and other media accounts directly related to helping and accommodating newcomer children and facilitating their adjustment and integration process. Additionally, we reviewed work on the relationships between children and their newcomer families to understand what additional burdens might be placed on children during the integration process. We reviewed the target group’s needs and identified key pressing problems that newcomer children experience throughout the integration process, including loss, problems developing social networks that result in social withdrawal, misbehaviour and bullying, and difficulties with identity formation. Social adjustment is one of the critical issues that need to be addressed.

We reviewed several learning theories such as experiential learning theory and social and contextual learning theory to expand our understanding of the potential connections between our review topic and these theoretical perspectives. Discovering the roots of this topic is fundamental to building a theoretical foundation for using game-based learning, digital storytelling and co-design approaches in the future.

Our review revealed a growing need to develop and share best integration practices to address the ongoing needs of many newcomer families and their children within a Canadian context. For example, according to Statistics Canada, in 2016, there were about 2.2 million newcomer children under the age of 15. Additionally, 37.5% of Canadian children had at least one foreign-born parent. Statistics Canada also predicts that by 2036, between 39% to 49% of all Canadian children will have an immigrant background (Hou & Bonikowska, 2016). Today, digital media plays a dominant role in the lives of the young digital native generation. A constant increase in children's and adolescents' digital media consumption has been witnessed in many countries (Wong & Lam, 2016).

In our previous work related to technology and newcomer children, we identified that game-based learning is rarely used in the context of helping newcomer children in their social adjustment journey. Likewise, this review shows no evidence of using a co-design approach within the context of generating educational, social adjustment games with and for newcomer children. The previous attempts in the context of newcomer children have been limited to afterschool homework clubs and other general workshops, but none were related to co-design with newcomer children. Also, we have uncovered knowledge gaps in the ways of knowing and doing co-design research with newcomer children, as most of the research was done either with youth aged 18 and above or newcomer parents. As such, there is a need to construct guidelines for how to conduct co-design research with newcomer children to ensure that their voice is heard, following the correct process and best research practices that take into consideration their cultural values and precarious migration process.

This study will help researchers, technology and game designers, developers and other stakeholders who work or provide services to newcomer children, as outlined in

Appendix B. We synthesize the previous literature related to co-design with children in general and any related work done with newcomer children and youth, including research or design activities.

As such, we believe that children who use advanced edutainment technology such as game-based learning, co-design and digital storytelling can benefit in several ways. Most crucially, the social gap among newcomer children may be filled educationally and entertainingly. This will positively decrease stress and allow newcomer children to overcome their fears, try different scenarios and learn more about their new way of life.

2.7.2. Active Research Questions and Paths for this Thesis Research

Many questions regarding digital game-based learning and engaging newcomer children in co-design digital solutions for their social adjustment remain unanswered. Therefore, we construct several questions based on the insights we learned from the reviewed work and our research experience in the field. As such, this thesis focuses on investigating the following research questions:

- **Q1.** What are the most pressing issues that newcomer children face during the transitional period when moving to Canada?
- **Q2.** To what extent these problems may overlap or differ across three target groups: children, parents, and teachers?
- **Q3.** Can game-based learning be used to assist newcomer children with their social adjustment problems, and how does it compare to more traditional methods?
- **Q4.** What do the participating children feel/think, i.e., can the workshops be engaging?
- **Q5.** What do children learn through the workshop, i.e., can the workshops be educational?
- **Q6.** What game features and cultural aspects do the participating children use in the game design?

- **Q7.** What can we learn about the process of running co-design workshops through some examples with newcomer children?

Other questions that are not addressed in this thesis:

- Will game-based learning assist newcomer tweens in improving their behavioural adaptation in the long term?
- To what extent can the GBL approach be applied to help other target groups such as Indigenous children preserve their identity and communicate their culture with other children through gameplay?

The following chapter discusses the proposed theoretical and practical digital solution and explains its elements further.

CHAPTER 3: Research Approach

3.1. Theoretical Framework

The previous two chapters explored of the researchers' experience in the field and the previous literature on the topic. In this chapter, we bring these together, propose a theoretical framework and design specific studies that give an overview of the aspects we focus on during this research. Also, this research approach serves as a lens to adopt when conducting our planned studies throughout different phases of our research.

As we examined in the previous chapter, our research is interdisciplinary and brings together multiple areas of study including: social integration; newcomer children social adjustment; children educational learning theories; relevant frameworks and models; game-based learning, digital storytelling, and co-design technology; children centric design approach and research methods with children. To the best of our knowledge, no specific research has been done in the context of using game-based learning and co-design methods for newcomer children's social adjustment. The frameworks we discussed in Chapter 2 are the basis of this research, and our theoretical framework is designed for using game-based learning and co-design approach to work with and for newcomer children to help them in their social adjustment journey.

This thesis is based on our new theoretical model developed after reviewing the related studies, comprising the following principles:

- Advances in game-based learning technologies in different educational contexts allow us to apply GBL to address the ongoing needs of newcomer children, as do the vast accessibility and recognition of using games to teach and entertain children in various age groups.
- When designing a game for newcomer children, no one size fits all. As such, it is essential to design a culturally inclusive game to keep the child players engaged and motivated.

- While different methods may already exist to help newcomer children, these efforts give parents minimal information about social adjustment, and there is no direct engagement from newcomer children. An alternative approach is to co-design with and for newcomer children to engage them directly to discuss their concerns and participate in designing educational, social and digital games to address their social adjustment problems and help other upcoming newcomer children.

As such, we propose a theoretical and practical framework to help newcomer children make the necessary social adjustments in their new way of living. Our basis is existing educational and migration theories, and our model consists of the above three elements: 1) game-based learning for newcomer children; 2) inclusion of cultural considerations in game design; and 3) co-design of educational games with newcomer children. Our theoretical model is conveyed in Figure 3.1. We refer to this framework as *WeCan*, a title that represents various characteristics of our proposed solution, as illustrated in Figure 3.2.

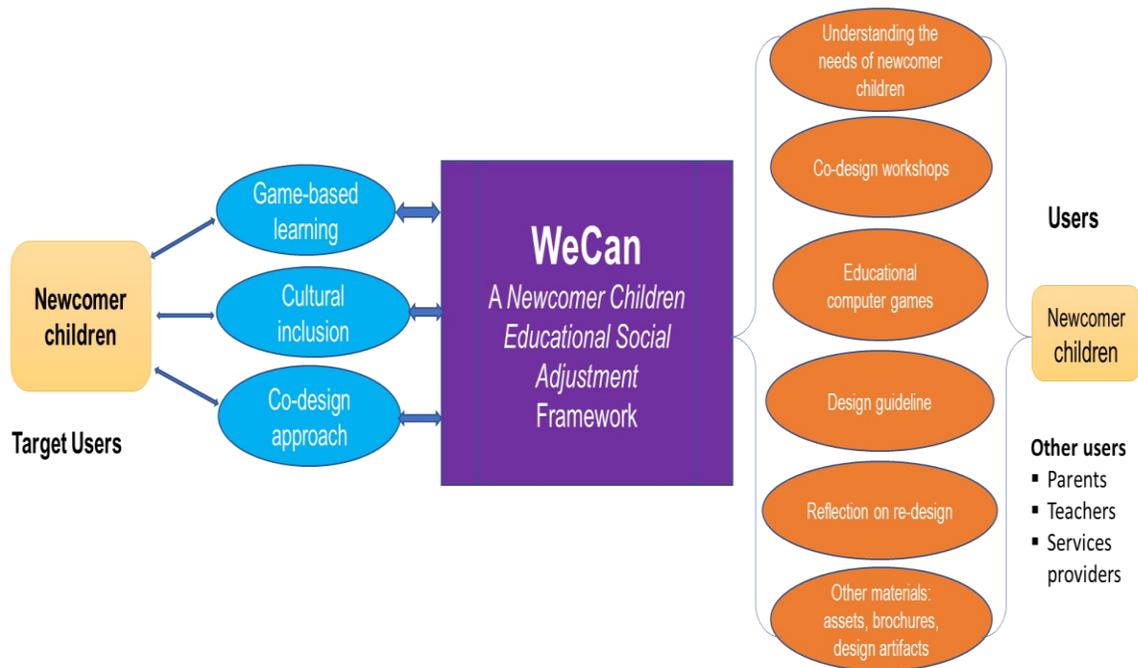


Figure 3.1. Study Theoretical Framework

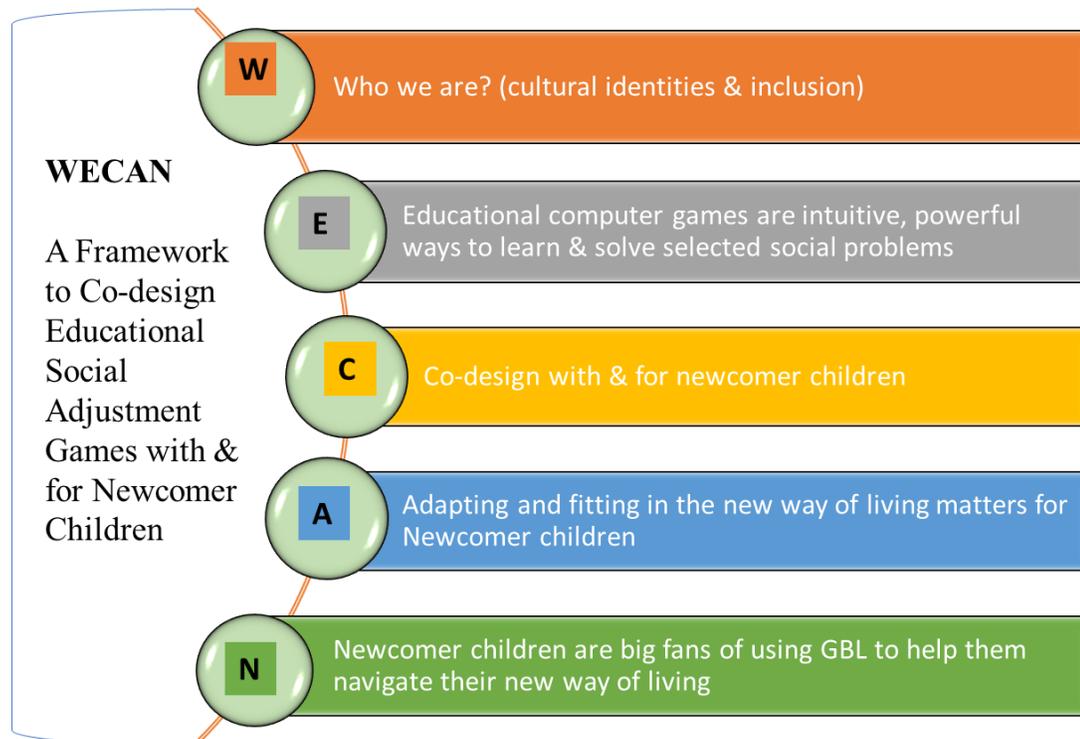


Figure 3.2. *WeCan*

As reviewed in previous chapter, our framework brings together the knowledge on four major areas as input: newcomer children and their needs and interests as the primary target user group, and culturally inclusive games, game-based learning, and co-design as the main principles of the solution we are proposing. The framework then offers the following outputs:

- Better understanding of the needs and problems
- Sample educational games
- Sample co-design workshops
- Design guidelines for games and workshops

- Examples of how to apply those guidelines
- Various assets to be used in educational games

This framework can be used by three groups of users:

- Newcomer children who can directly use the games or participate in workshops
- Parents who can learn about the experience of their children and guide them to use the available resources
- Teachers who can use the resources in their schools
- Service providers and designers who can use the guidelines and example to develop new resources, with the help of the other three groups

While we envision a full framework with many examples and assets, for this thesis research, we focus on exploring the needs of the newcomer children through a survey, and investigating the main proposed principles (GBL and co-design) with two example games and one set of co-design workshops with children, as described in Section 3.3. We hope that these examples demonstrate the value of *WeCan* framework, which can then be developed into a more comprehensive resource through future research and development projects.

In addition to newcomer children who are actively involved in this research and *WeCan* framework, parents and teachers are essential part of the proposed solution. As explained in the following chapters, we have tried to demonstrate their involvement by including them in the surveys and opinion gathering. Future efforts can have a more active role for these groups through different options such as:

- offering insight on social adjustment problems and solutions
- collaborating in design workshops
- having active play experience with children

Our research follows the principles of Equity, Diversity, and Inclusion (EDI) by trying to remove barriers that newcomer children face in their social adjustment. We also aim at providing solutions that actively involve children (and parents and teachers) in the design process so not only they can access the games, but also are heard and have an active role in designing them.

3.2. Research Questions

As described above, the overall focus of the research is to consider game-based learning, culturally inclusive and co-design with and for newcomer children. Based on the proposed system described in the previous section, and to investigate the long-term motivation and effectiveness of the proposed system, this proposed study aims to investigate the following research questions:

On the general issue of newcomer children's needs:

- **Q1.** What are the most pressing issues that newcomer children face during the transitional period when moving to Canada?
- **Q2.** To what extent these problems may overlap or differ across three target groups: children, parents, and teachers?

On the use of GBL:

- **Q3.** Can game-based learning be used to assist newcomer children with their social adjustment problems, and how does it compare to more traditional methods?

On the effect of co-design workshops with children:

- **Q4.** What do the participating children feel/think, i.e., can the workshops be engaging?
- **Q5.** What do children learn through the workshop, i.e., can the workshops be educational?

- **Q6.** What game features and cultural aspects do the participating children use in the game design?
- **Q7.** What can we learn about the process of running co-design workshops through some examples with newcomer children?

In this research, we chose to design and develop a customized social adjustment game using the Unity game engine, as no such games exist for newcomer children. Also, we designed and developed the newcomer children educational game-based learning social adjustment approach based on the previous literature, our own experience working with newcomer children and cultural officers who help newcomer children in the Ottawa-Gatineau area.

We keep this process safe for children, and there was no harm or violence in the game features, as these are beyond the focus of our study and may affect the results. Also, our focus is to adjust and solve some selected social adjustment problems in the form of educational gamifying in an engaging way. Therefore, we strive to keep the game features and the user interface of the experimentation simple to emphasize the key variables that we were investigating, i.e., the game-based learning model, customized cultural inclusive game features and co-design activities.

3.3. Research Phases

The proposed research approach includes three phases of experiments to examine the research questions progressively. The proposed research approach is divided into four phases of studies to gradually design, develop and optimize the system, and investigate the research questions proposed above, as summarized in Table 3.1.

Table 3.1. *Mapping of research question to research phase*

Research phase	Research Question(s)	Focus
One	Q1, Q2	Identifying users' (newcomer children aged 9–12) social adjustment problems
Two	Q3	Proof of concept study computer game
Three	Q4- Q7	Exploring the potential of using a co-design approach with/for newcomer children to co-design educational, social adjustment games

Phase one: This phase consists of two fundamental studies. The first (Bani-Taha et al., 2020) was a comprehensive literature review to explore the role of emerging technology in helping newcomer children with their social adjustment. In the second study, we designed a survey to investigate and identify Middle Eastern newcomer children's social adjustment problems from three perspectives: newcomer children, parents and teachers (Q1 and Q2).

Phase two: The third study (Bani-Taha et al., 2019) was designed to investigate the feasibility of using computer games for the social adjustment of newcomer children (Q3).

Phase three: We conducted an in-depth qualitative study to evaluate the feasibility of using co-design activities with and for newcomer children to generate guidelines for co-design educational, social adjustment games. (Q4-7).

To progressively investigate the research questions, three user studies were carried out within the four phases of research:

- In research phase one, an online user survey study of 50 newcomer children, 30 newcomer parents and 15 teachers was designed to identify the most pressing issues of newcomer children aged 9–12. The study used a mixed quantitative and qualitative approach to collect insights from the study participants.
- For research phase two, a user study was conducted with 30 newcomer children from Arabic-speaking countries between the ages of 9 and 12. We divided the

participating children into two groups: Group A, who played the game, and Group B, who read out the study brochure. We mainly used a quantitative approach to evaluate the difference in children's knowledge improvement of the accepted behaviour in certain situations before and after using the brochure or the game. Also, we asked a few open-ended qualitative questions to support our quantitative method and give the children the opportunity to comment and share any concerns or related ideas they would like to express. This is elaborated on in Chapter 4.

- In research phase three, we conducted an in-depth qualitative user study with 26 newcomer children who were divided into six workshops, each group including 4-5 children, through several co-design activities to evaluate the feasibility, effectiveness and improvement of using a customized educational, cultural inclusive game in addressing social adjustment problems. Also, we aimed to evaluate the benefits of engaging newcomer children in the process of creating such a social adjustment game and gathering their thoughts and consideration in solving selected social adjustment problems. A full description of this study design is explained in Chapter 6.

CHAPTER 4: Research Phase One – Identifying Newcomer Tween Children Needs

4.1. Overview

The journey following migration for newcomer families and their children can comprise various economic, social and cultural difficulties associated with acculturating and social adjustment into the new way of living. This study aims to identify the pressing social problems that newcomer children face during the transitional period when moving to Canada. The specific research questions are:

- *Q1. What are the most pressing issues that newcomer children face during the transitional period when moving to Canada?*
- *Q2. To what extent these problems may overlap or differ across three target groups: children, parents, and teachers?*

This study draws on a previous work that used online surveys to collect data on a sample of the over 50 newcomers' tweens, aged 9–12 years, newly arrived and living in Ottawa, Canada for no more than two years. Also, we collected data from 30 newcomer parents and 15 teachers who have experience with newcomer children. It is worth mentioning that this study was initially designed to be conducted in person, but due to COVID-19 pandemic restrictions and to comply with the Carleton University Ethics Board, we modified the structure of this study to be conducted through an online survey. This study uses a mixed quantitative and qualitative approach, with a specific emphasis on the implementation of quantitative methods as a primary method of inquiry using surveys. The strengths of survey research include its cost-effectiveness (short time frame for an administered survey), reliability by critical analysis, and facilitated numerical data for groups and extents of agree or disagree from respondents. However, survey research has some weaknesses, such as inflexibility and lack of depth (Choy, 2014).

In the following section, we discuss the survey design of this study, report the collected results from the children survey, parent survey and teachers survey separately,

and then conclude with an overall discussion of what we learned and how to use the collected results in this thesis.

4.2. Study Design

4.2.1. Participants

We collected responses from newcomer children from Arabic-speaking backgrounds who came to Canada within the last two years. The study participants were recruited through the *Alnour School*, Ottawa, who agreed to collaborate once the ethics application was approved. This school program offers language training for people from diverse cultures to maintain the original language of these families' children. Also, we recruited from *Ottawa Chinese Community Services* (OCCS). They provide settlement services for a wide range of immigrant families and, in particular, migrants from Arabic-speaking countries.

We collected 52 responses; we disregarded two of them as their responses to the survey questions were not answered. Thus, we performed our study analysis based on 50 children. The participant children's ages range from 9–12 years, with 23 girls (46%), 25 boys (50%) and two who prefer not to say (4%). Also, we collected data from 30 newcomer parents between the age of 23–58 years, who have been in Canada for two years, including 17 females and 13 males from various Arabic-speaking countries including Lebanon, Syria, Libya, Palestine, Jordan, Iraq and Egypt. Their education levels range from high school to doctorate, with many of them holding master's degrees. In the teacher survey, we asked the same questions as in the parents' survey with some slight changes so that teachers could express their interaction experience with newcomer children. We collected responses from 15 teachers working closely with newcomer children or who previously taught them. Teacher participants were between the ages of 25 years and 52 years, and they were 11 females and four males, with a wide range of teaching experience from 2–22 years. They teach grades 3, 4, 5 and 6, and their education level was a diploma in teaching and master's in various subjects, including math, English, social science, physics, drama, physical activity and religious studies.

Carleton University's Research Ethics Board approved this research project, Phase I: Identifying Newcomer Tween Children Social Adjustment Problems: A Primary Analysis from the Perspective of Children, Parents and Teachers #112214.

4.2.2. Materials

We designed a questionnaire for each group (children, parents and teachers) to answer our study research questions. Participants (children, parents and teachers) were asked to complete a questionnaire on three areas: the social experience of newcomer children when moving to Canada, the problems they face and their willingness to use technology. Our questions are based on the previous literature of studies that focused on newcomer children and families and their experiences and adaptation process (Portes & Rumbaut, 2005; Picot, Hou & Statistics Canada, 2011; CLIP, 2018). Similarly, and to ensure the accuracy and inclusiveness of our survey for newcomer children, we adapted some questions from other comparable studies that focus on children from educational and government agencies who measure various social and cultural concerns of newcomer children and their families (Chuang et al., 2011; Nibbs & Brettell, 2017; UK Government Policy, 2011; Fan, Fang & Liu, 2009; and Searle & Ward, 1990).

We considered a few points when we designed the children's survey to ensure the clarity and appropriateness of the questions to our research target group. We strived to keep the questions short and straightforward; reviewed the survey questions a few times to ensure that children could understand them easily; used a Likert rating scale with answers that are relevant to the children; and worded the questions in a natural way to help children connect the question with their migration life experience. Furthermore, we included the option of "not sure" to give freedom to a child to choose this option if they do not want to answer a question or even if they do not recognize the question. Finally, we revise the direction of some questions to avoid bias or leading participants to a particular answer.

This study used a 5-point Likert scale (from strongly agree to strongly disagree), and adding the option "not sure", to gather children's opinions and experiences about particular social problems. The questionnaire consists of 30 questions split into ten social problems: feeling loss, feeling out of place, bullying, social withdrawal, peer's perspective, and interest of newcomer children' culture, lack of cooperation skills, self-perception, insecurity about appropriate behaviour, identity formation and sense of belonging, and personal space, as illustrated in Table 4.1. Also, we asked the newcomer parents and a group of teachers the same questions as the children with a slight modification of the language to suit the different

audiences. As we were interested in learning if these social problems exist and are confirmed among those three categories, doing so helped us validate what we have learned from children through triangulation methods by comparing and validating between children's, parents' and teachers' responses. Full details of these three questionnaires are attached in the Appendices C and D.

Table 4.1. Children questionnaire

Questions Statement
<p>*Group 1: Feeling loss: I feel supported in my new life in Canada. I communicate with my old friends and relatives regularly. I have new friends in Canada.</p>
<p>Group 2: Feeling out of place I am happy with my new life in Canada. I am confident to talk and play with children from different cultures. I feel that I fit in my new life here.</p>
<p>Group 3: Bullying I get along with other children well. I know how to deal with a bully. My school helps stop bullying.</p>
<p>Group 4: Social withdrawal I enjoy playing with other children at school. I enjoy spending time with other children at birthday parties and playdates. I enjoy doing group projects with other students.</p>
<p>Group 5: Newcomer children concerns about their Peers' perspective and interest of newcomer children culture. My family supports me to engage with children from different cultures. Kids from different cultures are happy to hear more about my own culture. My parents respect my opinions and interests (for example, to choose friends or clothes).</p>
<p>Group 6: Lack of Cooperation skills I work well with other students in group projects. I feel more comfortable hanging out with children from my native culture. I prefer to work with children from different cultures.</p>
<p>Group 7: Self-perception I can share my feeling and thoughts freely with other children. I need help for making new friends and keeping them. I am proud of my native culture and like to talk about it.</p>
<p>Group 8: Insecurity about appropriate behaviour I am comfortable interacting with children from other cultures. The way people treat me is because of who I am, not where I am from. My classmates and I have many things in common.</p>
<p>Group 9: Identity formation & Sense of belonging I love my native culture. I enjoy living in Canada. I feel that I belong here.</p>
<p>Group 10: Personal Space People sometimes need personal space. I respect my classmates' personal space. At school, we have no problem with personal space.</p>
<p>Open Questions Do you have any specific social problems at school? If yes, can you tell us about them? Would you like to tell us any story about yourself when you moved to Canada? How often do you play computer games? Can you give us some examples of your favourite computer games?</p>

* Participants saw only the questions, not the «group labels».

4.2.3. Procedure

The survey responses were collected from newcomer children aged 9–12 from Arabic-speaking countries who have been in Canada for less than two years, plus parents and teachers of such children. The participating children needed to have the ability to study in English-speaking schools without the need for a translator. The study consisted of three separate anonymous surveys for three groups of participants as follows:

A. Children

We recruited newcomer children who can read and write in English. We defined language skills as the “ability to study in English-speaking school without the need for a translator”.

B. Parents

We recruited newcomer parents from Arabic-speaking countries who arrived in Canada in the last three years. While we wrote the survey in plain language and using a Likert scale, the survey was only available in English.

C. Teachers

We also recruited teachers with experience teaching and interacting with newcomer children.

The researcher contacted the study participants (children, parents and teachers) through the Al-Nour school administration and Ottawa Chinese Community Services settlement officer. They were accommodating, and they sent the study letter of invitation, including a link to the online questionnaire, to the potential participants on their mailing lists. The online study included a consent form with a brief description of the research. The consent form content was available prior to seeing the questions and clicking on “agree” showed participants’ agreement to proceed to the survey. On the children’s survey, there were two separate items to “Agree”: for the parent and the child. The text clearly stated that even with the parent’s permission, the child also has to agree, and it is their choice to

participate. Participants could withdraw at any time during the online survey session. Since the survey is anonymous, it was not possible for participants to withdraw after submitting the answers. The letter of invitation and consent form clearly stated this.

Our study was supposed to be accomplished in person, but due to the COVID-19 pandemic situation and following the guidance of Carleton ethics, it reviewed and cleared for online by the Carleton University Research Ethics Board-B (CUREB-B Clearance # 112214). We conducted the study through an online survey that took about 20 minutes to complete. The study comprised three separate anonymous surveys for three groups of participants (children, parents and teachers) recruited through the school administration and other immigrant non-profit organizations. We sent the study letter of invitation, including a link to the online questionnaire, to the partner organizations' administration, where it was distributed to potential participants who meet the study section criteria. The online study, including the children, parents and teachers' survey questions, is attached in Appendices C, D and E.

4.3. Results

4.3.1. General Considerations

In this study, we present the collected data in graphs for each of the ten problems. Each problem was measured by asking children to rate their level of agreement vs. disagreement with three statements related to each problem. So, we asked 30 questions in total. We then list the qualitative responses for the last three open-ended questions without any modification.

Regarding the sample size, we started by collecting information from 25 participants, and then we ran an analysis. We continued collecting responses, and then we ran another analysis with 50 respondents (which is the current analysis). We found that the analyses results are the same with some slight differences, as exemplified in Table 4.2. We concluded that gathering more responses would probably not change the major problems that newcomer children reported.

Table 4.2. *Examples of analysis results based on 25 participants compared to a 50-participant sample size*

Problems measured examples of questions	Analyze results with 25 participants	Analyze with 50 participants	Difference
Feeling loss:	<ul style="list-style-type: none"> ● 56% agree that they feel supported in their new life in Canada 	49% agree	7%
- I feel supported in my new life in Canada	<ul style="list-style-type: none"> ● 24% of the children feel not supported, while 20% were neutral, both = 46% 	29% disagree 22% were neutral, both = 51%	5%
- I communicate with my old friends and relatives regularly	<ul style="list-style-type: none"> ● 88% of the newcomer children communicated with their old friends and relatives due to their feeling of feeling loss 	92%	4%
Feeling out of place	<ul style="list-style-type: none"> ● Strongly agree 12% 	8%	4%
- I am happy with my new life in Canada	<ul style="list-style-type: none"> ● Agree 32% ● Neither agree nor disagree 32% ● Disagree 20% ● Not sure 	30% 31% 19% 0%	2% 1% 1% 0%
Bullying	<ul style="list-style-type: none"> ● Strongly agree 16% 	17%	1%
- I get along with other children well	<ul style="list-style-type: none"> ● Agree 48% ● Neither agree nor disagree 16% ● Disagree 12% ● Not sure: 8% 	53% 17% 8% 6%	5% 1% 4% 2%

4.3.2. Quantitative Results

4.3.3. Children Survey Results

This study survey identifies the social adjustment problem for newcomer children from Arabic-speaking backgrounds, aged 9–12 years, in Canada. We collected our data from selected private schools and non-profit organizations that support and help newcomer children. Our study confirmed several social adjustment problems as follows:

1. Feeling Loss

To measure the problem of feeling lost or not, we asked the child participants three statements, and the results were interpreted as follows:

I feel supported in my new life in Canada

Figure 4.1. shows that 49% of participants agree that they feel supported in their new life in Canada; 29% of the children feel not supported, while 22% were neutral. The children who feel not supported together with the children who were neutral form 51%, which is a high percentage. This leads us to recommend that lots of work needs to be done to increase the support for newcomer children.

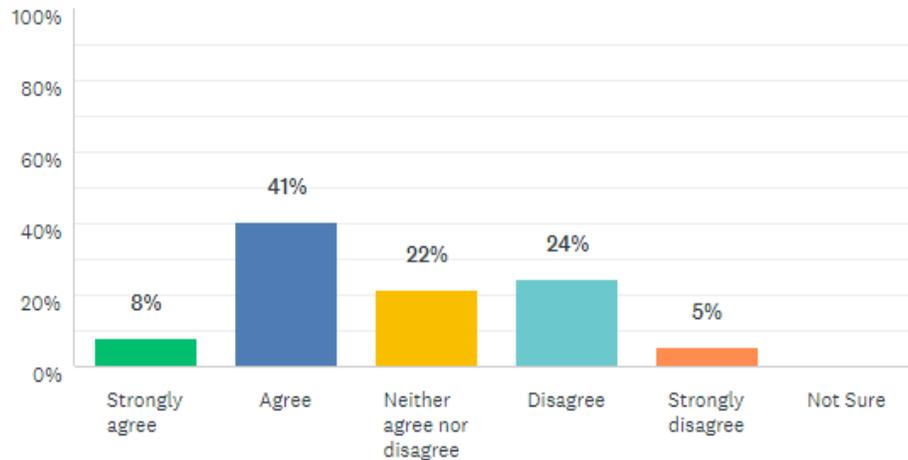


Figure 4.1. *I feel supported in my new life in Canada*

I communicate with my old friends and relatives regularly

We discovered that 92% of the newcomer children communicated with their old friends and relatives, as described in Figure 4.2. This high percentage suggests that those children are still connected to their back home. From this we can infer that the newcomer children are still figuring out their way of living, and for that reason, they continue to communicate with old friends. Also, this high percentage supports the previous research result that newcomer children usually feel loss, especially during the transitioning period.

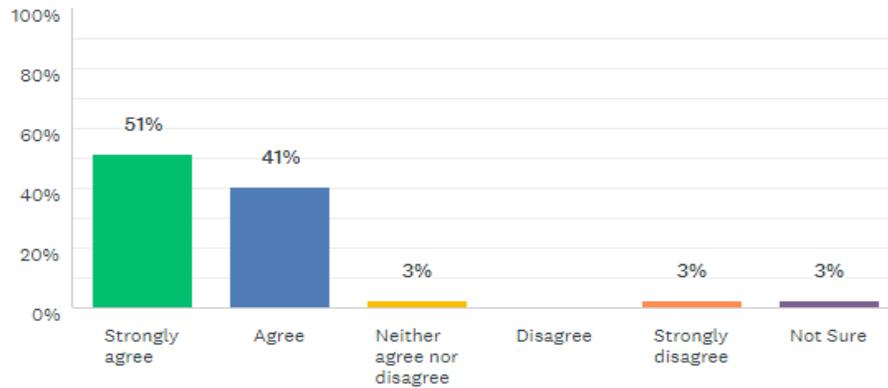


Figure 4.2. *I communicate with my old friends and relatives regularly*

I feel I belong here

Figure 4.3 indicates that one-third of participants said that they feel they belong here in Canada. Half of the participants were neutral or unsure, and only 11% disagreed. This suggests that almost two-thirds of newcomers were concerned about their feeling of belonging within their new way of living.

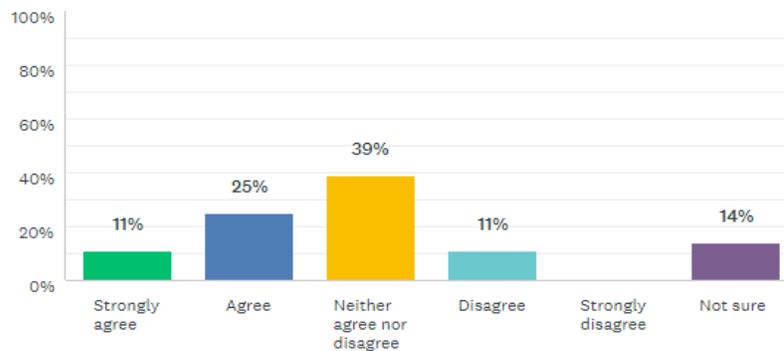


Figure 4.3. *I feel that I belong here*

2. Feeling out of Place

I am happy with my new life in Canada

Figure 4.4 shows that 38% of the children were happy with their new life in Canada, while 54% is divided between children who disagree and others who were neutral in their answer, while 8% were not sure. Therefore, two-thirds of participating children have concerns about their happiness, which suggests they need to figure out why they are not happy and that they are still not feeling comfortable or integrated yet.

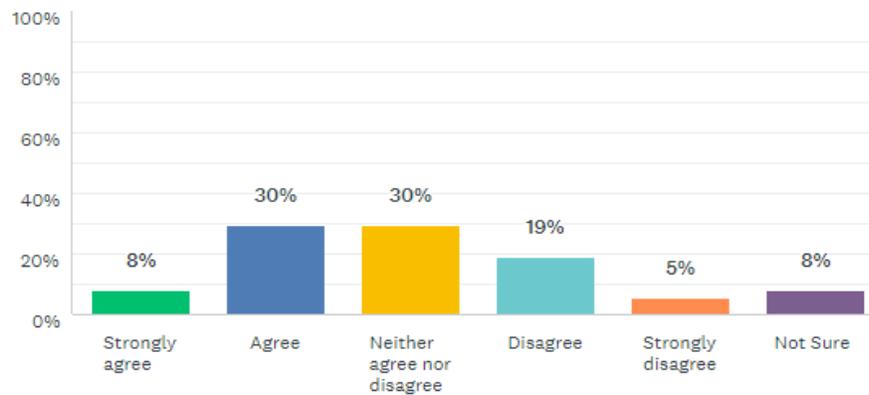


Figure 4.4. *I am happy with my new life in Canada*

I am confident to talk and play with children from different cultures

Figure 4.5 shows that 40% of participating children are confident talking and playing with children from different cultures. However, the second half of responses is divided into one-quarter who neither agreed nor disagreed, 22% who disagree, and the remaining were not sure, as explained in Figure 4.5. Thus, two-thirds of the participants are hesitant or unable to decide or do not feel confident interacting with children from other cultures.

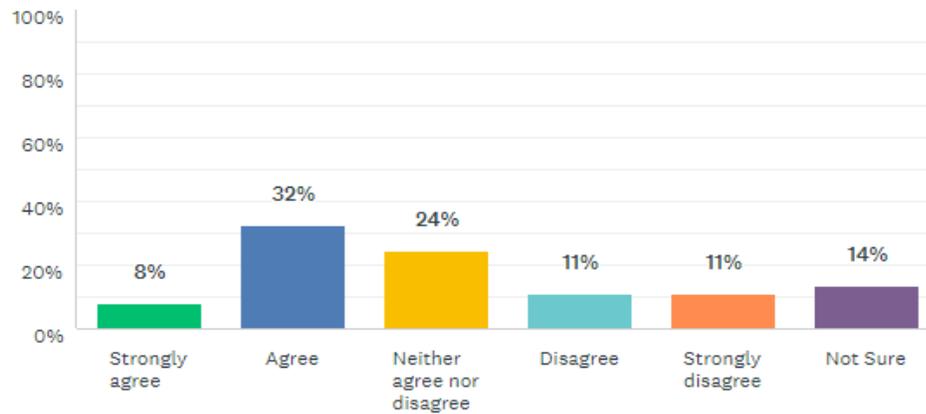


Figure 4.5. *I am confident to talk and play with children from different cultures*

I feel that I fit in my new life here

As shown in Figure 4.6, almost one-third of the participating children report that they do not fit in their new life, and almost half of the participants were either neutral in their answer and not sure. At the same time, the remaining quarter agrees that they do fit in. As such, three-quarters of the children feel they do not fit in with their new life; this is one of the most pressing issues with which newcomer children require help.

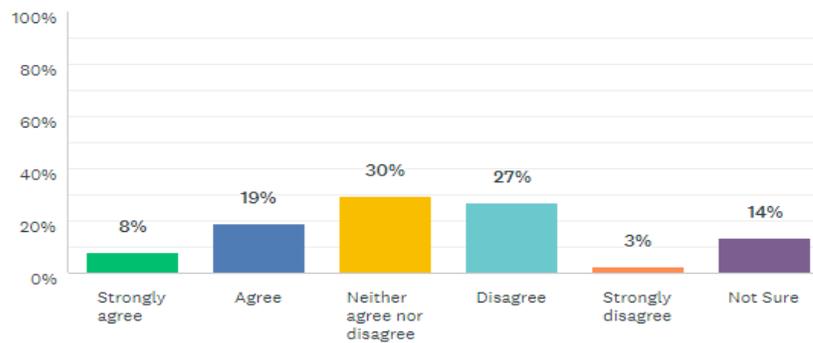


Figure 4.6. *I feel that I fit in my new life here*

3. Bullying

I get along with other children well.

Two-thirds of the newcomer children can get along well with other children. One quarter was either unsure or neutral about their experience, while one-third were not sure or could not get along with other children, as illustrated in Figure 4.7.

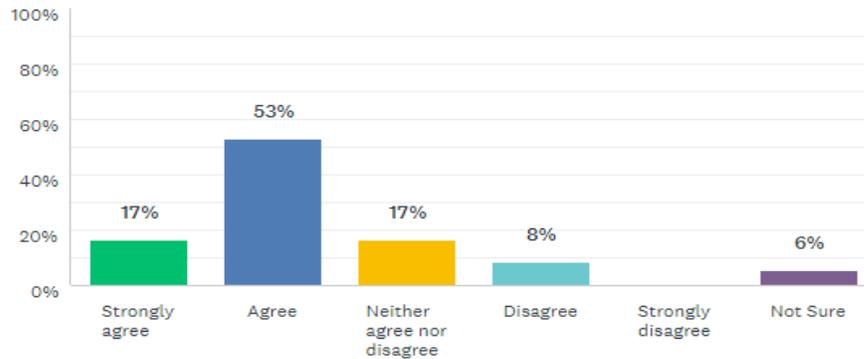


Figure 4.7. *I get along with other children well*

I know how to deal with a bully

Figure 4.8 shows that one-third of the children know how to deal with a bully, while one quarter disagrees and need help with this. Furthermore, the remaining third was neutral in their answers. This suggests that bullying still exists for newcomer children, and two-third were unsure how to deal with it. This is not a surprise, as bullying is a reported problem with other local children. So, newcomer children require a strategic and smart way to assist them to deal with this issue.

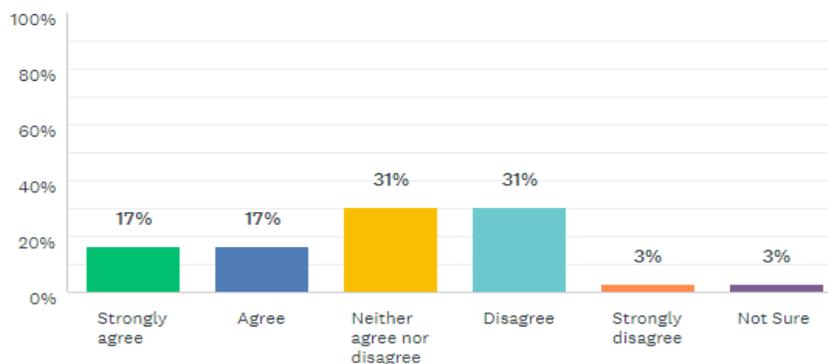


Figure 4.8. *I know how to deal with a bully*

My school helps stop bullying

Half of the newcomer children feel that school supports them to stop bullying, while 17% disagree and feel that their school is not as supportive, while another quarter was neutral in their response, as depicted in Figure 4.9. This means one-third of participants cannot explain how schools stop bullying, while the remainder may disagree with how schools stop a bully. This suggests that schools need to figure out non-traditional ways to help their students manage bullying and its consequences.

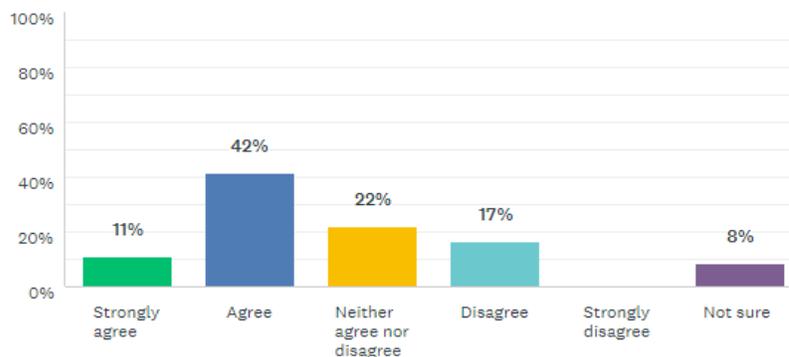


Figure 4.9. *My school helps stop bullying*

4. Newcomers’ Concerns about their Peers’ Perspective and Interest in Newcomer Kids’ Culture

My family supports me in engaging with children from different cultures

Three-quarters of the children thought that their family supports them to engage with children from different cultures, 17% were neutral and only 6% disagreed, as shown in Figure 4.10.

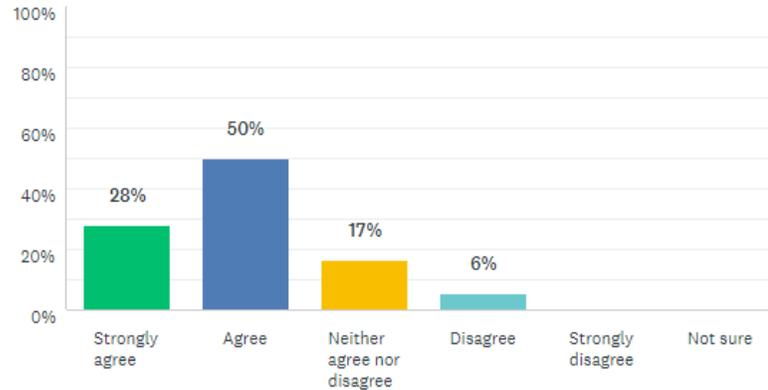


Figure 4.10. *My family supports me to engage with children from different cultures*

Kids from different cultures are happy to hear more about my own culture

In Figure 4.11, half the participants were either neutral or unsure if children from other cultures are happy to hear about newcomer children’s cultures. Only 17% agree with the given statement; however, almost one-third of the children disagree and feel that children from different cultures are not happy to hear about their own newcomer culture. This could be explained by two reasons: 1) newcomer children had previous experience with children from other cultures or 2) if they have not had a bad experience, this also could be explained by the matter of confidence of newcomer children towards their own culture, which needs to be addressed.

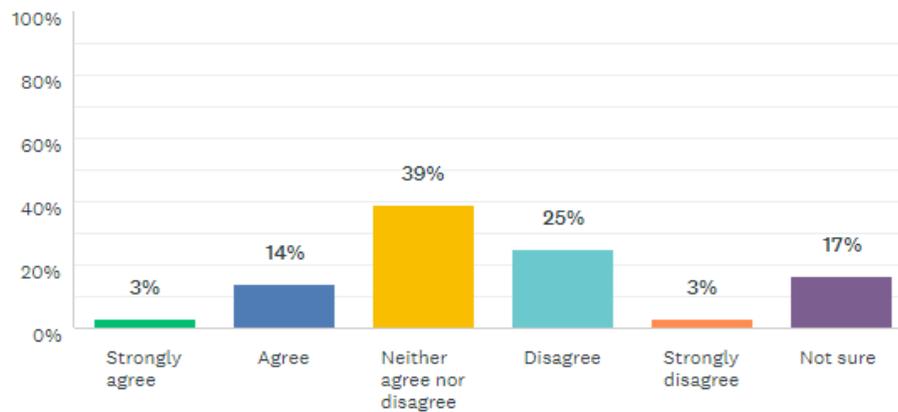


Figure 4.11. *Kids from different cultures are happy to hear more about my own culture*

5. Lack of Cooperation Skills

I work well with other students in group projects

Most respondents agreed that they work well with other students in a group project. 14% were neutral, 3% disagreed and the other 3% were unsure, as shown in Figure 4.12. So, newcomer children have a strong confidence in working with other children, which could be leveraged to solve other issues.

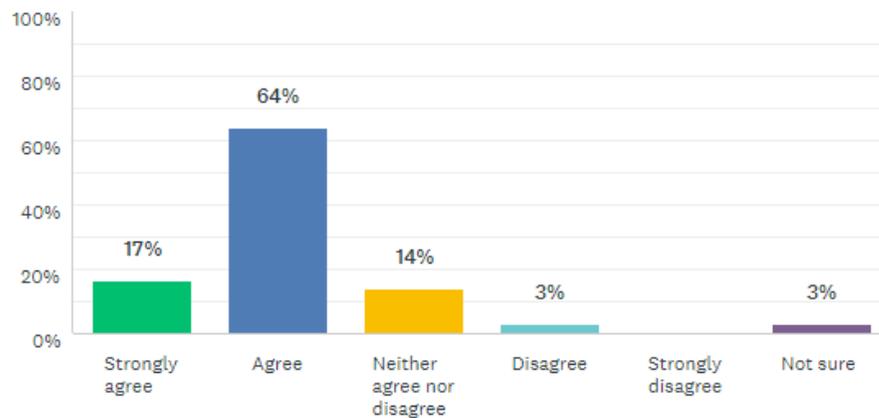


Figure 4.12. *I work well with other students on group projects*

I feel more comfortable hanging out with children from my native culture

We found that 89% of the children feel more comfortable hanging out with children from their own native culture, 8% were neutral and only 3% of the children strongly disagree, as shown in Figure 4.13. This suggests that most newcomers prefer hanging out with children from their own culture rather than children from other cultures. This problem can be explained by languages, culture and comfortable differences elements, which can be the extent of their level of comfort in hanging out with children from their own culture.

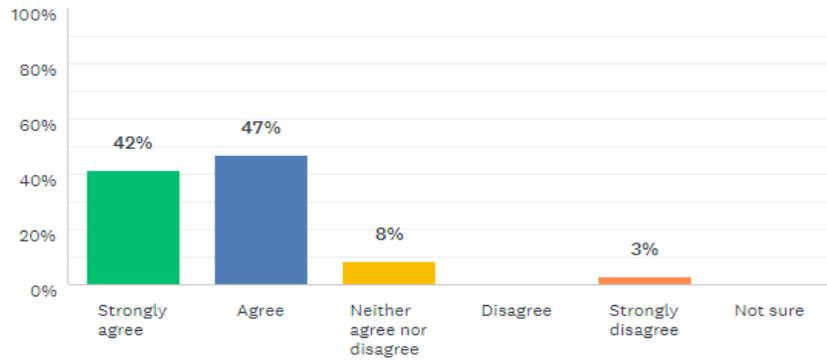


Figure 4.13. *I feel more comfortable hanging out with children from my native culture*

I prefer to work with children from different cultures

In Figure 4.14, only 19% of the responses express their preference to work with children from other cultures. Half of the participated children neither agreed nor disagreed regarding their preference to work with children from other cultures, and one-third disagreed. If we add those two numbers, we can see that three-quarters of participants were hesitant and may have some level of disagreement regarding their preference to work with children from other cultures. This leads us to question why this is the case? Do the newcomer children feel uncomfortable interacting and working with children of other cultures? If so, the question is, how can we help newcomer children to increase their level of preference to work with children from other cultures?

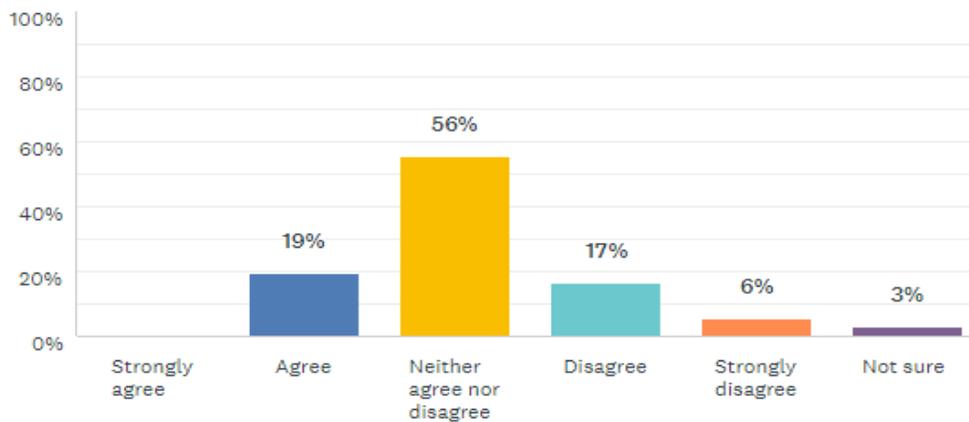


Figure 4.14. *I prefer to work with children from different cultures*

I need help with making new friends and keeping them

Interestingly, 67% showed that they need help in making friends and keeping them. Nevertheless, one-quarter disagreed and did not need help; the remaining small percent were either unsure or neutral, as shown in Figure 4.15.

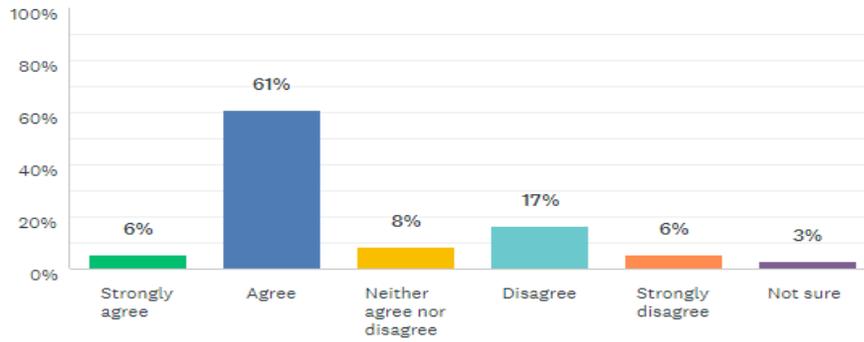


Figure 4.15. *I need help with making new friends and keeping them*

6. Insecurity about Appropriate Behavior

I am comfortable interacting with children from other cultures

One-third of participants were comfortable interacting with children from other cultures, while the other third disagreed and do not feel comfortable doing so, while the remaining third were neither agreed nor disagreed and a small fraction was not sure, as shown in Figure 4.16. Once again, this suggests that newcomer children may feel insecure or worry about interaction with children from other cultures.

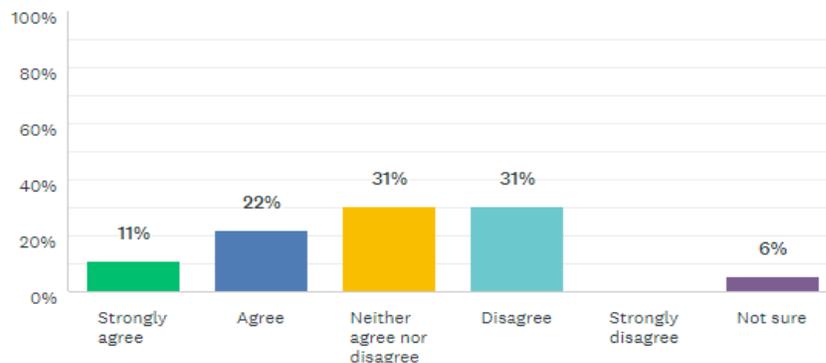


Figure 4.16. *I am comfortable interacting with children from other cultures*

I can share my feelings and thoughts freely with other children

Figure 4.17 shows that almost one-third of participants feel they cannot share their feeling freely with other children. 39% were neutral in their response. Moreover, only 28% believe they can express their thoughts freely with others. In other words, three-quarters of the children have some sort of concern or are hesitant about their ability to share their thoughts freely with other children, which is a significant issue that needs to be addressed.

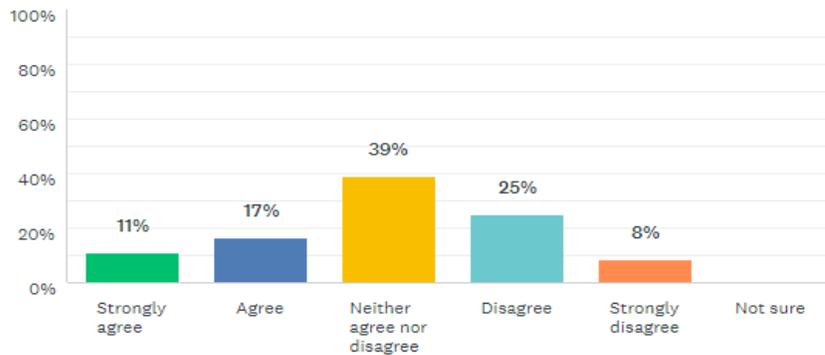


Figure 4.17. *I can share my feeling and thoughts freely with other children*

7. People Sometimes Need Personal Space

People sometimes need personal space

The majority of children believe in the importance of personal space; only 6% are neutral. Furthermore, no one disagreed with this statement, as shown in Figure 4.18.

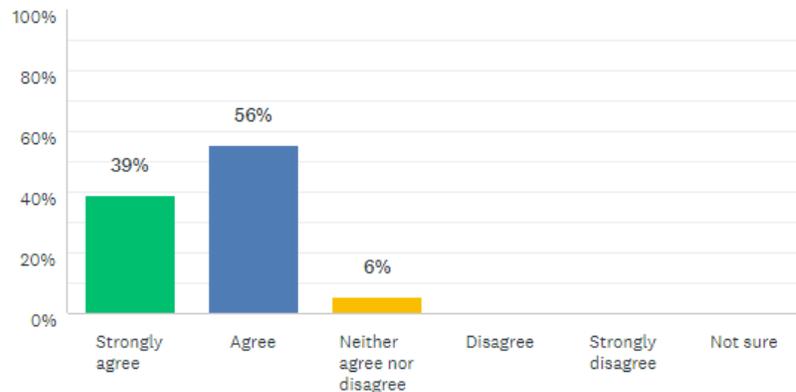


Figure 4.18. *People sometimes need personal space*

At school, we have no problem with personal space

One-third believe there are no problems with personal space, two-thirds disagreed and felt there are problems with personal space at school, while 11% were neutral or unsure, as explained in Figure 4.19.

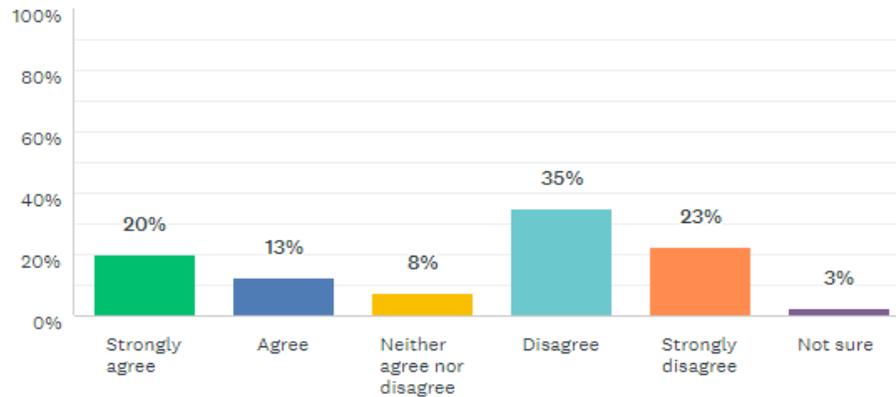


Figure 4.19. *At school, we have no problem with personal space*

4.3.4. Children Parents and Teacher Survey Results Summary

We focus our results on highlighting the most pressing social adjustments, the emerging trends and the interpretation of these problems from the perspective of newcomer children, parents and teachers, as illustrated in Table 4.3. For more details of the overall responses of newcomer children, parents and teachers, refer to Appendices F, G and H.

Table 4.3. *Social adjustment problems reported by newcomer children and their parents and teachers*

More pressing Problems	Quantitative results based on children, parents, and teacher surveys			Qualitative – children quote examples	Comments
	Children	Parents	Teachers		
1 Feeling loss: I feel supported in my new life in Canada	<ul style="list-style-type: none"> 49% agree that they feel supported in their new life in Canada 29% of the children feel not supported, 	<ul style="list-style-type: none"> 35% were neutral 9% not sure Total is 44% on the borderline 	<ul style="list-style-type: none"> 15% strongly agree 32% agree 30% not sure and 23% neutral 	<ul style="list-style-type: none"> “Stress and feeling loss sometimes” “I feel lonely. I missed my family member” 	<ul style="list-style-type: none"> - The children who feel not supported and the children who neither agree nor disagree comprise 51% (almost half of respondents show the need to be supported)

More pressing Problems	Quantitative results based on children, parents, and teacher surveys			Qualitative – children quote examples	Comments
	Children	Parents	Teachers		
I communicate with my old friends and relatives regularly	<ul style="list-style-type: none"> while 22% were neutral, both = 51% 92% of the newcomer children communicated with their old friends and relatives due to their feeling of feeling loss 	<ul style="list-style-type: none"> 43% felt their children were supported 71% of the parent confirmed that their children communicating quality with their relatives and old friend 	<ul style="list-style-type: none"> 39% agree 23% on border 38% not sure 	<i>back home and other close friends”</i>	- This high percentage suggests that the newcomer children are still figuring out their way of living here, and for that reason, they continue to communicate with old friends
<p>2 Feeling out of place</p> <p>I am happy with my new life in Canada</p> <p>I feel that I fit in my new life here</p> <p>I feel that I belong here</p>	<ul style="list-style-type: none"> 54% are unhappy or borderline. 70% are not sure or do not feel they fit 31% agree 53% on the borderline 8% disagree 	<ul style="list-style-type: none"> 51% of the parents were borderline or disagreed, and 11% were unsure, while 39% agree 57% were neutral or disagreed 37% agree 	<ul style="list-style-type: none"> 55% agree 23% neutral 13% disagree 9% not sure 23% neutral 22% disagree 12% not sure Total: 57% 	<i>“Sometimes I feel lost, and I ask myself what I am doing here, as I was so happy with my life back home, but we moved with my dad”</i>	54% of those children cannot confirm their happiness, which suggests they need to figure out why they are not happy, and if so, this means they still do not feel comfortable and are not integrated yet
<p>3 Bullying</p> <p>I know how to deal with a bully</p>	<ul style="list-style-type: none"> 68% are not comfortable or neutral on how to deal with bullying 	<ul style="list-style-type: none"> 55% disagree or are on the borderline, and 11% were not sure 	<ul style="list-style-type: none"> 29% disagree 45% on borderline Total: 74% 	<i>“I am confused about how to deal with bullying”</i>	This suggests that bullying still exists for newcomer children
<p>4 Newcomers’ concerns about their Peers’ perspectives and interest to hear more about my own culture</p>	<ul style="list-style-type: none"> 28% disagree 56% neutral or not sure In total, 84% are not sure or disagree that people want to hear about their culture 	<ul style="list-style-type: none"> 15% disagree 35% neutral 25% not sure. So, 75% are either disagree, not sure or on the borderline 	<ul style="list-style-type: none"> 25% disagree 40% neutral Total: 65% disagreed or were on borderline 	<i>“Sometimes, I feel hesitant talking about my own cultures; I always worry about being judged based on that!”</i>	This could be explained by: 1) newcomer children had previous experience with children from other culture or 2) if they have not had a bad experience, this could also be explained by the confidence of newcomer children towards their own culture, which needs to be addressed

More pressing Problems	Quantitative results based on children, parents, and teacher surveys			Qualitative – children quote examples	Comments
	Children	Parents	Teachers		
<p>5 Lack of Cooperation skills</p> <p>I feel more comfortable hanging out with children from my native culture.</p> <p>I prefer to work with children from different cultures</p>	<ul style="list-style-type: none"> 89% are more comfortable working with people from their own culture 56% of participating children neither agreed nor disagreed, and 23% disagreed 	<p>60% believe that their children are more comfortable hanging out with children from their own culture. Also, 34% were on the borderline.</p> <p>60% where on the borderline, 4% disagree and 6% not sure</p>	<p>68% agree 22% on border 10% disagree</p> <p>50% on the borderline 40% disagree 10% agree</p>	<p><i>“I am scared to play with other children who do not speak my native language”</i></p>	<p>Several factors are related to this problem, such as languages, culture, sense of safety, interests, cultural differences, etc.</p> <p>Kids were hesitant or had some disagreement about their preference to work with children from other cultures. Thus, how can we help newcomer children increase their comfort level to work with children from other cultures?</p>
<p>6 Insecurity about appropriate behaviour</p> <p>I am comfortable interacting with children from other cultures</p>	<ul style="list-style-type: none"> 67% are not comfortable or on the borderline 	<p>59% are not comfortable or on the borderline</p>	<p>48% agree 22% neutral 22% disagree 8% not sure. So, 52% disagree or are borderline</p>	<p><i>“I am worried about how other children see my behaviour or actions; this is making me less confident to interact with them”</i></p>	
<p>7 Personal Space</p> <p>People sometimes need personal space</p> <p>At school, we have no problem with personal space</p>	<ul style="list-style-type: none"> 95% agree on the importance of initiating personal space 35% disagree and 23 strongly disagree (57% is the total of disagreement) 9% on border 	<p>60% agree 30% strongly agree</p> <p>15% disagree 22% strongly disagree 28% on the borderline Total: 65%</p>	<p>The teacher fully supports this statement</p> <p>53% strongly disagree 20% neutral 7% not sure Total: 80%</p>	<p><i>“At the start, I did not know about the bubble space and how some children got mad if one touched their bubble”</i></p>	<p>Three-quarters of children state that they are having problems with personal space in school</p>

4.3.3 Qualitative Results

4.3.3.1. Children

We asked children to answer three open-ended questions, and by synthesizing the children's responses, we found the following results:

- The most-reported social problem at school was lack of friendship; misunderstanding during interaction with others; missing friends and relatives; bullying concerns; lack of confidence; social withdrawal; feeling insecure about proper behaviour, loneliness; peers' lifestyle comparison; language barriers; self-confidence; problems with personal space; and issues related to identity and pride in their culture.
- Most newcomer children's migration stories can be categorized into three groups: emotional, optimistic and hardship/uncertainty stories. For example, one respondent said it was hard for her at the beginning, as her English was not good enough. Some children made fun of her that she was speaking (as she was told) "funny English". This situation made her uncomfortable to speak, and it took her a whole year to get over it.
- Most respondents play some video games daily. However, most children said that their parents restrict their screen time. For example, they cannot play before finishing their schoolwork and home chores; others said the game's content should be educational and violence-free. Examples of the played console types and games include Console, Nintendo Switch, Ludo, PBG, Roblox, y8, sp4 and Coin-master. Once participant said: *Some of these games, such as Roblox, were preferred because it is a game where you can interact with people all over the world and still have fun; it is my favourite game ever!*

4.3.3.2. Parents

The parents' overall responses were positive. They stated that it is a great idea to learn through fun activities such as interactive games, as long as children use these games

effectively so that it will not impact other academic and social activities. Parents believe that computer games are a fun and engaging way of teaching children about different social scenarios. The following is a representative example of parents' views:

It is a good idea to keep them learning through fun; it is a smart idea since the children can try out different behaviours and realize the consequences, which might not be available in real life without consequences. I wish I had such a game when I moved to Canada 2 years ago!

Parents help their children adapt to their new life in Canada using various strategies including:

- a) Reading to children about success stories of migrants and trying to socialize with other newcomer families to exchange the experience each has faced in their new life.
- b) Educating children about Canadian norms and reminding them to share and present our values whenever it is relevant.
- c) Encouraging them to invite their peers over and go to their parties and other school social activities.
- d) Working with them and their school to solve any behavioural problems.

Some parents shared some stories of their children when they arrived in Canada including:

- *Our move was smooth in general, and once the honeymoon was done, we started realizing the new responsibilities and financial needs for the family, but most importantly was our children, they missed their grandparents as we were living at the same building back home but with courage and online calls things getting better.*
- *The first six months were tough; I wish I could have some smart games or websites that can help my children stimulate the lifestyle in Canada and how they interact with local Canadians.*

- *Even though my husband and I planned our move carefully, we realized that the reality was different, our daughter felt isolated for the first six months, and she was so attached to her best friend back in Iraq. This took us a lot of patient, courage, and efforts to enable her to cope. During that time the mental health support was not easy to be accessed for children, and we were not sure what to do at the beginning till we found a good friend here who referred us to a good counsellor that helped up to find some related resources.*

4.3.3.3. Teachers

The interviewed teachers believe that GBL is essential and valuable to teach children in a fun and engaging way. However, they argue that these tools need to be developed with consideration of a good lesson and an educational plan to achieve specific goals and gain a successful result. Also, they stated that computer games have become essential components of learning and teaching today because they are used and played locally and internationally. They felt they are a great way to keep students interacting positively as well as continuing to mature through a natural and less direct way of behaviour intervention to solve problems.

Teachers reported that they help newcomer children adapt to their new life in Canada using various methods such as:

- Organizing several social group activities throughout the school year.
- Speaking to newcomer students individually to learn more about their concerns and welcome them.
- Encouraging newcomer children to share their own stories with other children within a planned social activity, and if some children are shy, having them write a short paragraph that the teacher then shares with the class with their permission.
- Communicating with newcomer students' parents about any cultural activities or events so the teacher can mark their calendar to make sure those students are supported and feeling welcomed.

- Assigning newcomer children to be a lunch mentor or helper for other children.

Also, teachers shared some stories of their interaction with newcomer students, such as:

- *A student moved last year from Syria; he was so positive and ready to learn and grasp the language so fast even though he was suffering from war trauma. I was so amazed by his strong personality and dedication. I had the opportunity to help him throughout the school year, and he was part of our school basketball team. He makes me think always to avoid hurting them unintentionally by trying to help but in the wrong way.*
- *There are lots of success stories. For example, a couple of students were struggling to adapt because of their language difficulties, and sometimes they acted in a way that might be too rough for other students; it sounds they are used to it, but after four months of closely mentoring and encouraging, they managed to adjust. After two years in school, they became very successful and adjusted fully in school as they represent our school in different sports activities.*

Other specific problems reported by teachers

- Difficulties in knowing every child's culture specification makes teachers sometimes hesitant to keep asking a newcomer child to avoid making them feel that they are being questioned.
- A teacher-student relationship needs to be clearly explained to newcomer children.
- Body language differences.
- Social behaviour sometimes becomes a concern, impacting the children's ability to learn and catch up with other children. For example, they can get in a fight quickly, which may cause them to lose friends or make other children concerned about accepting their friendship.
- Language comprehension and direct translation to English may change the meaning and cause problems.

4.4. Discussion

We found that newcomer children reported the following most pressing problems: *Feeling loss; Feeling out of place; Bullying; Concerns about their peers' perspective and interest in newcomer children' culture; Lack of cooperation skills, Insecurity about appropriate behaviour; and Problems with personal space.* These identified social adjustment problems become the focus of this thesis's solution of using a Game-Based Learning approach. The parent and teacher participants' results align and report similar problems identified by the children.

This study is original for several reasons: 1) it identifies the most pressing social adjustment problems of tween newcomers aged 9–12 during the process of cross-cultural transitions when learning a new way of living; 2) it focuses on understanding the social adjustment problems from newcomer children's perspectives, as well as those of parents and teachers; 3) it creates a deeper understanding of migrant children's needs within the family and school context. While our study results align with the previous related literature around newcomer children's needs, it reveals new insights and synthesizes other existing trends among newcomer tweens that were partially investigated or had not been examined with tween children from Arabic-speaking backgrounds. We identified the following overarching themes that exist among children, parents and teachers:

4.4.1. Children, parents and teachers identified parallel social problems

By analyzing the collected views from our three stakeholders (children, parents and teachers) about these problems, we found a general agreement on the social adjustment problems faced by newcomer children, their parents and teachers. This can increase our trust in the importance of focusing our research efforts on selected examples of these pressing problems, and allows us to build and gear our proposed solution to tackle and mitigate these issues. Also, the significant similarity among children, parents and teachers suggests the importance and necessity of providing support to newcomer children and their parents to enhance and assist with their transitioning process into Canadian society.

4.4.2. Study findings align with previous related literature

Our results align with other migration studies around the world. For example, a UNICEF report (2019) shows that psychosocial support in primary and secondary schools often fails to assist teachers, refugees and their children, who may have difficulty focusing and learning in class due to stress and disturbance accumulated in their countries of origin, during transit or at their destination (UNICEF, 2019). Other studies showed that newcomer children are at higher risk of developing various social and mental health problems (Mckenzie, Agic, Tuck & Antwi, 2016; Unicef, 2016). Furthermore, newcomer children may experience greater risks of depression and distracting behaviour levels compared to non-immigrant or native-born children (JaHun Kim et al., 2018). One of the main influences is the change and relocation into a new way of living, which can have detrimental effects on newcomer children, as it is challenging for them to adapt, potentially leaving them experiencing loneliness and feeling misunderstood (Tienda & Haskins, 2011). Our study survey also confirmed the existence of some social problems among our study target group of the Middle Eastern newcomer children, which was reported by previous research on newcomer social integration, such as language acquisition difficulties, experiences of loss, the growth of social networks, the influence of changes due to relocation and the general well-being of newcomer children (Scott et al., 2016; Valencia, 2015; James, 2007).

Our study reveals that cultural differences make it very challenging to adapt quickly. Some children's responses described how some of their social interaction was perceived in the wrong way, such as their body language or when they entered other children's personal space by mistake, especially in their first few months and before they had learned what is acceptable and not acceptable. In previous research, Colbert et al. (2013) and Scott et al., (2016) stated that newcomer children were found to be shy and cautious of strangers. Further, they may find it tough to express their feelings or to show their emotions. Newcomer children may have been taught to show respect for their teachers and other adults in their home countries by lowering their voice and averting their gaze. They may have been discouraged from expressing their opinions (Colbert et al., 2013). These

behaviours may be misunderstood in a culture that values maintaining eye contact and the freedom to express one's thoughts.

4.4.3. Newcomer children and parents may adjust at a different speed

The parent survey reveals that their children picked up the language and local norms quicker than their parents, which the parents were happy about, but they expressed concern that their children may start relying on themselves and overlooking their own identity to satisfy their peers and to let things go without giving enough time to reflect on how this new lifestyle works. As described in the survey, newcomer children often acquire language skills quicker than their parents, and as such, they need to help their family deal with daily tasks. This may further increase the children's challenges in forming their own identities. As such, we contend that the failure to mature a strong sense of identity with a good connection to family and the new way of living may cause isolation from the family unit and society as a whole, which potentially may produce frustrations and even radicalization.

4.4.4. School and teachers play a crucial role in newcomer children's social adjustment

Teachers play a central role in helping students in various aspects, including academic growth, social relationships and their lives in general. In some cultures, teachers are engineering the future of our society. They can do that by assisting students to get through challenging times they may experience and helping students find their way to the future. Newcomer children experience a difficult situation when they move to a new way of living. As a result, we believe that teachers are a key channel in helping newcomer children adjust and adapt quickly and wisely to their new school environment by introducing them to knowing and engaging in their new place of living. Further, the teacher can be one of the front lines to communicate with newcomers and assist them to solve social problems that may be caused by external elements that go beyond the school environment. In the case of our study survey, teachers had similar ideas to the children and their parents in identifying the main social problems, which supports the notion that teachers are essential stakeholders in the study of newcomer social integration in this age

group. Also, in this research survey, teachers point out several vital points that a researcher or educator can invest in to enhance the success of newcomer adjustment. As such, we recommend having engaged teachers in any design solution for newcomer children.

4.4.5. Identifying several strengths of newcomer children

Some of the collected insights suggest that newcomer children have several qualities that make them well-equipped to understand and interact with the proposed digital social adjustment components. Examples of identified strengths include newcomer children feeling happy in general. They believe that they have many things in common with other children in the classroom; they are positive towards their relocation process; and they feel proud of their own identity. Also, they were so eager and interested in sharing their thoughts about their feelings and experiences of being a newcomer to Canada.

Focusing on helping children based on their strengths is a concept well-established in previous research, under what is called an asset-based approach model, which focuses on strengths rather than weaknesses (Rose, 2006). In our view, we acknowledge that the asset-based approach has some rationale in terms of being positive and investing in strengths, but this model was built to help children and youth in general who have likely grown up in the same environment with the same language and norms. However, this is not the case for newcomer children who relocate to a new environment, norms and language. Therefore, our proposed solution is built based on a mixed approach that focuses on addressing deficiencies while simultaneously considering the strengths we can invest in to overcome these shortcomings. Also, we believe that many newcomer children may be left behind if we do not focus on solving their social problems or at least involve them and empower them to solve challenges they may encounter as early as possible. Otherwise, they may fail to adjust and keep struggling with such challenges.

4.5. Summary of Findings

This study survey focused on identifying the social adjustment problem for newcomer children from Arabic-speaking backgrounds, aged 9–12 years, in Canada. We collected our survey from selected private international language schools and non-profit organizations that provide support and help to newcomer children. Our study results align with the overall problems of the newcomer children in general; furthermore, our study is unique in identifying several social adjustment problems that exist among newcomer tweens aged 9–12 from Arabic-speaking backgrounds, which have not been studied before. These problems include: *Feeling loss; Feeling out of place; Bullying; Newcomer concerns about their peers' perspective and interest in newcomer children's culture; Lack of cooperation skills; Insecurity about appropriate behaviour; and Problems with personal space.* The study results are helpful for researchers and agents who intend to assist migrant children. We seek to use this new knowledge and evidence to develop a novel digital technology framework and solution to help newcomer children overcome these identified problems and adjust socially. We anticipate this study may benefit several stakeholders such as newcomer children, newcomer parents, schools, local communities and immigrant-related non-profit organizations who can support children by learning more about specific problems faced by children aged 9–12 years.

CHAPTER 5: Research Phase Two – Educational Computer Game For Newcomer Children Social Adjustment

5.1. Overview

This study aims to investigate the effectiveness of educational computer games as a tool to help newcomer children adjust socially. We have developed an educational game called *New Beginning* to help newcomer tweens (aged 9–12 years) learn more about a few selected behavioural issues (Bani-Taha, El Kouzi, Arya, & Taylor, 2019). The game includes social behaviour advice focusing on bullying and how to respond to it, plus concepts of personal space. The participating children were randomly assigned to do one of the following activities: 1) playing a computer game that contains behavioural advice about social interaction in the context of a space fantasy story or 2) reading a brochure taken from Canadian school material related to the same topics.

Our specific research question is:

- *Q3. Can game-based learning be used to assist newcomer children with their social adjustment problems, and how does it compare to more traditional methods?*

Our main hypothesis in this study was that GBL provides a greater learning experience for newcomer tweens trying to adjust socially to their new way of living. We used a series of objective and subjective measures:

- Level of learning measured by the number of correct answers before and after the participation (objective)
- Perceived Ease of Use (subjective)
- Perceived Usefulness (subjective)
- Pleasantness (subjective)

The learning was measured by counting the number of correct answers, while the subjective metrics were measured using a 1-5 Likert scale.

For the objective learning metrics, as such, we hypothesized that:

- H1.1. Children will have better scores after reading the brochure compared to before the experience.
- H1.2. Children will have better scores after playing the game compared to before the experience.
- H1.3. The score after playing the game will be higher than the score after reading the brochure.
- H1.4. The score increases after playing the game will be higher than the score increases after reading the brochure.

For the subjective part, we hypothesized that:

- H2.1. The game will have a higher rating for usefulness.
- H2.2. The game will have a higher rating for pleasantness.
- H2.3. The game will have a higher rating for ease of use.

We also provided children and their parents the opportunity to report their experiences in response to the open-ended comments describing their opinion and thoughts about the experience.

We observed that reading the brochure is perhaps easier than playing a game, but for the sake of

comparison, we kept the hypotheses in the same order. Ease of use is a valid metric; it is acceptable for a more pleasant and useful method to be harder to perform. Also, game usability will be researched in the future work of this project. We also provide children and their parents the ability to enter optional comments describing their opinion and thoughts about the experience.

A paired t-test is used to identify differences other than random variability between study sample statistics of small sample sizes where the same participants of a study or

experiment have been subjected to two different conditions. We applied the three conditions required for paired t-test analysis, and all three were met for our Game Group samples compared to the Brochure Group: 1) Samples are of the same size; 2) Differences in samples usually are or nearly normally distributed.; and 3) Samples are dependent (precise pairs can be easily identified).

5.2. Study Design

5.2.1. Participants

We conducted this study at the Ottawa Chinese Community Service Centre (OCCSC), which actively

supports many newcomers from a diverse set of ethnic backgrounds. We recruited 30 newcomer tweens (aged 9 to 12) from Arabic-speaking backgrounds with an intermediate level of English language skills. They were accompanied by their parents. Also, most participating children had played some sorts of computer games in the past, but their level of experience varied. We randomly divided the children into the Game Group, who played the game, and the Brochure Group, who read a brochure. Each group included 15 participants. Translation from English to Arabic and vice versa was made available by researchers.

Carleton University's Research Ethics Board approved this research project (protocol #110087).

5.2.2. Material

The children were divided into two groups: the Game Group who played the game, and the Brochure Group, who read the brochure.

5.2.2.1. Brochure Design

We design a comprehensive pamphlet, as seen in Figure .1. We designed a comprehensive brochure, as seen in Figure .1. We used some existing brochures taken from the Canadian Ministry of Education that describe how to manage bullying in schools (Canadian Ministry

of Education, 2013). An equal number of children were randomly assigned to this group and the other one. Those in this group were tasked with reading the aforementioned brochure. The children used it as a reading activity to learn about the social problem of bullying, as shown in Figures 5.1 and 5.2.

Once children read the brochure, they answered a post-study questionnaire to measure the impact of these tools in dealing with various social interaction scenarios.

Bullying Prevention & Intervention



What is Bullying?

Bullying is a repeated aggressive behavior by one or more people, which harms others physically and/or emotionally. No matter how it is defined, bullying is abuse. It cannot be simply brushed aside as a “normal” part of growing up [1].

How to keep away from being bullied?



-If you know a kid who doesn't like you, stay away from them and places they like to hang out.

- Hang out with friends and play in groups.
- Walk to school with a buddy.
- Stay within the sight of grownups whenever possible. If they can see you, they can help you [1].

Ways to deal with a bully:

Talk about it with your family or friends, so that you don't feel you are alone.

Fighting back can make the situation worse, and you may get hurt. Get away. Find safety or call for help.

Report the situation to the school and your parents [1].

What if someone else is being bullied?



Most of the time when bullying takes place, other kids are watching. These bystanders, as they are called, have the power to help stop bullying. In fact, when other kids step in, bullying stops within 10 seconds, 57% of the time.

Most kids feel uncomfortable watching, but few intervene because they are afraid or don't know what to do. You can:

- Walk away. Don't be an audience for the bully. Get help.

- Speak up...a simple “you're being a bully” might be enough to stop the incident [1].
- Nurturing healthy relationships can help stop bullying.
- Students who have healthy relationships are less likely to bully others, and more likely to support students who are bullied. Also, they are more likely to reach their educational goals.
- Promoting healthy relationships is a key to prevent bullying and create a safe and accepting school environment.

Conflict and bullying:

People may sometimes confuse conflict with bullying, but they are different.

Conflict occurs between two or more people who have a disagreement, a difference of opinion or different views. The conflict between students does not always mean bullying.

Conflict becomes negative when an individual behaves aggressively by saying or doing hurtful things. Then the conflict is an aggressive interaction. Conflict only becomes bullying when it is repeated over and over again, and there is a power imbalance [2].

Figure 5.1. Study brochure.

How serious a problem is bullying?

Bullying is never acceptable. It should not be considered just “part of growing up”.

Children and teens who learn to use power and aggression to distress others may stop caring about the difference between right and wrong in general. Eventually, they may become abusive adults. Therefore, it is important to help them stop bullying as early as possible [2].

Bullying includes:

1) Verbal bullying:

Name-calling, verbal taunts, gossiping and put-downs, mocking, or making sexist, racist or homophobic comments [1,2].



2) Social bullying:

Excluding others from a group or spreading gossip or rumors about them [2].



3) Physical bullying:

Physical violence and attacks, hitting, shoving, damaging or stealing property [1,2].



3) Written bullying:

Written notes or signs that are hurtful or insulting [2].



5) Electronic bullying

(commonly known as cyber-bullying)
Spreading rumors and hurtful comments through the use of e-mail, cell phones (e.g., text messaging) and on social media sites [2].



References:

- 1) *Bullying What you should know, what you can do.* Bullying pamphlet_se06
- 2) *Bullying we can help stop it,* A Guide for parents of elementary and secondary school students spring 2013.

Figure 5.2 Study brochure

5.2.2.2 Game Design

Game Development

We designed an interactive educational and cultural video game called *New Beginning*. This video game is created especially for newcomer children aged 9–12. It contains daily life behavioural advice in a fun, educational way, as illustrated in Figure 5.3. This game was developed using the Unity game engine and its publicly available assets (Unity website, 2018).

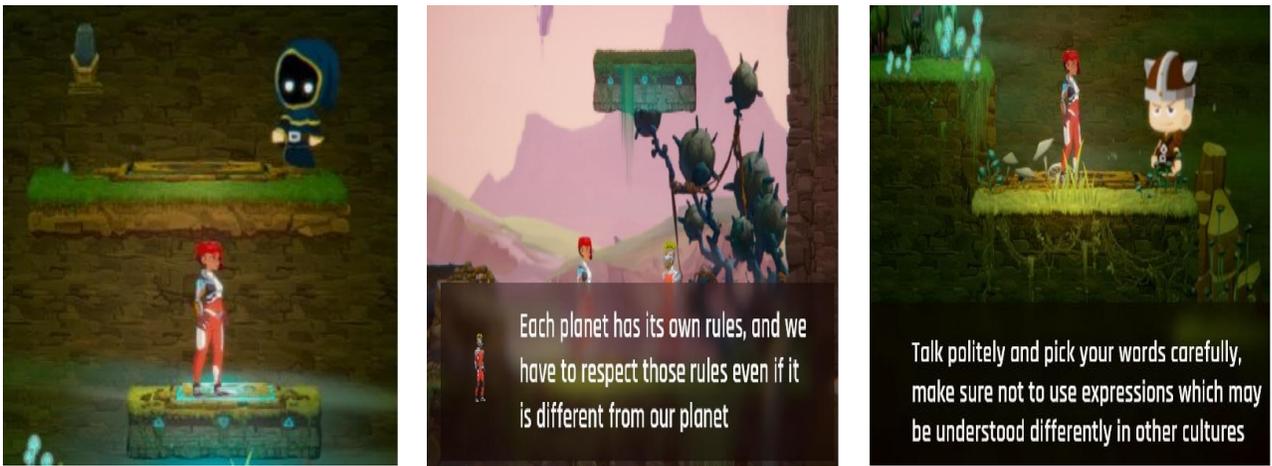


Figure 5.3. Shows *New Beginning* game's designed interface and some of the advice given in-game.

Gameplay

In this section, we discuss the game's goal, rules, challenges, and actions through a discussion of the three levels of *New Beginning*.

The game aims to help newcomer tweens (aged 9–12 years) learn more about selected behaviour issues. The game includes social behaviour advice that the player may not know, and we anticipate improving their understanding of how to deal with a given situation. Such advice is derived from real incidents that those tweens might face in the school environment or their new community.

- **Level One**

The game starts with Sarah standing next to her spaceship. After taking a few steps of exploration, Sarah meets Adam. Simultaneously, she steps on a Pressure Pad, which shows a dialogue box and a recorded voice containing the first advice from Adam to Sarah, which is: “Each planet has its own rules, and we must follow those rules even if it is different from our planet,” as depicted in Figure 5.4.



Figure 5.4. *The first piece of advice given to Sarah in level one.*

After this advice, Sarah jumps on a moving platform that takes her to a teleportal door. This door will take her to the other side; however, there is danger (acid water) between the two sides. Sarah continues jumping and moving throughout a fixed platform to avoid the acid water until she encounters Adam again. She steps on a Pressure Pad that will activate a recorded voice and a dialogue box containing the second piece of advice, which will be: “Personal space is the area immediately surrounding your body. Personal space can even be different from culture to culture. Getting inside someone's personal space can make them uncomfortable.” Then she jumps to pass through two platforms and move up and down the platform. After she reaches the top of the game, she jumps to the left side, where she collects a hitting tool that breaks the poles only when the K key is pressed on the keyboard. Then she jumps down to collect health from the health box if she needs it [optional]. Sarah must break another pole before she meets Adam for the third time. Again, she stands on a Pressure Pad and this triggers the voice speech reading the dialogue box,

which contains the third piece of advice: “Do not fight back, even if someone wants to hurt you physically. Try to get away from him/her and tell an adult what is happening to you.”

After listening to the advice, Sarah continues her journey in level one, and then she meets the Disturbance, who gives Sarah a hard time by keeping following her. However, she must avoid them and persist in her journey. If the Disturbance succeeds in touching Sarah, she will be sad, which will break her heart. After facing two Disturbances, Sarah gains the first “Advice Key,” and the first level will be completed.

- **Level Two**

Sarah faces an Armed Man. He is swinging his sword to hurt everyone who gets near him. Therefore, he does not move from his place but will also hurt anyone who comes behind him. Sarah remembers Adam's advice, and she jumps above the Armed Man to avoid him and being near someone who wants to hurt her. Then she meets a guard-man. Sarah tells him what she had seen and expects him as an adult to know what to do in this situation, as explained in Figure 5.5.



Figure 5.5. *In level two, Sarah sees the armed man and is going to tell the adult.*

- **Level Three**

This level is the final stage; it contains other challenges and obstacles. In this level, Sarah meets the Helpers, who give her advice, and again encounter the Disturbances. Sarah starts this level by learning about the switch, which will open the first door. She searches for other switches through this level when she opens the doors. Then she must shove a pushable Box and drop it in the acid water so that she can use it to jump to the other side. The

Spikes are a new challenge that Sarah also faces. The Spikes are dangerous obstacles, and if Sarah touches them, she feels discouraged and heartbroken. She must avoid the Spikes by jumping on the moving platforms until she reaches the switch to open the door. She descends until she meets the first Helper and steps on the Pressure Pad. Voice advice plays, and the dialogue box appears. Sarah hears the fourth advice: “Talk politely and pick your words carefully, make sure not to use expressions which may be understood differently in other cultures,” as shown in Figure 5.6.



Figure 5.6 *In level three, Sarah meets a Helper and listens to his advice.*

Then she meets another character (Guider), whom she asks politely about the directions to practice the advice. He informs her about the correct direction. She jumps up through the Path through the platform and avoids touching the Spikes. After reaching the top, Sarah pushes a push-able box and drops it down to reach the acid water. After she does so, the Disturbance will try to demotivate her by breaking her heart. Sarah must avoid it and continue on her way. She jumps on a platform and searches for a switch to open the next door. Next to the switch, she will find the Wizard, and he will give her the fifth advice: “If you felt depressed and that nobody understands you, try to tell your parents about your feeling and your concerns; also, you can chat with your teachers.” Finally, a push-able box will move with Sarah while she is on the moving platform; she must stay on that platform after she opens the door so that the box will also be dropped in the acid water. The two boxes will create a path to help her cross the acid water. After she reaches the other side,

she will gain the third Advice Key, which will allow her to open the last door. Then the game will be over.

Camera Controller

A dynamic camera was used, which would follow the player while moving. To achieve this, the camera was given the necessary velocity so that it would accelerate when the player runs and slow down when the player's movement slows down.

Player Controller

Sarah can be controlled using the following keyboard keys:

A: Turn/move left

D: Turn/move right

S: Crouch

K: Hit columns using the breaking tool

Space: Jump

Space+ S: Pass through the platform

Setting/Story

The stories on which the game is based were collected from Multicultural Liaisons Officers. The themes of the three levels were inspired by school Multicultural Liaison Officers (interview with Multicultural Liaison, 2018) and our synthesis literature review on the topic.

- *Theme One:* We were informed by an officer that once a newcomer student arrives at the new school, they will be assigned a friend from the same culture to help them better adapt to the new school environment, especially in the first few days.

- *Theme Two:* Some newcomer children may face problems socializing with other students. Some of the students are helpful, and others may not be friendly to the newcomer student.

Characters

The main character in the game is called Sarah, whose spaceship has landed on C planet. Unfortunately, her spaceship breaks down. Thus, she decides to start figuring out other alternatives by adapting to life on this new planet. She finds herself lonely and needs help and advice on how to start her new life. More descriptions of the game's characters are provided in Tables 5.1. and 5.2.

Table 5.1. *A description of the New Beginning game's characters*

Character	Description and its role	Character	Description and its role
	Sarah She is the main character. She should learn from the advice given to her to adapt better to the new environment.		Adam He only appears to advise Sarah on level one. He came from Sarah's planet before her.
	Disturbance It moves automatically toward Sarah when he senses her coming. The disturbance will hurt her when he touches her.		Barbarian He is the first Helper in level three. He cannot be controlled. He gives Sarah the fourth piece of advice.
	Guider Sarah will meet the Guider after she feels lost. She asks for directions, and he guides her on the right way to go.		Wizard In level three, he will give Sarah the fifth piece of advice. He cannot be controlled. Moreover, he does not move from his
	Security Guard Sarah will meet the Police Helper in level two, and she will inform him that she has seen the Armed Man. He knows what to do in this situation.		Armed Man Sarah will meet the Armed Man in the level two. He will stay in his place while swinging his sword.

Obstacles

Table 5.2. Game Obstacles

Delaying obstacles: May not hurt Sarah but will prevent her from proceeding in the game unless she knows what to do.

	Destructible column: This column will block Sarah's way to continue her journey. Moreover, there would be no other way unless she breaks it with the breaking tool.		Door: This door will stop Sarah from proceeding. She should search for the switch to open the door.
	Pass-Through Platform: When under it, Sarah can jump through it by pressing Space. If she is above it, you should press S+ Space.		Pushable Box: Push the box to make Sarah drop it and jump above it to continue moving.
	Teleporter: Enter through it to be transported to another place.		

Harming obstacles:

	Acid Water: If Sarah falls in this water, it will result in heartbreak. She should jump above it and land safely on the other side.		Spikes: The Spikes are either on the ground or on/under a moving platform. Sarah should not touch nor let the Spikes reach her to avoid having her heart broken.
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New Beginning game design notes

New Beginning is designed using a common template in Unity Asset Store that provides a basic and popular game structure. The design process followed the standard pattern of defining goals, rules, challenges, and actions (Adams and Rollings, 2007). It is a social game, not a purely academic one. We use the term “academic” in this context to mean related to the school curriculum. Even though *New Beginning* contains realistic advice and situations that resemble a realistic physical world, it is not realistic in the sense that it depicts a fantasy world, not the school or city environment. This was decided so that the game would not be hurtful by reminding children of any traumatic experiences.

New Beginning is an interactive educational and cultural video game. This video game was created especially for newcomer children aged 9–12. It contains some daily life behavioural advice in a fun, educational way. The game has been developed in two stages: pre-production—developing the concepts and designs behind the game; and production—the actual asset collection and game development.

Preproduction

During the pre-production phase of development, the entire game was accurately designed. Every aspect, from characters to environment, was discussed, and precise decisions were made at this early stage. We organized the problems and advice that we gathered from the liaison officers and the literature review into categories, dividing them into three stages. This created an excellent platform on which to allow the game in mind to be rapidly and efficiently developed and gave a clear and reliable picture of the final product. Of course, there were changes made regarding the presenting of the advice and the proper action taken after each advice to properly represent the advice that was discussed, and additional possibilities were explored, but the main concepts have remained as planned and accepted by the officers.

As a special consideration, we decided to remove violent features from the proof-of-concept game due to a few reasons: 1) While some violence may be common in children's games, removing violence is a more inclusive choice as it can still be attractive to all children while accommodating those who do not want or should not be exposed to any levels of violence. For example, some newcomer children have trauma-related conditions, especially if they are from a war zone, so any violent content could harm them in particular. 2) Parents rarely approve their children playing violent games, so by removing the violent content from the games, we make sure that children will have access to play this type of game with the permission of their parents. We recognize the potential implications of this design decision in lowering attraction of the game or enforcing a special condition. However, any design would have been restrictive to its own features and our research could not afford to experience with a wide range of design choices at this time. Further studies can address and investigate this limitation.

Production

In this stage, we selected the gaming platform, which suited the requirements and helped us establish the needs efficiently. We chose Unity, which is a cross-platform game engine. Unity provides game creators with the necessary features to build games quickly and efficiently. The Unity version we used was "Unity 2017.4.17f1." We selected a project called "2D Game Kit" from the Unity assets store. This game kit was chosen because it is suitable for the age group we are targeting (tweens), and it is easy to modify and add assets that would be helpful to customize the scenes and events according to our purpose. Shooting and other unrelated features in this game kit were removed so that the players would not feel unpleasant feelings during the design or play. We modified this project to reflect the given advice. We used assets from the Unity Asset Store to help us achieve our goal. Several modifications were made to the behaviour of some assets and we customized most of the game to fulfil our requirements.

The Story of the Game

The story of *New Beginning* was created to provide relevant advice and add more enjoyable elements to the game; a non-realistic setting was chosen for this reason. The game contains the fundamentals of cultural information concentrating students behaviour in school and society. The players will hear the characters and read the accessible text, so they will practice listening and reading while playing this game. Learning about the new culture will give the newcomer children self-confidence to help them communicate with others. That could also assist them to build relationships with new friends and improve their social network. By playing this game, the newcomer tween will solve most of the problems they may face in a new culture, which we categorized as culture, behaviour and education. By playing this video game, the tweens will learn better behaviour and help their community reach a better level. Such a computer game is a powerful tool for the newcomer tween to be engaged and motivated. These "Digital Natives" tweens may feel more involved by using this familiar learning tool that they play with daily. This activity may reduce cultural shock for tweens, allowing them to learn more about the encouraged behaviour, improving their self-confidence and hopefully motivating them act properly.

Instructional Design Model

Instructional Design is the organized development of instructional conditions using learning and teaching models to guarantee education excellence. The instructional design model offers strategies to form suitable educational settings to influence instructional goals. Instructional design can be defined as the preparation of creating instructional methods to help facilitate learning most proficiently. It is the full understanding of educational needs and goals analysis and the development of a delivery system to meet those requirements.

Ensuring that teaching and assessment activities are associated with supporting students includes developing instructional materials and activities, plus trialling and evaluating all instruction and learner activities. Instructional design models help instructional designers to make sense of abstract learning theory and enable real-world application. The most common instructional design models are the ADDIE Model, Merrill's First Principles of Instruction and SAM Model. While there are several game design methods such as Merrill's five principals (Collis & Margaryan, 2005), the SAM Model, and the ADDIE Model (Allen, Sites, & American Society for Training and Development., 2012), in this study, we follow the ADDIE instructional design model as it is similar to the Waterfall Model, which makes it straightforward and easy to learn and use since requirements are well understood and unlikely to change totally during system development (Sommerville et al., 2011). Furthermore, ADDIE is a basic model with an organizational style in designing educational materials that offers a solid framework to ensure that the produced educational products are efficient and effective (Branch, 2009).

ADDIE Model

In our study, we chose the ADDIE Model, the methodology of which was built on a linear model. ADDIE is an acronym whose letters stand for the essential parts of producing the ID: Analysis, Design, Development, Implementation and Evaluation, as shown in Figure 1.

The ADDIE Model is similar to the most-used software process model, which is the Waterfall Model. Using a standard management model for the whole project is easier, so software processes are still commonly used based on the Waterfall Model, since requirements are well understood and unlikely to change totally during system development. We have chosen the ADDIE model because it is straightforward (Sommerville, 2011). In his paper, Jansak (2001) explained that the ADDIE model is a basic model with an organized approach to designing education materials and provides a steady framework to guarantee that the educational products formed are efficient effective (Jansak, 2001).

Many professional instructional designers use this design model for technology-based teaching. Its success arises from it being deeply associated with acceptable quality design and distinct learning objectives, wisely structured content, plus its strong ties to desired learning outcomes. In addition, this model allows for the objectives or tasks to be defined clearly. Another strength is that this model is cost-effective. Applying the ADDIE Model processes can support producing an effective learning design for any instructional material.

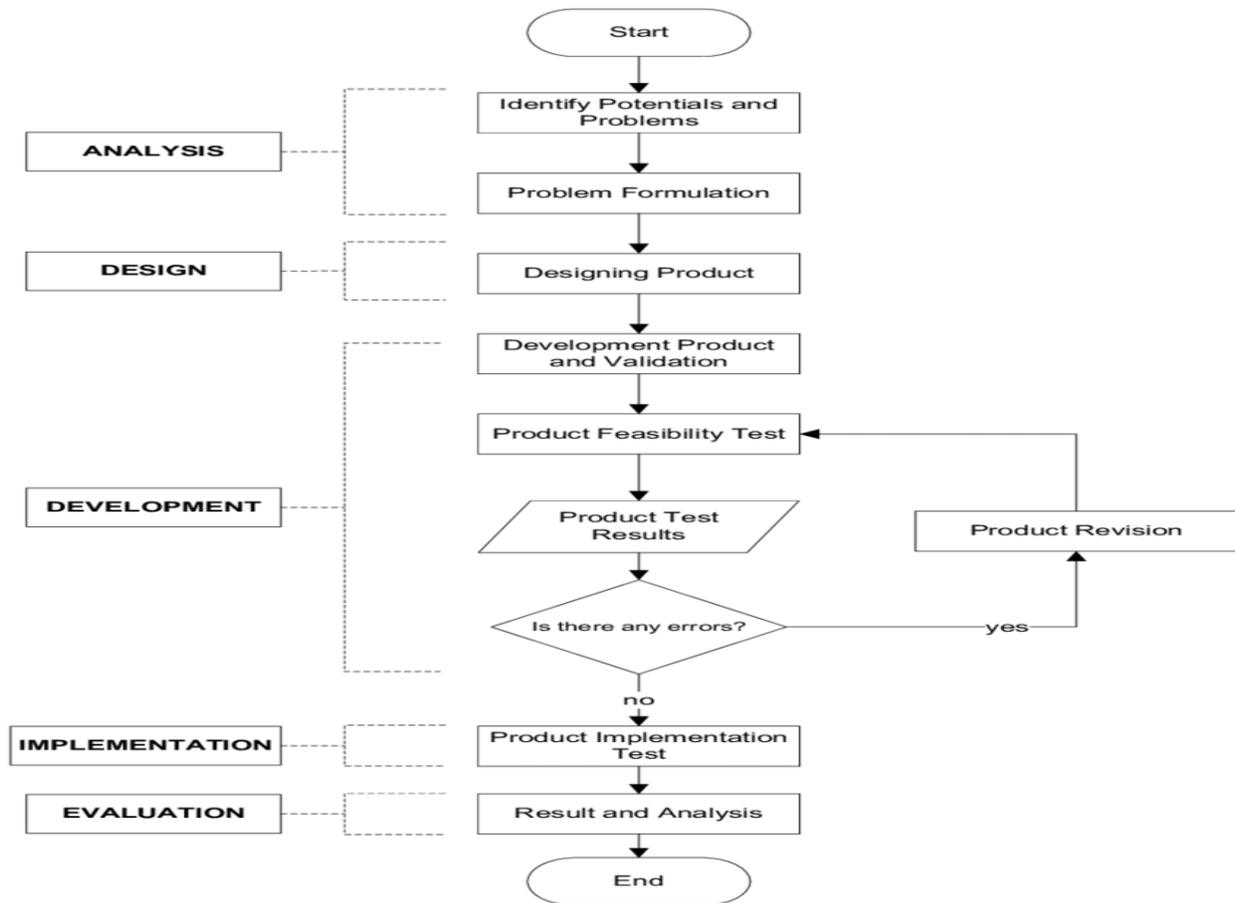


Figure 1. *ADDIE Instructional Design Model*³

- a) **Analysis:** Identify all the variables that need to be considered when designing the educational game, such as instructional problems and goals, learner characteristics and prior knowledge, resources available, delivery options and the timeline for the study, etc.
- b) **Design:** Hold what we learned from the analysis phase and use it to make practical decisions. The goal of this stage is to create the structure of the learning material. In this step, ideas are storyboarded, and a prototype of the educational material is created.

³ Aziz, A. N., Subiyanto, S., & Harlanu, M. (2018). Effects of the digital game-based learning (DGBL) on students' academic performance in Arabic learning at Sambas Purbalingga. *KARSA: Journal of Social and Islamic Culture*, 26(1), 1-22.

- c) **Development:** The development stage is where the storyboards, sketches, and detailed descriptions of various elements that were created during the design stage will come in handy. Each stage should be developed to match the design phase.
- d) **Implementation:** Implementation within the ADDIE Model includes issuing the educational material and proper training of the participants who are going to use this material. Finally, the material is shown and tested in terms of its usability.
- e) **Evaluation:** In the evaluation stage, it is vital to collect and evaluate the response provided by the participants who had played the educational material. Collecting more data is crucial to obtaining better results and improving educational material quality.

How Does the New Beginning Game Follow the ADDIE Instructional Design Model?

- a) **Analysis:** We started our analysis by defining the primary target audience, newcomer tweens aged 9–12. Then, we concentrated on the learning goals. After searching, we identified the advice we wanted to include in our game. Then, we set the physical and organizational constraints. Also, at this level, we decided that we were going to use the educational video game as an information delivery option.
- b) **Design:** We determined the number of levels and the advice given at each level. We decided which kind of video game would be suitable for presenting the educational material at this level. Next, we designed the activity that Sarah would do after each advice. At the end of this stage, we obtained a document we used during the development stage, which contained the answers to most of the questions that arose when developing the video game.
- c) **Development:** The game assets were gathered, and the game was built and modified several times to ensure that all the requirements from the design document were met. We took care to deliver the material on time and according to our schedule. We made a habit of continually testing the game as it was being developed. Friends and their children appraised the game through the eyes of the end-user, noticing errors within it. A fresh look was always valuable, and it helped to uncover issues that may not be

obvious to the developers. We used this approach to correct those errors directly and prepare the game for the next testing.

- d) **Implementation:** We installed the game on the required computers. We started by explaining the study to the participants on the implementation day. Then we divided the participants into two groups. The Game Group was given general information about the game and the direction of how to use the game's controls. Some of the children were not used to playing advanced computer games, so they needed some guidance regarding how to overcome some obstacles, so we provided such advice to make the game easier to enjoy and learn. Playing the game took around 15 minutes, with 10 mins average for most participants. Then the participants were given a questionnaire to collect the required data.
- e) **Evaluation:** In the evaluation stage, we ran the user study to compare the *New Beginning* game to the non-game method (reading a brochure).

Multimedia Learning Principles

New Beginning follows the multimedia learning principles (Mayer et al., 2008), which guided us in designing useful instructional material to engage learners in creative play. Those multimedia learning principles are mirrored in *New Beginning*. We also use the ADDIE Model as an instructional design model, which helped us design an effective educational game that facilitates learning. Multimedia Learning is a form of learning supported by different sources of information like sound, text, and graphics. Those sources are handled jointly to understand and memorize the given content. This section describes the multimedia learning principles applied to *New Beginning's* design to increase the game's instructional effectiveness. In their book, Clark and Mayer (Mayer et al., 2008) demonstrated multimedia learning principles that help design useful instructional material to engage learners in a creative play. These principles include:

- a) **Coherence:** Adding irrelevant elements to the instructional goal interferes with learning. Mayer and his colleagues theorize that these distracting details can interfere

with learning in different ways, like diverting the learner's attention from vital instructional points, disrupting the learner's organization of information, and activating irrelevant prior knowledge.

- b) Contiguity:** Contiguity refers to the effectiveness of multimedia instruction increasing when words and pictures are presented contiguously in time or space. When corresponding portions of narration and animation are presented at the same time, the learner is more likely to be able to hold mental representations of both in working memory at the same time, and thus the learner is more likely to be able to build mental connections between verbal and visual representations. If the time between hearing a sentence and seeing the corresponding portion of animation is short, the learner may still be able to build connections between words and pictures.
- c) Segmenting:** People learn better when a narrated animation is presented in learner-paced segments rather than a continuous presentation. So, the material given through multimedia learning would be better understood by the students when presented in separated parts.
- d) Pre-training:** Players can learn better when they know the names and characteristics of the main concepts. This principle proposes that learners learn more deeply when they are made aware of what they are going to see in the game (Story, Controls, Obstacles, etc.) before they start playing the game itself.
- e) Multimedia:** The use of multiple media types, such as images, text, and sound, is known as Multimedia. The student would understand the concept more effectively if the learning material is presented in a well-organized manner. Usually, the students use a textbook, which would also contain pictures and text. However, if these learning components were presented in Multimedia, such as joining sound with the text and image and improving it with attractive animation, it would create an active learning environment. This will encourage the students to be more engaged during the learning experience.

- f) Personalization:** Users learn more deeply from multimedia lessons when learners experience heightened social presence, such as when a conversational script or learning agents are used. In addition, it is an essential factor for guiding the learners throughout the instructional material.

How Does the Study Game Follow the Multimedia Learning Principles?

- a) Coherence:** In *New Beginning*, concise advice is used, followed by a direct activity done by Sarah related to that advice. Knowing that students grasp the advice better when it's written in simple and clear language, we minimized the advice text and inserted in the right activity to maintain coherence.
- b) Contiguity:** As a result of the above design decision, the advice was always given directly before Sarah's action. In this way, the player will build a mental connection between verbal and visual representation.
- c) Segmenting:** Similarly, *New Beginning* is divided into three levels. Also, the advice is not given only in one level but spread through the levels to apply the segmenting principle to this game.
- d) Pre-Training:** At the beginning of the study, the participants will watch a short introductory video clip about the game, to make them more comfortable to play it. Moreover, this prior knowledge would help them concentrate more on the advice given throughout the game.
- e) Multimedia:** *New Beginning* has combined aspects of multimedia by joining text, sound, and images. While playing the game, the student will be given behavioural advice, which will appear as text on the screen and will be narrated at the same time. This is done in a 2D RPG game.
- f) Personalization:** The advice communicated in *New Beginning* is always presented in a conversational style. Adam and the Helpers' advise Sarah when she approaches them face to face. The voice used in the narration is friendly, depending on the speaker.

Male characters are given male voices, and females a female voice. The speaker's picture will appear next to the text the speaker will be reading. The structure and presentation of the advice aims to improve the learner's feeling of social presence and game engagement.

5.2.2.3 Survey

The study's evaluation questionnaire was designed carefully based on the relevant literature, the opinions of the multicultural officer and the findings of a pilot test with some volunteer newcomer families to ensure the ease of use and clarity of the survey questions. First, participants were given a pre-study questionnaire (see Appendix M section 1). This included simple demographic questions and other rating and open questions aimed to reveal their existing experience with playing video games and their willingness to use them for learning purposes. This part of the questionnaire was given to all children who participated in the study activities. Then the participating children were divided into two groups (children chose which group they wanted to participate in).

The first group is the Game Group, which was prompted to play *New Beginning*, a video game that includes a series of activities using the computers provided by the Ottawa Chinese Community Service Centre. Moreover, once they complete this game, they will be given a post-study questionnaire as described in Appendix M, section 2, which is given to children who play the game).

The second group is the Brochure Group. They were given an information brochure (as illustrated earlier in section 5.2.2.1) that will be used as a reading activity for the children to learn about the social problem of bullying. Once they are done reading the brochure, they will be answering a post-study questionnaire as described in Appendix M. This will be given to the Brochure Group only. Finally, the parents of participants had the opportunity to complete an optional questionnaire (Appendix M, parent section) regarding their opinions about this study.

5.2.3. Procedure

The study began with the researcher introducing the study purpose and explaining to the children and their parents their rights, the study conditions, and what they were expected to do during the study. Then we gave the consent form to both the parents and their children. A spreadsheet was used to record both the children's and parents' attendance and consent.



Figure 5.7. *Researcher introducing the study purpose to the children and their parents at OCCSC.*

This study is divided into three activity groups:

1. Brochure Group

An equal number of children were randomly assigned to this or the Game Group. Children in this group read a brochure taken from Canadian schools that describes how to manage bullying in school.

2. Game Group

Children in this group played a video game created especially for newcomer children, age 9–12. It contains some daily life behavioural advice in a fun, educational way.

Each group included 15 participants. Some of the participants from the Game Group finished playing quickly, and others took more time to complete the game. After they finished playing, they were given a post-questionnaire as described in Appendix M consisting of two pages; the first page was the same as the pre-questionnaire, while the second page contained questions related to the game with a numerical scale from strongly agree (5) to strongly disagree (1). Also, the second page contained a space for any other comments that the participant would like to share with us after they played the game. The Brochure Group was also given a post-questionnaire as described in (Appendix M), but it related to the brochure, and they were also given space to write their comments regarding the brochure.

Children in both groups were asked to complete a questionnaire about their social daily life activities before participating and complete a post-survey about their brochure activity or video game experiences. At the end of the study, we gave the children in each group the opportunity to try the other group activity if they wished to experience it.

3. Parents (optional) activity: Parents were given the opportunity to fill in a short questionnaire related to their own experiences as newcomers to Canada; we sought to collect some ideas and feedback around the use of digital technology (e.g., educational games) in helping newcomer children to adjust socially.

Also, we informed them about what their children would be expected to do, their rights to withdraw, and keeping the study compensation.

Our study used a mixed approach to quantitative and qualitative methods. First, these methods were applied to evaluate the difference in children's knowledge about choosing the most appropriate behaviour in certain situations before and after using the brochure method compared to the digital game method. As such, we used quantitative statistics analysis to measure and compare participants' responses to the pre-questionnaire for each method separately through their responses to the post-questionnaire. Then we compared the differences in the number of correct answers between the brochure and the games, as explained in the results section. In addition, we used comparative qualitative

analysis to capture participants' feedback on each of the study methods individually. Further, we collected and analyzed parents' thoughts and experiences as they observed their children during the study sessions.

We identified a few topics related to social adjustment that we intended to teach in the game. These were justified by the previous fundamental survey study and our interview with Multicultural Liaison Officers who were specialized in dealing with newcomer children within selected schools in the Ottawa area. After defining the primary target audience, we focused on the learning goals and appropriate teaching activities, as illustrated in Table 5.3.

Table 5.3. Study learning objectives (needs) and their associated teaching activities

Learning Objectives (needs)	Brochure Activity	Video Game Activity
Respect the rules	Reading some text about how to deal with bullying and respecting rules.	During the game, this advice is given: "Each planet has its own rules, and we have to respect those rules even if it is different from our planet."
Maintain personal space	Reading about physical bullying.	During the game, this advice is given: "Personal space is the area immediately surrounding your body. Personal space can even be different from culture to culture."
No fighting back	Learning about different ways to deal with a bully.	During the game, this advice is given: "Do not fight back, even if someone wants to hurt you physically. Try to get away from him/her and tell an adult what is happening to you".
Best way to talk	Reading pieces of advice about dealing with: 1- Verbal bullying 2- Written bullying.	During the game, this advice is given: "Talk politely and pick your words carefully; make sure not to use expressions which may be understood differently in other cultures."

While there are several game design methods such as Merrill's five principal (Collis & Margaryan, 2005), SAM module and ADDIE models (Allen, Sites, & American Society for Training and Development., 2012), in this study, we follow the ADDIE instructional design model as it is similar to the waterfall model, which makes it straightforward and easy to learn and use. Since requirements are well understood and unlikely to change totally during system development (Sommerville et al., 2011). Furthermore, ADDIE is a basic model with an organizational style in designing educational materials and offers a solid

framework to ensure that the produced educational products are efficient and effective (Branch, 2009).

5.3. Result and Analysis

5.3.1. General Considerations

In this section, and prior to presenting and analyzing the data, we consider some general concerns related the nature of both activity groups that could have affected the collected data.

The first is regarding the amount of time necessary for each group. Both activities were planned to take about half an hour. The first 10 minutes was to introduce the study purpose, explain the social problems included in both study activities, and collect consent forms from parents and their children. The activities then took about 20 minutes. We observed that the average completion time for both groups was about 15 minutes, with several children completing at 10 minutes in the Game Group (we observed them play the game with ease, and they figured out the game idea very quickly). On the other hand, a couple of children took about 17 minutes to complete the game, and they asked for help. When the researcher helped them, they told us that they were new to video games, which explains why they took a longer time to complete it. There were similar trends in the Brochure Group, with some kids being slower readers than others. The average time to complete the brochure was 15 minutes, with a few kids completing reading within 10 minutes. Table 5.4 summarizes both study activities.

Table 5.4. A summary of study activities in both the Brochure and Game Groups.

Brochure Group experiment	Game Group experiment
<ul style="list-style-type: none"> • We have 15 participants for this group, and we timed the entire exercise to 20 minutes. • Even though for an adult reading may take up to five minutes, kids may take longer to read the brochure because they need to understand, think about, and process its contents more slowly. 	<ul style="list-style-type: none"> • We have 15 participants for this group, and we timed the entire exercise to 20 minutes. • Even though adults and some children could complete the game quickly, other children took longer due to their lack of experience with video game playing.

Brochure Group experiment	Game Group experiment
<ul style="list-style-type: none"> • The brochure provided was a typical brochure offered by Canadian school boards. • One researcher administered the activity and offered support to students in this group. 	<ul style="list-style-type: none"> • The game was a typical casual game. • One researcher provided support to students in this group. • Efficiency was not a particular concern here because we just wanted to have proof of concept.

Given these similarities, we believe that the impact of time to completion was not significant for this study to cause an unfair comparison. However, the time factor could be considered in future work particularly when evaluating the new version of the *New Beginning* game or other games. Future research may also consider various game and brochure examples for different tasks and problems, to show how games or brochures may be suitable for different tasks.

There were also some slight differences between the material in the game and the brochure. The brochure reflects the reality of how students learn about social problems, while maintaining the typical format of Canadian school board's brochures. Also, certain concepts are not specifically stated in the brochure, like "personal space," but could be understood from the overall message of the brochure, reading about physical bullying and how to handle conflict situations. The game, on the other hand, provided an interactive method of showing both the problem (bullying) and related concepts (such as respecting personal space and talking politely). The researcher briefly named the major social adjustment problems to ensure that participants of both groups have a common understanding of what they were expecting to do in the study, and evaluation was based on the information provide in the brochure. So, we don't believe the differences had a major effect on the comparison. Still, this was a limitation of the research and can be improved by further studies.

This study hypothesized that game-based learning would provide a superior learning experience for newcomer children 9 to 12 trying to adjust to their new environment. Based upon common Human-Computer Interaction (HCI) research

approaches (MacKenzie, 2012), we used a set of objective and subjective measures to verify this hypothesis, as explained in Table 5.5.

Table 5.5. *The objective and subjective measure of the proof-of-concept study.*

Objective learning metrics	Subjective measure
1. Children will have better scores after reading the brochure.	1. The game is more useful.
2. Children will have Better scores after playing the game.	2. The game is more pleasant.
3. After playing the game will be higher than the score after reading the brochure.	3. The game is easier.
4. The score increases after playing the game will be higher than the score increases after reading the brochure	

Finally, Due to the relatively small number of participants, we did not run any analysis on gender bias, and this study was a proof of concept. We did not test what they learned in real life, that we acknowledged is one limitation, but rather we were interested to see the potential of computer games in teaching newcomer children about social adjustment problems. In future studies, this shortcoming can be addressed in a specific long-term study that evaluates what the children can learn in a real-life.

5.3.2. Quantitative Objective Results

A. Brochure Experiment

Figure 5.8 summarized the participant's responses before and after reading the brochure. Q2, Q4, and Q6 show no change in the number of correct answers before and after reading the brochure. In other questions, however, there is a slight increase in the number of correct answers, such as in Q5 with 6%, Q3 with 13%, and 20% for Q1. However, the rise in the number of correct answers for the Brochure Group did not improve considerably, and only one question reached 20% of improvement.

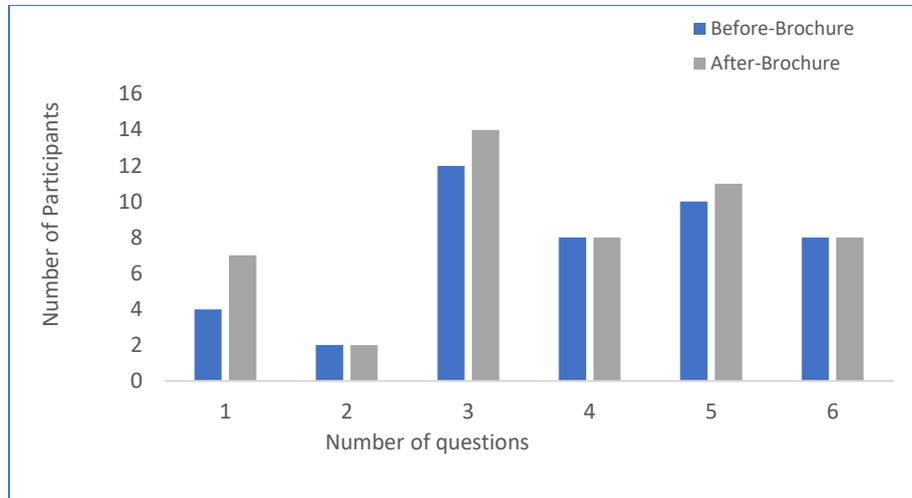


Figure 5.8. Comparison of the number of correct answers before and after reading the brochure.

To verify our hypothesis H1.1 (learning by brochure), we defined:

- H0 (null hypothesis): The brochure is not an effective way to teach the newcomer children the right behaviour.
- H1 (the alternate hypothesis): The brochure is an effective way to teach the newcomer children the right behaviour.

Using the data given in Figure 5.8. we ran the two-tailed and paired t-test method. Then, using the data of the participants answering the questionnaires correctly before and after reading the brochure, we used the one-tailed and paired t-test, as illustrated in Table 5.4. The obtained p-value for the given data is $p= 0.004$, which is around $0.4 \% < 5\%$, meaning that the probability of obtaining that difference by chance is low. This means that we have sufficient evidence to support the alternative hypothesis H1.1. So, the brochure is an effective way to teach newcomer children the proper behaviour.

Table 5.6. *t-Test: Paired two sample for means for before and after brochure*

	<i>Total Before</i>	<i>Total After</i>
Mean	2.933	3.3333
Variance	4.7809	4.3809
Observations	15	15
Pearson Correlation	0.9728	
Hypothesized Mean Difference	0	
Df	14	
t Stat	-3.0550	
P(T<=t) one-tail	0.004	
t Critical one-tail	1.7613	

B. Game Experiment

Figure 5.9 shows the number of correct answers before and after playing the *New Beginning* game. One can see that Q2 has no changes in the number of correct answers before and after playing the game. In contrast, there is a noticeable increase in Q1 with 27%, Q3 (27%), Q4 (13%), Q5 (14%), and Q6 (7%). Thus, the average increase in the correct answers for the Game Group exceeded 25% for two questions.

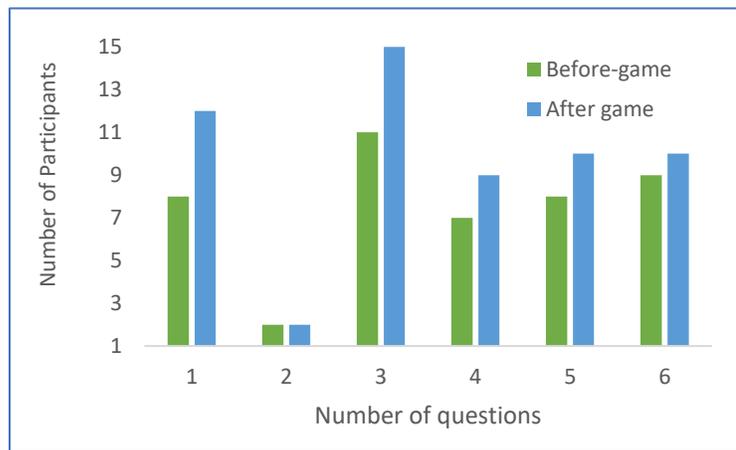


Figure 5.9. *Comparison of correct answers Before & After playing the game*

To verify our hypothesis H1.2 (learning by the game), we defined:

- H0 (null hypothesis): The game is not an effective way to teach newcomer children the right behaviour.

- H1 (the alternate hypothesis): The game is an effective way to teach newcomer children the right behaviour.

Using the data of Figure 5.9, which compares children’s correct answers before and after playing the game, we used the one-tailed and paired t-test, as illustrated in Table 5.5. The obtained p-value for the given data is $P=0.0029$, which is around $0.3\% < 5\%$. This means that the probability of obtaining that difference by chance is low. We reject the null hypothesis and accept the alternative, which means that we have sufficient evidence to support H1.2. This proves that the game is an effective way to teach newcomer children proper behaviour.

Table 5.7. *t-Test: Paired two sample means for before and after playing the game*

	<i>sum before plying the game</i>	<i>sum after playing the game</i>
Mean	3	4
Variance	6	3.2857
Observations	15	15
Pearson Correlation	0.8847	
Hypothesized Mean Difference	0	
Df	14	
t Stat	-3.2403	
P(T<=t) one-tail	0.0029	
t Critical one-tail	1.7613	

C. Game Group vs Brochure Group

We capture the difference between the correct answers of the children after reading the brochure and after playing the game, as illustrated in Figure 5.10. One can see that in Q1, 33% of the children from the Game Group answered correctly, more than from the Brochure Group. Likewise, in Q3 and Q4, the Game Group surpassed the Brochure Group, with 7% more of the number of correct answers. Also, in Q6, the number of correct responses after playing the game was 13% compared to the Brochure Group. On the other hand, the Brochure Group scored 7% more of the correct answers in Q5 than in the Game Group. Interestingly, it is worth mentioning that both groups showed no changes in the number of correct answers in Q2; this could be explained by some students giving only a

partially correct response, while only a completely correct answer was accepted. Dividing this question into two questions or re-phrase it would make it simpler for kids to comprehend. To verify our hypothesis H1.3 (learning by brochure vs game, using post data only), we defined:

- H0 (null hypothesis): The game is not more effective than the brochure.
- H1 (the alternate hypothesis): The game is more effective than the brochure.

When comparing the participants' correct answers after reading the brochure versus after playing the game, we ran the t-test as described in Table 5.10. The p-value for the given data is $P=0.179$, which is around 17.9% >5%, meaning that the probability of obtaining that difference by chance is very high. This means that the alternative hypothesis is rejected. The failure to reject H0 does not mean the null hypothesis is correct. Instead, it indicates that we do not have sufficient evidence to support H1.

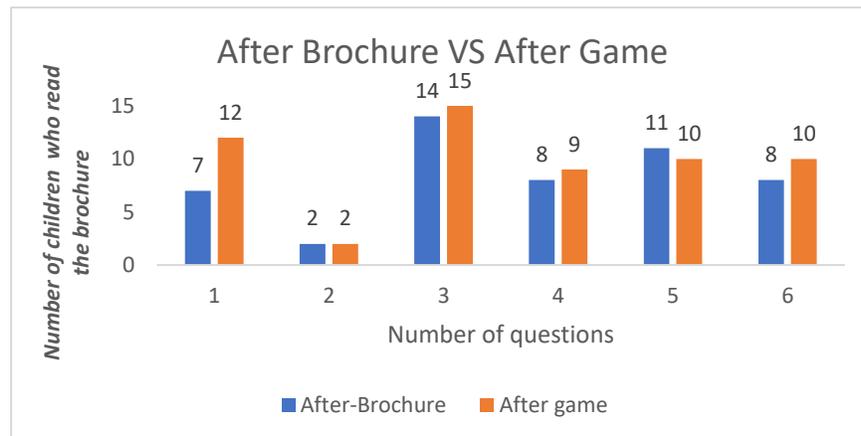


Figure 5.10.. *Difference between the correct answers after reading the brochure and after playing the game*

Table 5.8. *t*-Test unpaired two sample for means for after reading the brochure and after playing the game

	Total after	Total After
Mean	4	3.333
Variance	3.286	4.380
Observations	15	15
Hypothesized Difference	Mean	
Df	27	
t Stat	0.936	
P(T<=t) one-tail	0.179	
t Critical one-tail	1.703	

D. Difference between before and after the brochure and the difference between before and after playing game

In Figure 5.11, we calculated the difference in the correct answers between before and after playing the game in the Game Group and compared it with before and after reading the brochure in the Brochure Group.

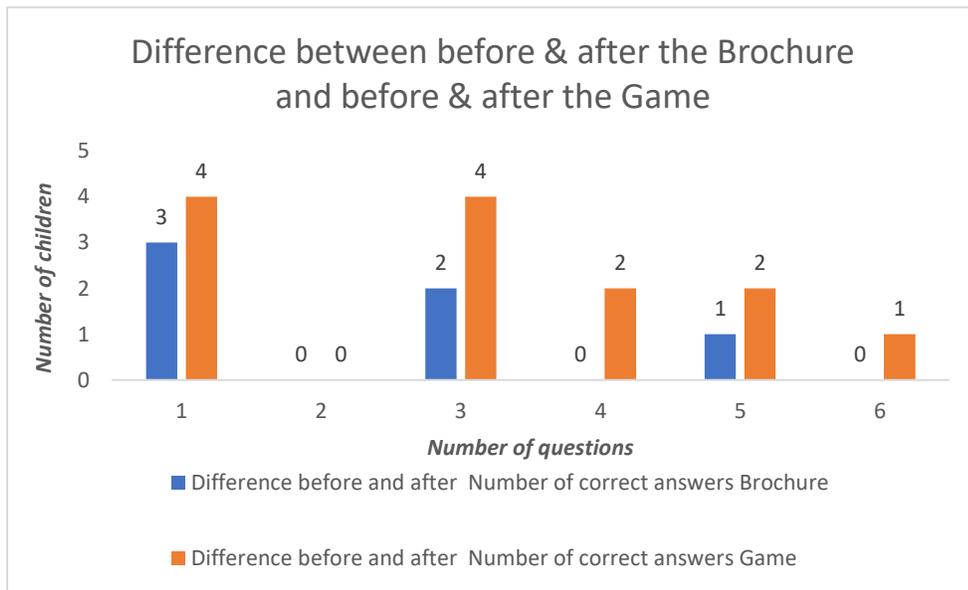


Figure 5.11. *Difference between Before and After the Brochure and The Game*

To verify our hypothesis H1.4 (learning by brochure vs game, using difference), we defined:

- H0 (null hypothesis): The game is not more effective than the brochure.
- H1 (the alternate hypothesis): The game is more effective than the brochure.

We calculated a t-test based on the difference in the correct answers between before and after playing the game in the Game Group and compared it with before and after reading the brochure in the Brochure Group, as shown in Table 5.7. The obtained p-value for the given data is $P = 0.0447$, which is around $4.4\% < 5\%$, meaning that the probability of obtaining that difference by chance is low. This means that the null hypothesis is rejected, and the alternative hypothesis is true. So, while the absolute correct answers after the game and brochure does not show a significant difference, the increase in correct answers does indicate that.

Table 5.9. *t-Test: Two- unpaired two sample for means for the difference between before and after reading the brochure compared to before and after playing the game.*

	<i>Difference</i>	<i>Difference</i>
Mean	1	0.4
Variance	1.43	0.26
Observations	15	15
Hypothesized Mean Difference	0	
Df	19	
t Stat	1.79	
P(T<=t) one-tail	0.045	
t Critical one-tail	1.729	

5.3.3. Quantitative subjective Results

We asked the children to rate their experience with the game using a Likert scale (1-5) represented by the following themes as described in Table 5.8.

Table 5.10. *Comparing children’s experience between Brochure and Game Groups*

Theme	Brochure Group	Game Group
Usefulness to learn about good behaviours	73% of the children agreed that the brochure was useful, 13% strongly agreed, 7% disagreed, and 7% neutral.	- All participants strongly agreed with 53% and 47% had agreed of the usefulness of games to learn about social behaviours. - No one disagreed.
Enjoyable to play	47% of the children agreed that the brochure was enjoyable to read, 20% strongly agreed, 13% strongly disagree, and 7% disagreed.	- 53% of children strongly agreed, 40% agreed, and 7% were neutral. - No one disagreed.
Ease of use/play	67% of the children strongly agreed that the brochure was easy to read and understand, 20% strongly agreed, 7% answered neutral, and 7% disagreed.	- 27% strongly agreed, 33% were neutral, and 20% agreed. - 20% strongly disagreed.

Comparing the subjective results

We collected feedback and insights from the children to measure the level of usefulness, enjoyment, and the ease of use for both the Brochure and Game Groups’ activities. The data we gathered is classified as nonparametric. We acquired parametric data in the prior study; therefore, we employed the t-test to check our hypothesis. The Mann-Whitney test was applied for the Likert scale, which is similar to the t-test but for nonparametric data.

The U-value of the Mann-Whitney test statistic represents the difference between the two rank sums. The lower the u-value, the less likely it was due to chance. A table of U-values demonstrates how likely it is that outcomes will be obtained by chance.

Our proposed hypotheses for the subjective Likert scale are:

- H2.1. The game will have a higher rating for usefulness.
- H2.2. The game will have a higher rating for pleasantness.
- H2.3. The game will have a higher rating for ease of use.

The Mann-Whitney test was performed to see if there was a significant difference between the two methods or if there was none. Then we looked at the average difference numbers to determine which method is more useful, enjoyable, and easier than the other.

Usefulness

In Q1, we compared the level of usefulness averages between the brochure and the game. Evidently, the game achieved 4.5, and the brochure had 3.9, as seen in Figure 5.12. This suggests that most of the children thought the game was more beneficial than the brochure. Using the Mann-Whiney calculator, we obtained a U-value of 60.5. The critical value of U at $p < .05$ is 72. Therefore, the result is significant at $p < .05$. This verifies that the H1 hypothesis is true and that the participants thought that the game is more useful than the brochure.

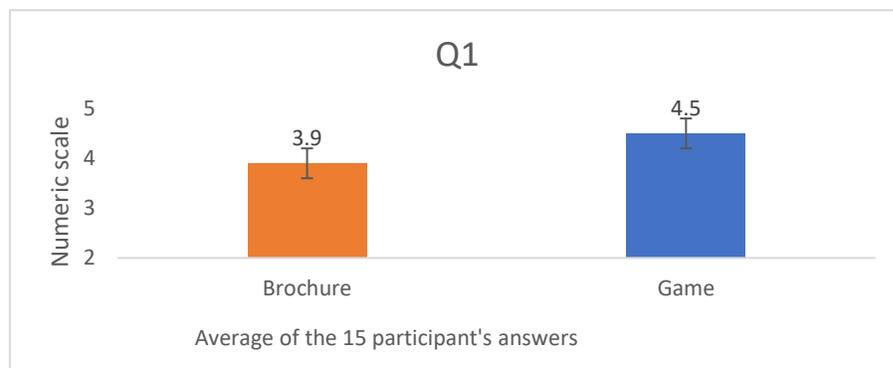


Figure 5.12. *Average of the 15 participant's answers in Q1*

Enjoyment

In Q2, we compared the enjoyment averages between the brochure and the game. We found that the children who played the game enjoyed playing it more than the children who read the brochure, as illustrated in Figure 5.13. Using the Mann-Whiney calculator, we obtained the U-value, which is 62. The critical value of U at $p < .05$ is 72. Therefore, the result is significant at $p < .05$. According to the above-average figure in Q2, we can deduce that the participants thought that the game was more enjoyable compared to the brochure.

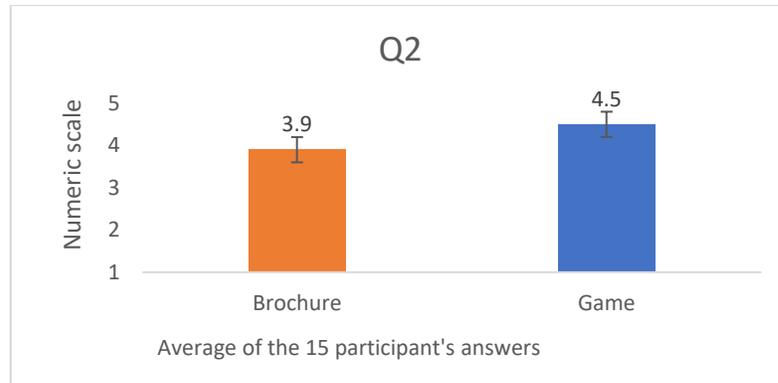


Figure 5.13. Average of the 15 participant's answers in Q2

Ease of Use

In Q3, we compared the ease-of-use averages between the brochure and the game. It is noticeable that some of the children found the game too difficult to play, and that the brochure was easier to read, as seen in Figure 5.14. Using the Mann-Whiney calculator, we obtained a U-value of 58. The critical value of U at $p < .05$ is 72. Therefore, the result is significant at $p < .05$, which verifies that the H1 hypothesis is true, and according to the above-average result for Q2, we can deduce that the participants think that the brochure is easier than the game.

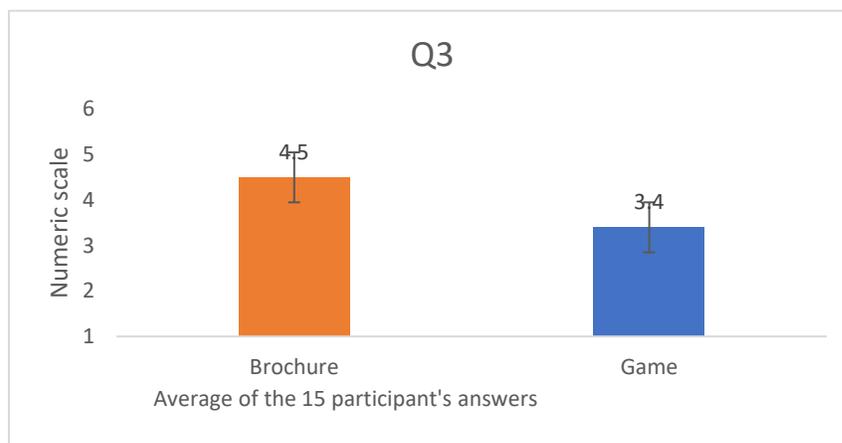


Figure 5.14. Average of the 15 participant's answers in Q3

Some of the children found the game challenging to play. Moreover, others found the brochure was easy to read. This difference can be attributed to several factors.

First, the game was developed on higher-end computers than those provided to the participants. This led to a slight lag while they were running and playing the game. Since most of the game needs a quick response from the player and because of the lag, the players were not able to reach their goals quickly, and it took them longer and more effort to complete the game.

Second, several of the newcomer children weren't accustomed to playing games on computers, leaving them frustrated by not being able to complete the requests easily even though they were glad to play the game. Generally, challenges are part of games. If the player isn't challenged during a game, the game will become boring. This game did have some challenges, and since most players found it fun, it has achieved its objectives.

Alternatively, we believe that the interactions and mechanics of such games can be improved to best suit newcomer children who may not have stable access to high performance computers by:

- Decreasing the graphic quality and resolution for the game requirement to make it compatible with average computers. This can be done by choosing 'very low' on everything in the settings menu. Turning off any extra effects is a great starting point. Then, we can edit or reduce the graphics quality even further. For example, you may be able to turn off shadows entirely or reduce the texture quality. Nevertheless, of course, this option has some sacrifice as far as performance goes.
- Installing the game on a web server or a game-streaming platform, and then the children can play it online. These platforms allow you to stream from a high-end PC in the Cloud.
- Limiting the background apps that run when you play the game.
- Finally, we need to remember that everybody's situation is different, so some of these methods may work better on a particular machine than others.

5.3.4. Qualitative Results

We collected feedback and insight from both children and their parents to measure the level of usefulness, enjoyment, and ease of use for both the Brochure and Game Groups' activities. We were not able to collect teachers' input in this stage of this study, but we plan to integrate their feedback in the coming phase of this project.

A. Children's experience in the Game Group

When measuring the level of usefulness of the game, we found that all the participating children either strongly agreed or agreed on the usefulness of the *New Beginning* game. Additionally, the following are some examples of the Game Group participants' reflections:

"It is a really good educational game that teaches children good things."

"It is a very nice educational game; I would love to see another game like this one."

We asked about the level of enjoyment of the game and most children agreed that the game was enjoyable to play. One interesting comment regarding this topic was:

"I want to see more characters in the game, and it is enjoyable."

Also, three-quarters of the children strongly agreed that the game was easy to play, while the rest disagreed. However, a considerable number of children found the game difficult, and the children mentioned this in their comments. For example:

"I think it was hard because it was hard to control."

"The game is fun, but it is a bit hard. I would love to see another game like this one."

"It was hard on some levels but fun to play."

B. Children's experience in the Brochure Group

As with the Game Group, we asked the Brochure Group participants to rate their experience with the study brochure method using a Likert scale. We asked them three

questions, as demonstrated in Figure 8. Some examples of children's comments about the brochure activity are included below.

When we asked participants to rate the level of usefulness of the brochure, we found that three-quarters of the children agreed that the brochure was useful to learn about good behaviours. However, a small portion of children disagreed with the usefulness of the brochure. Some of the comments about how helpful and valuable the leaflet is included:

“I think that the brochure was helpful, but it only contained general ideas.”

“It was a beneficial brochure. Now we know how to behave if a kid was bullying.”

Interestingly, when looking at the level of enjoyment of the brochure, we found that two-thirds of children enjoyed reading and learning from the brochure. In contrast, the rest of the children strongly disagreed about the enjoyment component. As an example of the former experience, one participant said:

“I enjoyed reading the brochure; it has good information and pictures.”

Most the children agreed that the brochure was easy to read and understand, and a small portion disagreed.

These comments differentiated the game from the brochure, as it was found to offer interactivity and enjoyment compared to more conventional methods such as reading a brochure.

C. Parents' experience

While children are the leading target group of this study, we also asked their parents—who attended as observers of their children—to express their thoughts and comments on what they noticed during the study. A few examples of their views are:

“I like the idea and be sure the results will be very helpful for the newcomer's families. A handy tool as the kids will simulate behaviours and adapt to the given characters.”

“Computer games are majors in our children's life nowadays. Therefore, I agree in deep to bring an educational game instead of the criminal games, but we want you to bring the attractive one.”

5.4. Discussion

We used a set of six behavioural questions as an objective test of knowledge to investigate the effectiveness of the games, while Likert Scale questions were used to evaluate the subjective preference of the participants. After analyzing the pre-and post-questionnaires for both the Game Group and Brochure Group, the data shows that the children’s knowledge of social adjustment in both groups has improved, with a significant increase in the numbers of correct answers and the Game Group showing the most robust results. While the brochure was easy to read, children found the digital game more useful and enjoyable compared to the brochure. As such, the study confirmed that educational games could be more effective and preferable in enhancing newcomer children's understanding of social interaction and behaviour in situations of conflict, compared to other conventional mediums such as educational brochures. Even though children were the primary target group of this study, the participants’ parents were also allowed to express their opinions. They were positive toward using the digital game in the context of our study because of its ability to keep children engaged and connected, and perceived it is a safe place to simulate behaviours and adapt to the given situation, which may not be available otherwise.

5.4.1. Notes on Questions

As shown in Table 5.9, we noticed that in Q1, there were 7% more correct answers in the Game Group compared to the Brochure Group. For the former, the advice was given in a text form and presented visually using audio to show the behaviour advice in a multimedia mode of presentation. For Q2, there were no changes after use of either method. In Q3, the advice given teaches the participant to talk politely and directly when facing a person and respectfully ask them questions. Even though the same information was stated in the brochure, in the game participants saw Sarah consider this advice and then they directly applied it in the game. This application of knowledge reflects the Coherence

principle described in the literature (Mayer, 2005). In Q4, there was no difference in knowledge between before and after reading the brochure. In the game, the advice was shown as text and visually through the character of the armed man. In this manner, the game player can build a mental link between the verbal and visual representation of the advice and improve their learning process.

In Q5, 8% more students answer correctly from the Game Group. After being advised at the beginning of the game, the players had to follow the rules of the new planet to keep Sarah alive when facing different obstacles throughout the whole game. This demonstrates to the player that each place they live in has rules that they should follow. Q6 refers to the advice about personal space. In the game, after being given the advice about this topic, Sarah faces two situations related to this concept. As such, the players understood that getting into another individual's personal space results in harmful consequences. The 7% difference in the correct answers is a result of this understanding derived from using the game compared to zero changes for the Brochure Group.

Table 5.11. *A summary of the percentage of the correct answers after reading the brochure and playing the game.*

Question number	Brochure Group correct answers percentage %	Game Group correct answers percentage %
1	20	27
2	00	00
3	13	27
4	00	13
5	06	14
6	00	07

When we compare the level of usefulness averages between the brochure and the game, it is apparent that the Game Group scored 4.5 out of 5 while the Brochure Group scored 3.9 out of 5. This means that most children felt that the game was more useful than the brochure. Comparing the average level of enjoyment between the brochure and the game yields the result that the children who played the game enjoyed it more than the children who read the brochure enjoyed their activity. Brochure Group participants felt a little bored while reading, even though it contained some visual content. On the contrary,

participants in the Game Group enjoyed playing the game, which aligns with other research (Brox et al., 2012; H.-P. Chen et al., 2010; Lobel et al., 2017; Marsh & Dieckmann, 2017; Moser, 2013, 2013; Vasalou et al., 2017; Walsh et al., 2010) that contends that children today are digital natives and experience great enjoyment when playing video games. Of course, for the purposes of our study, this RPG game was made to be enjoyable and educational simultaneously.

The children expressed great interest in playing games and use it as a medium to learn more about social adjustment. Most children in both groups were very interested to try the study game, so we give the children in brochure group the option to try the game as well but after they completed the experiment. The majority of children were talking about the benefits of playing video games such as helping them with their math and problems solving skills, collaborations with other players. Based on our research, educational video games promoted understanding of social interaction behaviour in newcomer children in comparison to other conventional mediums. This finding is in line with previous studies that have confirmed the benefits and value of using games-based learning in teaching and solving social and cultural issues.

These results align with previous literature which showed that video games are known to help players' brain development (Cheng et al., 2017). The player may need to search, negotiate, plan, and try different approaches in order to move forward in some games. The majority of recent games involve planning, problem solving, creative self-expression, a deep understanding of game rules and structure, and new ways to highlight personalities and interests. Kilgore (2012) argues that children must take responsibility for their learning within the artificial world of the video game. While teachers and parents can guide and help from the real world, in the game, the student has full control over his or her actions. The children are growing up in a technological world. They play video games frequently, and they enjoy it (Kalemis, 2011). Players are required to make decisions while playing several games, which helps build a student's personality (Kilgore, 2012). Various studies have suggested that educational games can be a useful tool in the classroom

(Kalemis, 2011; Cheng et al., 2017; Amaia et al., 2016; Li et al., 2016). A large number of successful educational games were tailored to achieve a specific educational goal.

On the other hand, when we compare the ease of use of both groups, the Brochure Group performed better than the Game Group, meaning that some of the children found the game relatively difficult to play. Considering the familiarity of written material and differences in computer platforms, this was explainable. Some hardware problems and suggestions were discussed in Section 5.3.3.

5.4.2. Limitations

We conducted this study as a first step toward examining the role of Computer games in social adjustment among newcomer children due to limited resources and a few decisions we made that affected the size and direction of the study. Because it was an initial study and we had limited resources, we made a few decisions that affected its size and design. We chose this game theme because it is suitable for the tween age group, which we are targeting. Upon review, the liaison officers approved the work we had done, and the combination of the game environment and the advice.

One of the subjective evaluations indicating that the game was perceived as hard was an unexpected one. As explained earlier in this chapter, it was due to technical difficulties that occurred at the beginning of the study when children tried to run the game. This led to questions about the types of interactions and mechanics that are best suited to newcomer children who may not have stable access to high performance computers.

Also, it was challenging to recruit students directly from standard schools, as it is a complex and lengthy process to obtain ethics approval from the Ottawa District School Board. Of course, the impact of the COVID-19 pandemic complicated the process further. Therefore, we worked with students from Ottawa Chinese Community Center (which helps immigrant families from different backgrounds and, particularly, families from Arabic-speaking backgrounds) together with participants from Alnour school. For future work, we recommend scaling up the focus of the research to include other ethnic groups. To achieve this, it would be helpful to consider recruiting newcomer children from across the standard

schools, pending ethics approval from the Ottawa District School Board. This study could be improved by exploring the impact of creating a multiplayer social game similar to this one that allows players from different cultures to join together. Also, there is a need to perform a study comparing the results from three different groups: Group A played a video game, Group B read a brochure, and Group C watched a video or attended a lecture about social adjustment in children's home school.

5.5. Summary of Findings

This study aimed to scrutinize the effectiveness of educational computer games as a tool to help newcomer children adjust socially. We developed an educational game named *New Beginning* to assist newcomer tweens aged 9–12 to learn about various social behaviour issues. Our study revealed that educational computer video games are efficient and desirable tools in enhancing newcomer children's understanding of social interaction behaviour compared to other conventional mediums ($p \leq 0.05$). The results align with previous studies that confirm the values and benefits of using GBL in teaching and solving various social and cultural issues. Also, to the best of our knowledge, our research is the first study to use GBL formally in the context of newcomer children's social adjustment.

This research is just the beginning in terms of using digital games in this context. In chapter 7, we seek to integrate this study's collected feedback to improve the game's design for the context of newcomer children's social adjustment. Also, we intend to implement a co-design workshop to engage newcomer children in the design process. This will allow us to gain insights for use in developing a specific game guideline that considers various social and cultural perspectives for forthcoming game development and research in the context of newcomer children's social adjustment. We acknowledge two key shortcomings of the current study and have identified two important next steps for future research: 1) Conduct a longitudinal study with newcomer children's groups to better understand their growing needs as they progress during their transitional period of migration; and 2) Integrate teachers' feedback and opinions toward using a digital game in this context to further inform the effectiveness of this approach.

CHAPTER 6: Research Phase Three – Co-Designing Educational Social Adjustment Games With And For Newcomer Children

6.1. Overview

Co-design is increasingly used in designing and developing educational games for children with complex needs. This participatory design process allows children to have a role in the design of educational games to make those games more effective in their learning purposes. While Game-Based Learning (GBL) is commonly considered as the process of “learning through playing games,” it is shown that game design and development events can have a significant educational outcome (Arya et al., 2013). This can be referred to as “learning by designing/making games” which is another aspect of GBL. Involving some users in the design process can have two aspects: (1) for other users, the educational games will be designed to be more effective when played (learning by playing), (2) for participating users, the design process itself can be educational (learning by designing games).

The role of newcomer children in designing solutions to social adjustment problems and how these solutions match their culture and identities have not been adequately investigated. Similarly, there is limited knowledge on how participating in co-design activities affect the participating children themselves. Based on these gaps, we constructed the following research questions:

- *Q4. What do the participating children feel/think, i.e., can the workshops be engaging?*
- *Q5. What do children learn through the workshop, i.e., can the workshops be educational?*
- *Q6. What game features and cultural aspects do the participating children use in the game design?*
- *Q7. What can we learn about the process of running co-design workshops through some examples with newcomer children?*

To answer these research questions, we conducted a co-design approach to work with and for newcomer children aged 9–12 years to co-design inclusive, engaging, and intuitive educational computer games to solve selected pressing social adjustment problems. The study employed a qualitative approach (co-design workshops and interviews) and additional subjective quantitative surveys. Data was collected from verbatim transcripts of co-design workshop discussions (n = 6); Individuals Interviews (n= 15) and two self-report surveys (n = 26). This study is built on the premise that engaging newcomer children in the design process will greatly benefit the quality and effectiveness of our educational, social adjustment GBL solution in using GBL in helping newcomer children to solve selected pressing social adjustment problems. Also, having children participate in designing technology or solutions that relate to their daily life activities will greatly impact the success and adaptation of such solutions to assist a wide spectrum of newcomer children make the necessary social adaptation as they adjust to a new way of living.

Our study co-design workshop structure is aligned with previous related research practices with children from the same age group. Therefore, we developed our workshop based on the best practices of previous related studies such as Bratteteig, 2013; Guha et al., 2004; Schepers et al., 2018; Schneider et al., 2020; Stålberg et al., 2016; and Yip et al., 2013. Our study workshops centred around brainstorming game ideas to solve selected social adjustment problems that we identified from our fundamental survey study, as explained in the introduction (full workshop descriptions are provided in Appendix. I).

The development of new games based on the outcomes of the workshops was out of the scope for this research due to logistical reasons. As such, our investigation focus was on the emotional and learning outcomes of the workshop itself for the participating children (Q4 and Q5) and also what we as researcher/designer can learn from the workshops in terms of how to design educational games for the target group (Q6 and Q7). Our reflection included a re-design to demonstrate the use of what we learned, to be evaluated in future research (discussed in Chapter 7).

6.2. Study Design

This study used multiple methods to incorporate qualitatively (dominant) and quantitative processes and collect subjective data through pre-and post-questionnaires, in which we asked participants to rate their pre- and post-workshop experiences. Our study approach was designed based on well-established previous related work. We followed a similar sampling approach to the previous activities but with only four to five children at a time. The group number in our study was inspired by Fisher, Yefimova and Yafi (2016). Several examples have used a similar research approach to conduct their studies, with fewer children from similar age groups. For instance, in a study titled ‘Examining Adult-Child Interactions in Participatory Design’, Yip et al. (2017) conducted a co-design-based case study with seven to ten children and four to six adults. In the same vein, another study (Roumelioti et al., 2020) was conducted based on the engagement with four children aged 11–13, one female and three males, who voluntarily participated in the workshops, as design pros. Also, Wöbbekind, Mandl and Womser-hacker (2020) developed a UX evaluation questionnaire by conducting a co-design session with six children aged 7–11. As a result, we can conclude that our in-depth qualitative methodology of interviewing 15 children is appropriate and is validated by previous research that takes a similar approach.

Our study comprised six weekly workshops, with each session lasting about 60 minutes. Each session had specific goals and outcomes, as detailed in the results section. The content of the individual sessions varied in terms of goals, however, as they evolved as we proceeded through the workshop sessions. The study workshops primarily shared a typical structure (see Appendix I). Further details of the workshop goals and progress are outlined in Table 6.6.

A couple of co-designers reviewed the co-design workshop materials to identify and eliminate any early issues and ensure that our workshop’s design aligned with existing co-design practices for the same age group. Next, we piloted the workshop with a small group of four newcomer children, to verify that the children could understand the workshop materials and the language was age appropriate. Also, we confirmed that the allocated time was adequate to accomplish the purpose of the study, especially in the virtual model.

6.2.1. Participants

Twenty-six children (15 male and 11 female) participated in our study by attending one of six workshops held in June–July 2021, as described in the next section. The participating children were newcomer tweens (aged 9–12) who arrived in Canada from Arabic-speaking countries within the last two years. We recruited participants through professional connections with Ottawa Chinese Community Services Centre (OCCSC) and word-of-mouth with newly arrived migrant families from Arabic-speaking backgrounds. They provided a list of names to the study’s primary investigator who contacted them to ensure the children listed matched the study criteria and that they were available to participate. Then we sent letters to families interested in allowing their children participate in the study. The parents then emailed or called the primary study investigator to discuss the study requirement and scheduled activities. The consent form was completed online along with the pre-study Questionnaire. Parents were required to be present to answer the questions in the consent form, which also included separate questions by which children could give consent regarding their participation. Once both parents and their children agreed to participate, children could start answering the pre-study Questionnaire. We ensured that all parents and their participants’ children’s consent were submitted before the commencement of the workshops. Furthermore, at the start of each workshop and interview session, the facilitator (the study’s primary researcher) established verbal assent from children by reading a statement about the project and asking them to raise their hands or type “yes” in the text chat if they agreed to take part. The study consent forms are available in appendix J.

Carleton University’s Research Ethics Board approved this research project, Phase III: Co-designing Educational Games with and for Newcomer Children # 115644.

6.2.2. Material

In this study, we employed various techniques and tools (see Table 6.1) derived from the related work presented in the literature review section. We have amalgamated the different dimensions of the tools we considered the most relevant to designing with and for

newcomer children. We focused on explaining these dimensions in terms of their aims, required skills, and advantages and disadvantages.

Table 6.1. *Co-design Technique and tools employed in the study*

Technique/ Tools	Description – Aim	Suggested design phase	Required skills	Benefits	Drawbacks
Contextual inquiry	Getting to know children’s perception of the context	Exploration	Linguistic, interpersonal	Experience of the context of use from children’s perspective	Needs detailed explanation from children for interpretation
work in groups/ workshop	Gathering children’s collective opinions or ideas on a specific topic	Exploration, Evaluation, Generation	Linguistic, interpersonal, social	Allows detailed exploration of topic and different perspectives in a single session; Comfortable for children	Influenced by group dynamics and leader effect
Scenarios	Stories describing use cases using storytelling	Generation, Evaluation	Logic linguistic partial/visual(drawn)	Structured and contextualized information	Depends on children’s narrative and comprehension skills
Brainstorming	Thought shower of ideas with more or less constraints	Generation	Linguistic, interpersonal	A rapid way to generate numerous ideas	Needs contextualization
Drawing	Visualization of ideas and context	Generation, Evaluation	Spatial/visual	Children know it well; Easy to communicate ideas; Maintains a sense of fantasy, imagination and abstraction.	Requires detailed clarification from children to avoid misinterpretation
Presentation	Children present their idea, with or without props	Exploration, Evaluation	Linguistic, interpersonal	Provide relevant information about children’s explanations of their ideas	Perhaps influenced by social circumstances and children’s language abilities

Technique/ Tools	Description – Aim	Suggested design phase	Required skills	Benefits	Drawbacks
Interviews	Obtaining individual opinions/ideas from children	Exploration, Evaluation	Linguistic, interpersonal	Explore details; No need for children’s literacy skills	Time-consuming; Requires interviewer skills to eliminate biased answers
Questionnaires	Obtaining specific and quantifiable data	Exploration, Evaluation	Linguistic	Offer a large amount of data in a short time; Measurable	Children may misunderstand questions; Depends on literacy skills

6.2.3. Procedure

The study workshops were conducted online with 26 newcomer children aged 9–12 through June–July 2021. As explained in Table 6.2 and Appendix I, these workshops consisted of several co-design activities, which influence the study co-design workshop structure and process.

We started each workshop by reviewing the outcomes of the previous workshop and allowing the children to choose to build on the previous group work and expand it or choose from their ideas. This prompted participants to engage and expand on other children’s ideas and demonstrated how they added to the design of other groups. Also, we feel this allowed me, as the facilitator, to check in with participants to ensure I understood their ideas and create a good flow for the workshop design progress.

We also captured the activities and artifacts in each session and afterward wrote analytical memos for each session, as illustrated in the results section. Also, children could expand the discussion one-on-one through the post-study interview.

Considering the complex and somewhat unpredictable nature of the design process as enacted by children, we used an iterative participatory action research method (Jangmin, 2016; Kindon, Pain, & Kesby, 2007). This allowed us to learn from each workshop and improve the next one as we move forward. So, at the beginning of each session, we presented what we learnt from the previous session and allowed the children to decide to build on previous group ideas and expand them further, or devise new ideas to work on.

Table 6.2. Study Workshop Agenda

Activities/ Goals	Description	Participants	Time
Pre-session	Children answer a short pre-questionnaire to collect demographics and capture the existing general knowledge about the co-design activity.	The pre-session package will be sent to the children’s parents’ email a few days before the actual workshop.	
Warm-up	<ul style="list-style-type: none"> ○ Welcoming the participants’ children ○ Obtaining children’s verbal consent ○ Explaining what they expect to see and do during the session 	<ul style="list-style-type: none"> • Children • Parents (optional) • Facilitator (will be game designer) • Observer 	10 mins
Exploration: Brainstorming ideas and sharing their stories	<ul style="list-style-type: none"> ○ Children will engage in a group brainstorm session via Online Google Meet. In addition, children use <i>Google Jamboard</i> to share their ideas and stories collaboratively with other children in the session. ○ Children were given scenarios related to social adjustment common problems (e.g., how to maintain self-identity, sense of belonging) ○ Children were encouraged to discuss game ideas that may help to solve such problems. ○ In groups of five, the children had a few minutes to think up ideas for a given theme (e.g., the ideal game goals, stories, characters) before moving to the next. ○ The facilitator may derive game topics from the selected ideas to be developed further. 	<ul style="list-style-type: none"> • Children • Parents (optional) • Facilitator (will be game designer) • Observer 	20 mins
Generation: Design and expand ideas	<ul style="list-style-type: none"> ○ Using Jamboard, children construct ideas, comment and share their thoughts. During this time, the facilitator assists the children, asks questions about their design decisions and makes suggestions. The researchers also takes notes in small notebooks regarding group dynamics, individual children’s likes and dislikes, and how children are co-designing. 	<ul style="list-style-type: none"> • Children • Parents (optional) • Facilitator (will be game designer) • Observer 	20 mins
Discussion and presentation	<ul style="list-style-type: none"> ○ Children presented their design ideas. During the presentations, the facilitator writes on the shared screens children’s ideas, suggested game features, likes, dislikes, etc. ○ Children were given the opportunity to ask any questions or add any comments they may have. The facilitator can provide clarity or ask small follow-up questions. 	<ul style="list-style-type: none"> • Children • Facilitator (will be game designer) • Observer 	10 mins

The co-design workshop discussion focuses on two of the most pressing social adjustment problems that we identified from the children survey study in phase 1, which are:

- **Lack of sense of belonging and feeling like they don't fit in with their new way of living:** Our survey study revealed that 74% of newcomer children are unsure or do not feel they fit. Also, 80% are not sure people want to hear about their culture. Meanwhile, 64% of newcomer participants were either on the borderline or did not feel that they belong here.
- **Lack of cooperation skills with children from other cultures:** We found that newcomer children are concerned about other children's interest in learning about their culture, with 84% not sure other children want to hear about their culture. Also, 73% of participants were uncomfortable or borderline about sharing their feelings and thoughts freely with other children. Consequently, 89% were more comfortable working with people from their own culture. We discussed potential game design ideas for the selected social setting using the prompting scenarios.

6.2.4. Data Collections

In this co-design study, we collected a range of data to support and validate our findings. Data included: audio recordings of interviews; children written notes and drawing from workshop activities; the observer's and facilitator's written notes; and some parents' feedback. In addition, we collected data through pre-workshop and post-workshop questionnaires (See Appendices I-L). With the permission of parents and children, the participants' interviews were audio-recorded. We used recording software on tablet devices; these recordings were transcribed in written notes, and then we destroyed them permanently. Process data were collected via an audio recording of co-design workshop discussions (n = 6), and researcher and observer written notes. Also, co-designer newcomer children completed an anonymous, individual written post-workshop survey at the end of each co-design workshop, adapted from an existing participation measurement tool.

The study facilitator (researcher) and observer paid close attention to the data collection and took notes during the session. In addition, the facilitator and observer

organized and discussed the collected data immediately after each session to ensure they did not forget anything and exchange thoughts about what they had learned during the sessions. The observations included capturing participants' comments, approach to co-design, engagement and interest cues, questions, ways of thinking and collaboration, and any other elements that arose during the workshop sessions. Also, we observed how the children shared stories and their perceptions towards designing social adjustment games using sketching and storyboards on which participants drew ideas using simple images to communicate a story, concept, idea or feature of a game.

After the final co-design workshop, semi-structured individual interviews were conducted by the facilitator and observer with a group of children ($n = 15$). The interviews were completed online via Google Meet and were audio-recorded and transcribed verbatim. Questions were designed to collect data on the co-designers' experiences of the process and outcomes (see a complete list of the interview questions in appendix L). For example, we asked questions related to the outcome of the co-design session, what they learned, the game ideas they discussed, game mechanics, characters and storylines, the best aspects of the session and other areas of improvement. Also, we asked the children and parents to rate the importance of a given social adjustment problem based on its importance to be solved and if they had other problems or wanted to expand the discussion of any of the given problems.

6.2.5. Data Analysis Approach

In the following sections, we describe the data analysis approach used in this study. We specifically discuss qualitative content analysis, process, units of analysis, and inductive and interpretive research methods.

From a methodological standpoint, this study examined the role of co-design social adjustment educational games in the context of newcomer children aged 9-12 from Arabic-speaking backgrounds, focusing on understanding the process of learning by playing games or making games. As such we adopted a content analysis approach.

Qualitative Content Analysis: A content analysis of texts suggests that they are rich data sources that can reveal valuable information about specific phenomena. The content analysis aims to increase our understanding and provide new knowledge about the phenomenon (Gulanowski, 2018; Kleinheksel, Rockich-Winston, Tawfik, & Wyatt, 2020; Kondracki, Wellman, & Amundson, 2002). Content analysis was carried out on the co-design workshops data to explore the children’s approach to and process of designing social adjustment games. This analysis sought to identify pertinent themes that emerged from children’s understanding of social adjustment and their social interaction while making games that addressed specific social adjustment issues. In addition, we aimed to identify how they created and shared their social adjustment stories as part of the workshop activities.

Content Analysis Process Description

The qualitative content analysis process is divided into three stages: “selecting the unit of analysis, creating categories and establishing themes” (Cho & Lee, 2014, p. 10). The creation of categories is a method of reducing large volumes of content into smaller groups (Cho & Lee, 2014; Gulanowski, 2018). A data set with similar meanings and associations are grouped into mutually exhaustive and exclusive categories, and no data set should be assigned to more than one category or between categories (Cho and Lee, 2014; Weber, 1990). The process of qualitative content analysis is summarized in Figure 1.

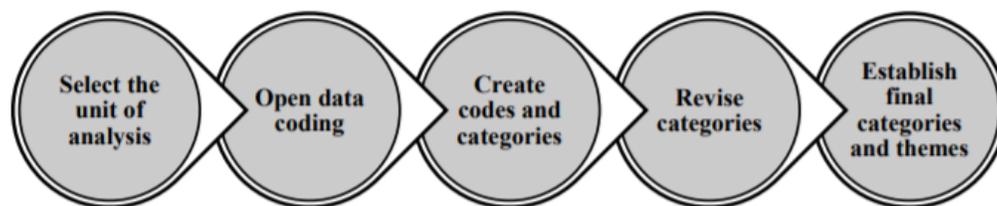


Figure 6.1 *Summary of the qualitative content analysis process* adapted from (Cho & Lee, 2014; Gulanowski, 2018)

Deductive And Inductive Mixed Approach:

The key difference between a deductive and inductive qualitative content analysis is how initial codes and categories are developed (Cho & Lee, 2014; Gulanowski, 2018). In the deductive approach, initial codes, categories and themes are developed from extant relevant theory or research, whereas in an inductive approach, initial codes and categories are developed directly from the data (Cho & Lee, 2014; Gulanowski, 2018).

Given the limited extant research concerning co-design with and for newcomer children, this study is exploratory and follows a mixed deductive and inductive approach. There are ideas from the literature that we expected to emerge from the data and we aimed to add new ones inductively as we processed our data. In other words, this study analyzed the data following the principles of a mixed approach to qualitative content analysis, allowing initial analysis and findings to inform and focus subsequent iterations of data analysis.

Units of Analysis Categories and Themes

As this study examines multiple research questions, it is best to examine them at various levels of analysis to gain a deeper understanding of them. According to conventional qualitative content analysis, codes and categories are derived directly from data and relevant research, then they are revised, grouped or divided, and new categories are added as the study proceeds. After multiple examinations of the data and revisions of coding and categories, the final categories and themes emerge, and the data itself informs the final findings, interpretations and understanding of the phenomena (Cho and Lee, 2014; Miles and Huberman, 1994; Miles et al., 2014).

Data analysis aims to make sense of and derive the meaning of rich collected data by following a rigorous and logical analysis (Miles, 1994; Saldaña, 2016). A thematic analysis organizes the interview, survey and usability data by core themes or ideas (Boyatzis, 1998). Several HCI studies have successfully used a thematic analysis to analyze recordings and interviews (Pykhtina et al., 2012; Bani-Taha, 2015). We analyzed three different data units: workshop and interview notes and observations; transcripts of voice

recordings of the workshops and interviews; and the self-reported surveys. The analysis was developed in response to the research questions. Our study analysis approach is inspired by previous research examples that conducted a qualitative analysis of co-design with children (Martens, Rinnert, & Andersen, 2018; Thabrew, Fleming, Hetrick, & Merry, 2018; Vaajakallio, Lee, & Mattelmäki, 2009).

Study Data Analysis

A. Qualitative Data Analysis

1. Co-Design Workshop Notes And Observation Notes

We ran a qualitative content analysis to analyze the collected data. To address the research questions, the outputs of the co-design workshops were analyzed using qualitative content analysis, as seen in Table 6.3.

Table 6.3. *Outputs of the co-design study and related research questions*

Output	Sub-Research Question
Written notes from researcher and observer	R4, R5, R6 & R7
Complete individual (child) and group ideas	
Transcript of the co-design workshops (1-6)	
Researcher and observer notes	
Any drawings/ artifacts generated during the workshops	

2. Post-workshop interview

We ran a qualitative content analysis to analyze the collected data of the most relevant questions, as outlined in Table 6.4.

Table 6.4. *Post-workshop interview questions directly related to the research questions*

Post-workshop Interview questions	Type	Related Research Questions
1. Can you tell me what happened during the workshop session?	Text	R4 & R5
2. What was the idea of the game that you talked about with your group? 3. What do you think the game players can learn from the game? 4. Who are the main characters in your group's game? What do they do in the game? 5. What game features would you like to include in your group's game? Why are these features important? 6. What game features do you think are not good to have in your group's game? Why not?	Text	R4, R6 & R7
7. Can you put the following social problems in order based on their importance to be solved through an educational computer game (similar to what we have discussed in the workshop)? 1-most important 2-important 3- neither important nor less important 4- not important 5-not important at all <input type="checkbox"/> Feeling Loss <input type="checkbox"/> Feeling out of place <input type="checkbox"/> Bullying <input type="checkbox"/> Peers' perspective and interest in learning newcomer kids' culture <input type="checkbox"/> Lack of Cooperation skills <input type="checkbox"/> Insecurity about appropriate behaviour <input type="checkbox"/> Personal space	Numeric rating	R5
8. Closing questions - What PART of the workshop did you like the BEST? Why? - What PART of the workshop did you not like? Why? - Do you have any other comments or suggestions about the workshop?	Text	R4 & R6

B. Quantitative data include Post-workshop Questionnaire

The post-workshop questionnaire included four main questions (some with multiple parts). Table 6.5 shows the questions most relevant to our research questions. The full list of survey questions can be found in Appendix. These quantitative data were analyzed statistically to determine what we can learn and draw from this data.

Table 6.5. *Questionnaire questions directly related to the research questions*

Questionnaire Question	Type	Related research questions
<p>1. <i>Rate the following:</i></p> <p>A. The overall quality and experience of the workshop</p> <ul style="list-style-type: none"> - Designing games was easy. - The workshop was fun. - The workshop was well organized. 	Numeric	R4
<p>B. Learning opportunities</p> <ul style="list-style-type: none"> - Making games is good for learning. - I learned something new. - The workshop motivated me to learn more. 	Numeric	R5
<p>C. Collaboration with other kids</p> <ul style="list-style-type: none"> - It was easy to work with other kids. - It was helpful to work with other kids. 		R7
<p>2. <i>Rate the following statement related to game features used/ discussed in the workshops.</i></p> <p>A. General features</p> <ul style="list-style-type: none"> - Getting rewards points. - A game having several levels. - Including training levels to support the player when they most need it. - Being able to choose a player partner. - Include obstacles (e.g., traps, puzzles, etc.). <p>B. Specific features</p> <ul style="list-style-type: none"> - Characters representing different cultures. - Giving players educational pieces of advice by voice and text. - Allowing the player to walk through a scenario and decide what to do and how to do it. - Ability to share your stories. - Ability to add friends to join the game. - Not losing points if players make mistakes for the first time. Instead, they should be able to try again. 	Numeric	R6
<p>3. <i>Open questions</i></p> <ul style="list-style-type: none"> - Are there any other game features you would like to see in the social game? If yes, please give examples? - Are there any other game features you do not like to see in the social behaviour game? If yes, please write them here? - Do you have any other comments or suggestions? 	Text	R6 & R7

6.3. Results

This section is divided into five sub-sections, one for the pre-workshop questionnaire and one for each of the following four research questions:

- **Q4.** What do the participating children feel/think, i.e., can the workshops be engaging?
- **Q5.** What do children learn through the workshop, i.e., can the workshops be educational?
- **Q6.** What game features and cultural aspects do the participating children use in the game design?
- **Q7.** What can we learn about the process of running co-design workshops through some examples with newcomer children?

6.3.1. Pre-Questionnaire Results: Participants' Previous Experience Before Joining the Co-Design Workshops

We ran a pre-questionnaire prior to the workshop with the participants' children to learn about their pre-existing experiences regarding several topics, as explained in Figure 6.2. We were interested to learn children's responses prior to the workshop for a few reasons: 1) to ensure that all participants' children and their parents were given their consent; 2) to ensure that they meet the study criteria; and 3) to understand the children's familiarity and experience of playing or making computer games, their perspective on learning through educational games, and if they had any experience of co-design computer games.

We asked the participants if they had ever made a computer game, and we found that 65% answered no, and the remaining 35% answered yes. Children explained that they had been introduced or made some simple games either in school with other children, especially during online virtual learning when teachers tried to encourage them to be creative and make some simple educational games using Scratch and Google Slides. Other children mentioned that they had built simple games using Roblox platforms. Also, most

children showed their willingness to use/play computer games designed to solve social problems such as bullying. Furthermore, 35% strongly agreed and 65% agreed that children should be involved in making educational computer games. These initial results indicate the great potential of engaging newcomer children in making educational games in general and their willingness to use social adjustment games if given the opportunity.

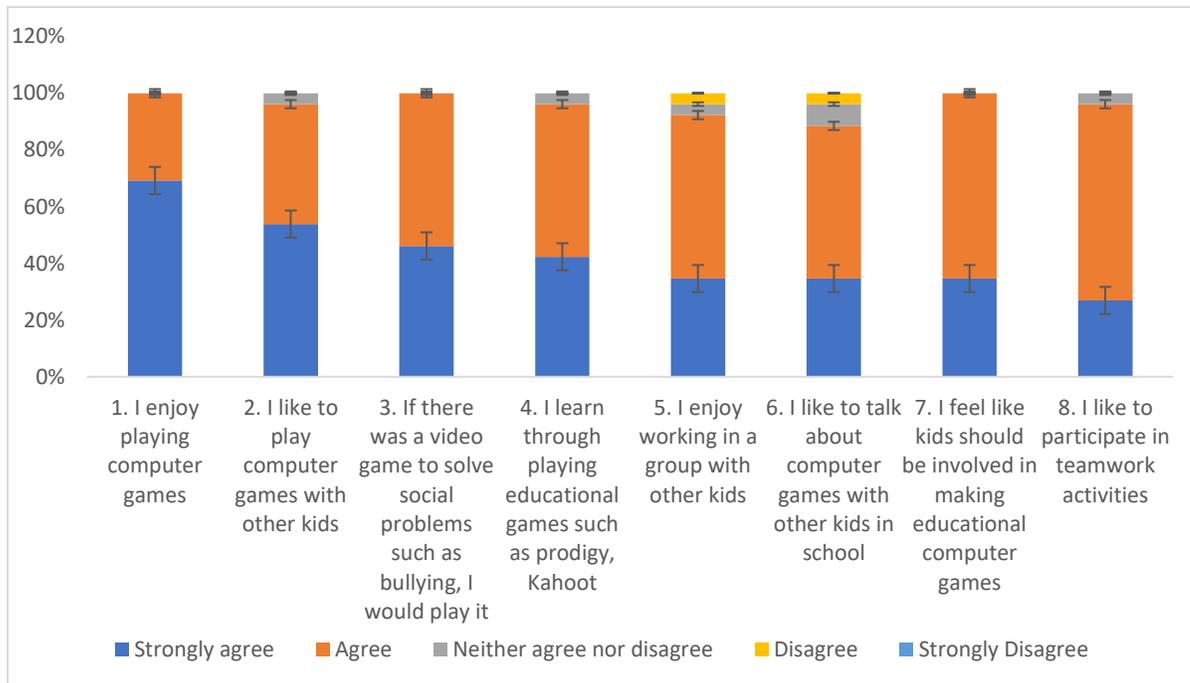


Figure 6.2 Participants' Responses to selected pre-questionnaire statements.

6.3.2. What do the participating children feel/think, i.e., can the workshops be engaging?

To answer R4, workshop and post-interview data were systematically examined. Using qualitative content analysis (Cho and Lee, 2014), initial coding and categories were generated from the data, and final coding and categories were determined through multiple iterations between the data and literature.

Summary of Analysis and Findings for Research Question 4

We ran four rounds of coding to ensure that there were no further or new themes. Therefore, first, the initial participants' responses were categorized into engaging, learning and fun.

Next, the initial thoughts (e.g., engagement, fun, learn something new) were coded. Subsequently, the expanded thoughts by topics were categorized. Finally, focus was given to the specific benefits of the workshop to further understand the workshop benefits that support newcomer children. The main steps taken to examine research question R1 are summarized in Figure 6.3.

Table 6.7 summarizes how the children benefitted, and what they did and felt when taking part in our co-design workshops; these included benefits and engagements; inspiration and motivation; the joy of creation; empowering children; group work was fun, and children given tips and advice. In addition, there are other benefits, with children finding it useful in relation to learning problem-solving; telling stories being enjoyable; and having the opportunity to exercise and hang with other peers to solve social problems.

The results of these questions confirmed the existing literature on the benefits of Participatory Design (PD) workshops (Kafai & Burke, 2016; Rogers, Kadylak, & Bayles, 2021, Akcaoglu, 2014; Zin & Yue, 2009; Anderson & Mack, 2019; Moutafidou & Bratitsis, 2018). Likewise, our results regarding PD benefits, and what children do and feel, were validated in the context of newcomer children from Arabic-speaking backgrounds, which has not been studied adequately. Further, some studies focused on the importance of digital storytelling (Emert, 2014), with interactive digital stories serving as the culminating activity of intensive curriculum, which our findings supported. Also, our findings reflected previous studies that showed that, to engage in multimodal digital storytelling, students must learn to read and write traditional texts and produce media projects that convey their ideas.

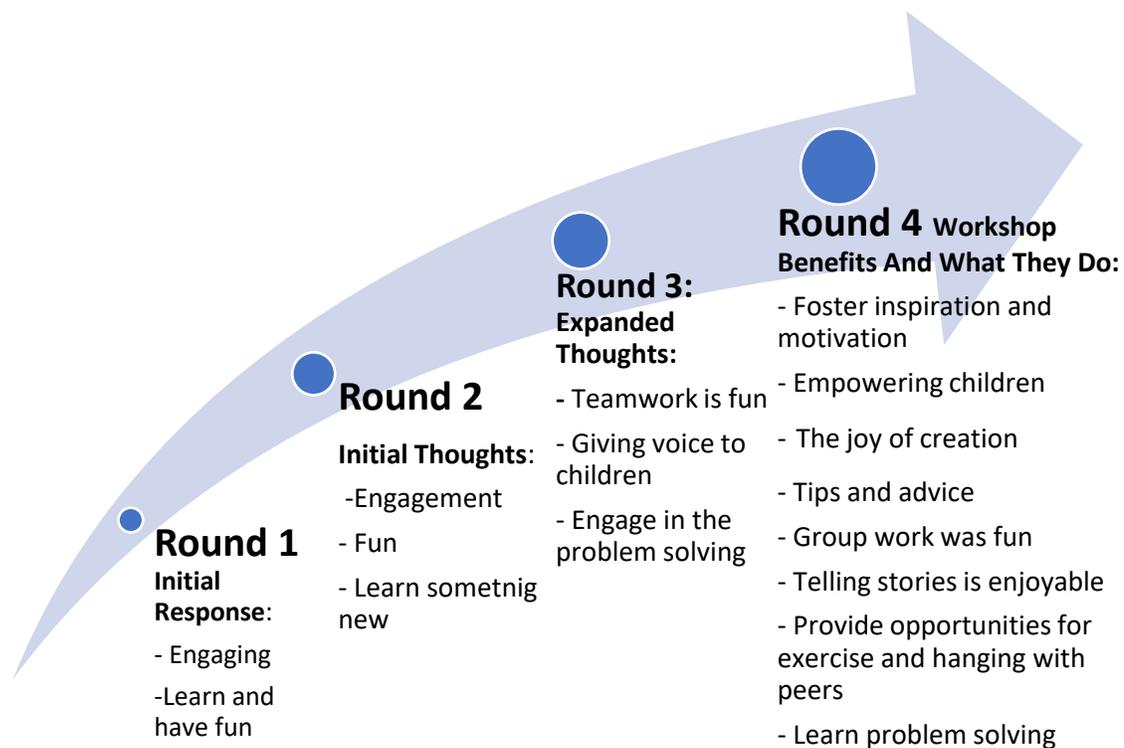


Figure 6.3 Main steps in the analysis of R4.

Table 6.6. Types of PD benefits and engagement elements provided by the workshops

Type of benefits	Occurrence#	%
Foster inspiration and motivation	85	32
Empowering children	30	11
The joy of creation	43	16
Tips and advice	23	9
Group work was fun	29	11
Telling stories is enjoyable	19	7
Provide opportunities for exercise and hanging with peers	14	5
Learn problem-solving	21	8
Total/ average	264	100%

Details of Analysis for Research Question 4

In the following sub-section below, we describe and discuss the overarching themes and insights by outlining the benefits and engagement elements that we observed and learned from the participated children related to Q4 in details:

- **What Children Do**

At the beginning of the workshops, we explained the purpose of the workshop and educated children about the game design process and elements. Next, we facilitated the discussion by letting them read and explore the study comic story that the researcher wrote and prepared to prompt discuss and encourage children to work collaboratively in learning and designing a game that focuses on solving the social problem described in the story. Storytelling is a great way to bridge the gaps in children's understanding because their reasoning skills are still developing, and it is essential to developing children's empathy. The story provided rich contextual details about the characters and the challenges they faced, and it engaged the children in the design process by stimulating their thinking. The children took turns telling the story and summarizing it in their own words. The version of the story focused on design issues, with children emphasizing their viewpoints. After discussing the story's content, as illustrated in Figure 6.4, we asked children how they would address Sara and her brother's challenges as game designers.

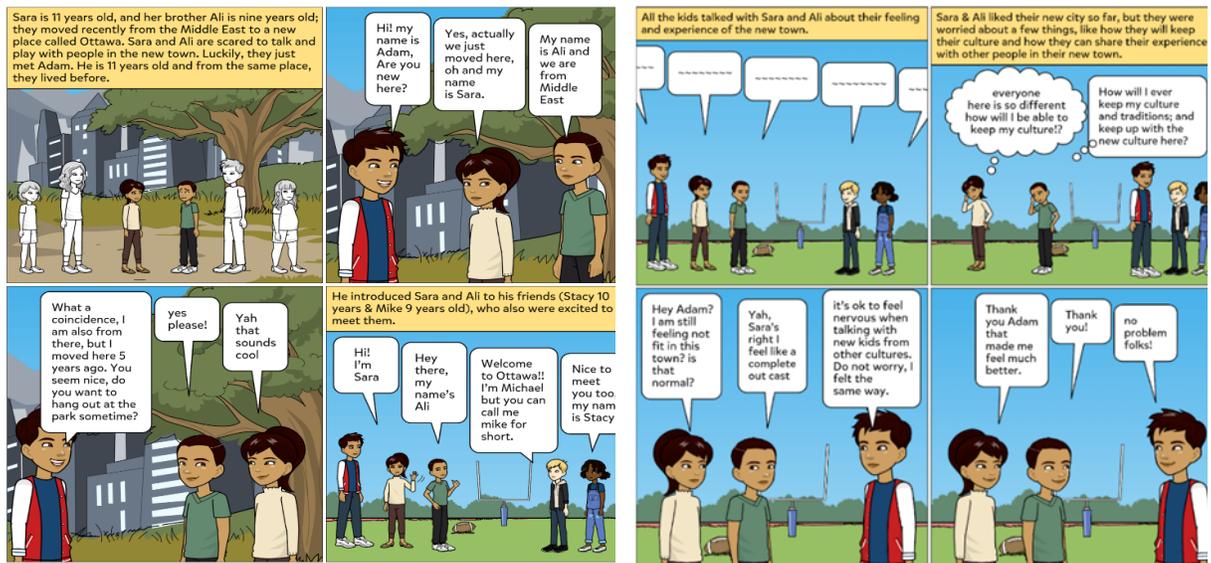


Figure 6.4 The storytelling content was used in the co-design workshops.

Our analysis identified general themes of what the children did, felt and thought across multiple workshop sessions. Next, according to these findings, the benefits outlined in the PD were used to re-examine, code and categorize the workshop notes. Finally, through four rounds of iterations and organizations of the collected data, a few PD benefits were identified that show participants' gains from their participation as follows:

- **Foster Inspiration and Motivation**

Our observations showed that children were motivated and inspired throughout their participation in the co-design workshop activities. This was made evident by the level of discussion and ideas generated. For example, we counted about 85 occurrences of terms related to motivation and inspiration, such as amazing, creative, smart idea, excited, interesting, like, make sense and useful, as in the following examples:

We learn from others, and we love to share our experiences with others. So, it is important to share and be proud of what we learn with our family and friends.

We learned a lot today; this workshop made me think about how to adapt to my new life here with confidence; now, I know that I am not alone in the process, and I should do my best to learn and be an active member of my neighbourhood and school.

These results align with the previous literature on the importance of PD in motivating and inspiring participants (Hansen & Iversen, 2013; Lindsay et al., 2012).

- **Empowering Children**

Analyzing the data revealed a critical function and benefit of empowering children and giving them a voice in the design process. These benefits include engagement and sharing ideas supporting self-esteem, learning the right to have a voice in adjusting, keeping their values, being part of the design process and advocating for their needs. In addition, we found that co-designing educational games with and for newcomer children can potentially help in creating educational games that incorporate children's cultural and social interests; tell their stories; and allow them to maintain and define their identities. Further, incorporating these elements can immerse newcomer children into social adjustment discussion and then empower them to be creative and successful in approaching their new way of living. When we asked the children about how they benefited from taking part in this study, a couple of children clearly stated the importance of engaging them in the design process:

It is an amazing idea to join other kids, working with them to make something useful for other kids and us; I hope our voice will be heard when there is something for kids.

I felt our group have control over what the game idea should be and what to include and exclude; I like the idea of asking children and engaging them with designing useful games to solve social problems such as how to stop a bully.

As for the viewpoint of children feeling empowered to participate in the co-design process, the children were asked about their perceived influence on the game design process. Each participating group was given the opportunity to ideate their chosen game idea. Most children felt they were able to control it “*pretty good,*” “*this is perfect,*” or “*just enough.*” Additionally, some children reported disagreements through their ideation process and referred to negotiating the decision-making and choices they made within their group. We observed some children who positioned themselves as having more influence,

such as one that stated, “*I knew that we would choose this game and present as I suggested from the start.*”

The prevalence of children’s empowerment is consistent with existing research on PD (Drain, Shekar, & Grigg, 2018a, 2018b; Gee, 2005; Iivari & Kinnula, 2018, Hussain, 2010). Our study of children’s empowerment is well established in previous PD studies with children and youth, which found that children can gain physical empowerment through participation in participatory projects, leading to products that increase their quality of life. While taking part in an event is not important in itself, nevertheless, doing so can empower children in the process of project design and contribute to its outcome (Drain et al., 2018b; Hussain, 2010; Iivari & Kinnula, 2018; Paper, Universit, & Universit, 2017). A critical value of the Child-Computer Interaction community is allowing children a voice in the design and research process, which can be achieved by representing and respecting children’s interests (Read & Markopoulos, 2013). Constructionism theory is also at the heart of the process of empowering children to design technologies that will impact their futures, as well as the environments in which they will live and work (Van Mechelen, Laenen, Zaman, Willems, & Abeele, 2019).

- **The Joy of Creation**

The participants were excited about the workshop ideas, starting from reading the workshop comic story and engaging in a lively discussion about social adjustment and how they can help other children. Then, we observed their joy in brainstorming and ideating their game ideas, choosing from different game elements, deciding what should be included in the game and justifying their choices. For example, in the “*fitting-in game*,” they propose to include components from their own culture and Canadian culture so the player of this potential game will be able to learn both values and become informed. In addition, one group of children was excited and asked if they could build the actual game. They shared their experience of making simple games using Scratch or a ready-to-use the platform such as “Roblox.” We explained to them that this co-design workshop is the start of this creative journey, and we will consider their suggestion in future workshops.

One group explained their design as follows: “*the process of making a game is amazing; we like the ideas generation and counting for different factors, we enjoy putting myself in the shoes of a player to make sure we make something fun and useful.*”

The power or joy of creation that we observed in our study aligns with that detected previous co-design studies (Hemmert, Hamann, Löwe, Zeipelt, & Joost, 2010; Vaajakallio, Mattelmäki, & Lee, 2010; Walsh, Foss, Yip, & Druin, 2013), indicating that, when designing, children started to get inspired and to generate ideas.

- **Tips and Advice**

Children participated actively in sharing tips and advice based on their experiences, These pieces of advice can be categorized into: 1) advice related to social adjustments (such as how to navigate in the new environment, make friendships, have patience, be self-confidence, deal with a bully by being assertive, advocate to the school about how bullies should be dealt with); and 2) advice related to the game design (such as recommending certain game features to include in the game, e.g., point system, characters should be customizable, the game should support different languages, etc.). The children benefitted both from this shared advice and what we communicated to them about how to best approach the selected social adjustment problems.

As one participant described:

I like to get advice whenever I have such a tough time or if I made a wrong choice

When I have options, I feel I have control of what I am doing; even in this game, this could be helpful to make a player make choices and realize the consequences of these choices. It is a real-life experience....

This finding matches the previous research that showed that active participation in co-design allows participants to negotiate, reflect and form new knowledge and worldviews to help them create practical, useful and effective solutions (P. Hansen, Fourie, & Meyer, 2021).

- **Group Work Was Fun**

We observed the group work of the children, and they showed a great deal of enjoyment. They clearly felt it was fun; this was evident through their verbal interaction, comments and laughter.

As one participant stated:

The workshop was well organized, and I liked the group work part the most; it was fun and useful to work and learn from other children’s ideas.

Previous PD studies also support this result (Vaajakallio, Lee, & Mattelmäki, 2009; Wong, Kumpulainen, & Kajamaa, 2021), in scenarios where participants gather to design artifacts, ideate and make the choices, and negotiate throughout the design process.

In addition, we asked the participants to rate their experience of the quality of the workshops. Most thought it was easy and helpful to interact and work with other children, as explained in Figure 6.5.

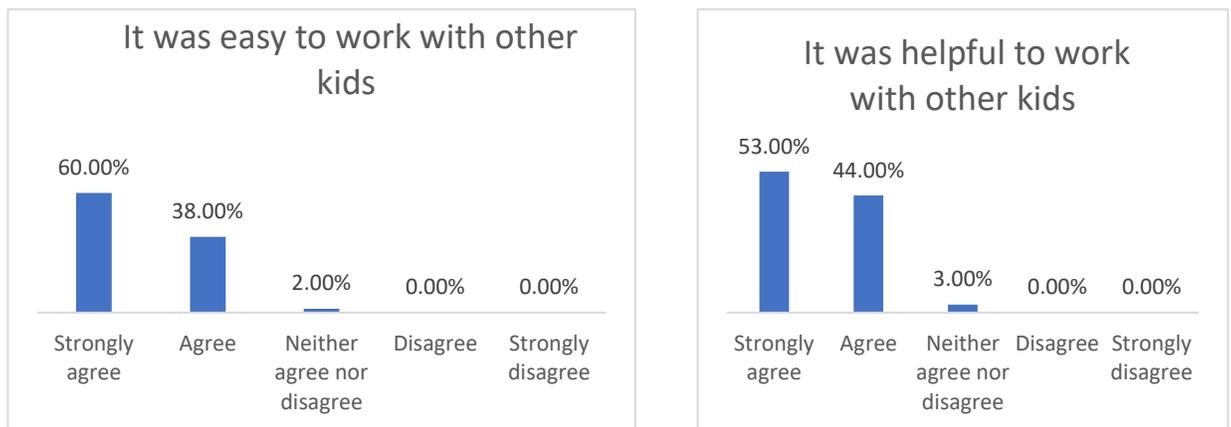


Figure 6.5 Participants’ evaluation of their collaboration with other children.

- **Telling Stories is Enjoyable**

Children were encouraged to share their migration stories, and they were active listeners to other children’s stories. We observed that this two-way process of telling

and listening to stories was useful and enjoyable. For example, one participant said, *“it is so exciting and inspiring to listen to other kids’ stories, which encouraged me to share mine, even if I was hesitant.”* Other children believe that storytelling is a powerful tool to communicate and talk about different topics, including identity. One participant said: *“I see the power of storytelling in sharing my values and inviting others to learn more about my culture... I tried that during some class presentations, and it worked and sparked the discussion with other children who became interested to learn more about me.”*

This finding aligns with previous research that indicated the importance of storytelling as an innovative tool to facilitate learning and development in postmodern society (Nilsson, 2008; Speek & Van Mechelen, 2018).

- **Learn Problem-Solving**

We found that learning problem solving was one of the children’s main benefits from participating in the co-design activities. They believed that the task—of approaching some examples of social problems and brainstorming game ideas about the best way to attack a certain problem—was challenging and promising. It was challenging because the social problem was complex, and children may experience a different level of that problem, and their response or coping strategies may vary as well. Despite this, the exercise was still promising because they felt they were in the right place to talk about it and try to come up with a reasonable solution or game design with other children that could be useful to help other vulnerable children.

As the participants explained:

Problem-solving is an important skill, and it can be helpful to figure out a different way of approaching and making our adaptation process more enjoyable.

I like figuring out our solution to some problems such as bullying with other kids, they can check my points, and at the same time, I can comment on their suggestions to make something useful for other newcomer children.

The PD literature has confirmed these results, with many studies pointing out the importance of PD in solving different problems (Akcaoglu, 2014; KILGORE, 2018).

Overall Impression of Co-design Workshop

We also analyzed the data of the Post-Workshop Questionnaire and found that most children believed the workshop was well-organized, with only 4% were on the borderline. Similarly, all the children who took part in the workshop either strongly agreed or agreed that it was fun, as illustrated in Figure 6.6.

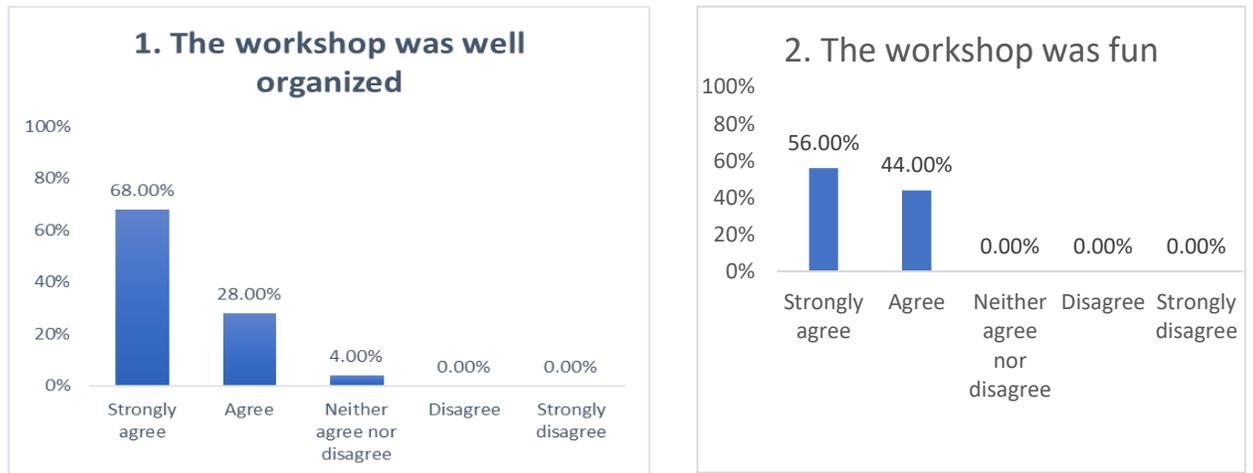


Figure 6.6 *Participants' overall evaluation.*

6.3.3. What do children learn through the workshop, i.e., can the workshops be educational?

To answer Q5, we analyzed workshop and post-interview data, using a similar approach to the previous question, by using qualitative content analysis (Cho and Lee, 2014). Initial coding and categories were generated from the data, and final coding and categories were determined through multiple iterations between the data and literature.

Summary of Analysis and Findings for Research Question 5

We ran multiple rounds of coding. First, the initial participants' responses were categorized into the educational benefits of the workshops. Next, the learning thoughts (e.g., making games) were coded. Finally, the major learning aspects of the workshop were analyzed to further understand these aspects from the perspective of newcomer children. The main steps taken to examine research question Q5 are summarized in Figure 6.8.

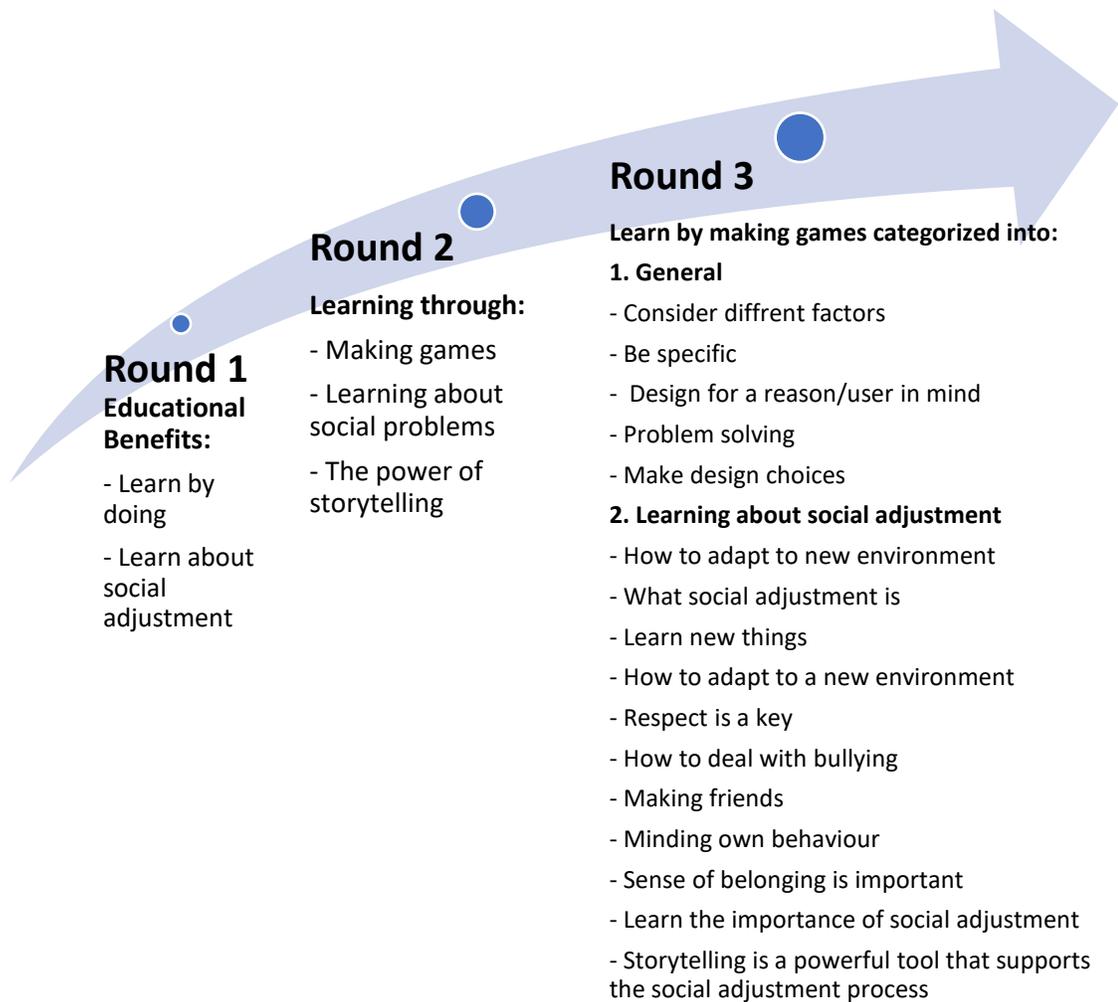


Figure 6.7 Main steps in the analysis of research question R5.

Table 6.7 showed that various forms of learning happened during the workshop that can be categorized as “learning by making games,” which can be grouped into general and social adjustment. These results align with the literature that demonstrates game jams can lead to general formal education, can provide learning experiences and increase motivation and self-efficacy (Arya et al., 2013; Aurava, Meriläinen, Kankainen, & Stenros, 2021) and that game development workshops can have general and specific learning outcomes beyond making games (Harrer, 2019; Jin & Xu, 2019; Xu & Jin, 2021).

Our study co-design workshops format supports these two types of learning through making games (the general learning and learning about social adjustment). Our discussion of these two types of learning is based on the involvement of children in the game design

process, specifically to inform the design of social adjustment games. In our six co-design workshops with newcomer children, we focused our efforts on enabling children to learn about social adjustment through a comic book story that sparked children’s discussions and reflections about the design of social adjustment games. Further, we describe how the knowledge gained from these workshops helped us to better understand newcomer children’s social adjustment experiences, their preferences for potential games, and how they discuss and create game stories for selected social adjustment problems during the game design process.

Table 6.7. *Type of Learning that occurred throughout the workshops*

Learning by making games	Occurrence#	%
1. General	-	-
- Consider different factors	21	17
- Be specific	19	15
- Design for a reason/user in mind	29	23
- Problem solving	24	19
- Make design choices	32	26
- Process and reflection		
Total/ average	125	100%
2. Learning about social adjustment	-	-
- How to adapt to a new environment	33	11
- What social adjustment is	26	9
- Learning new things	21	7
- How to adapt to a new environment	33	11
- Respect is a key	29	10
- How to deal with bullying	31	11
- Making friends	30	10
- Minding own behaviour	24	8
- Sense of belonging is important	19	7
- Learning the importance of social adjustment	23	8
- Storytelling is a powerful tool that supports the social adjustment process	21	7
Total/ average	290	100

Details of Analysis for Research Question 5

In the following sub-section below, I explain the educational perspective of the workshop by outlining the overarching themes and insights related to R5 in details:

- **Learning by Making Games**

Learning by making games was one of the core outcomes of this study. Children revealed that making games helped them learn to consider different factors; be specific; design for a reason or a user in mind; problem solve; and make design choices.

As an example of making design choices, the children, after a deep discussion, decided to design minigames to solve several social adjustment problems, and that these minigames should be shown on the landing page of the main game in which newcomer children can play learn about various social adjustment problems. The group defined this landing page of minigames in session 4, as illustrated in Figure 6.8.



Figure 6.8 Examples of suggested minigames during workshop 4.

As participants described:

I felt that making games could make me learn different things, such as being able to count for different elements in the game, try different options and learn from mistakes.

The main benefit of making a game is helping me be more thoughtful to estimate what other players want to see in the game; while I enjoy this learning process, I feel it is challenging at the same time.

Our finding that participants learn by making games aligns with the research trend on this topic, whereby making games has been shown to introduce children to a range of skills and better connect them to each other (Iivari & Kinnula, 2018; Kafai & Burke, 2016). Also, when analyzing data related to question 2 of the Post- Questionnaire, we found that participants perceived designing games as easy and that games were good for learning. As shown in Figure 6.9, three quarters of the participants agreed that co-designing games was easy, 20% were on the borderline and only 4% disagreed. When we followed up with the small percentage that disagreed in the interview, they stated that co-designing a game was a complex process because there were several game elements that designers needed to consider to create a meaningful design. Similarly, 92% of the participants believed that games are a good medium for learning, and only 8% were on the borderline in this regard.

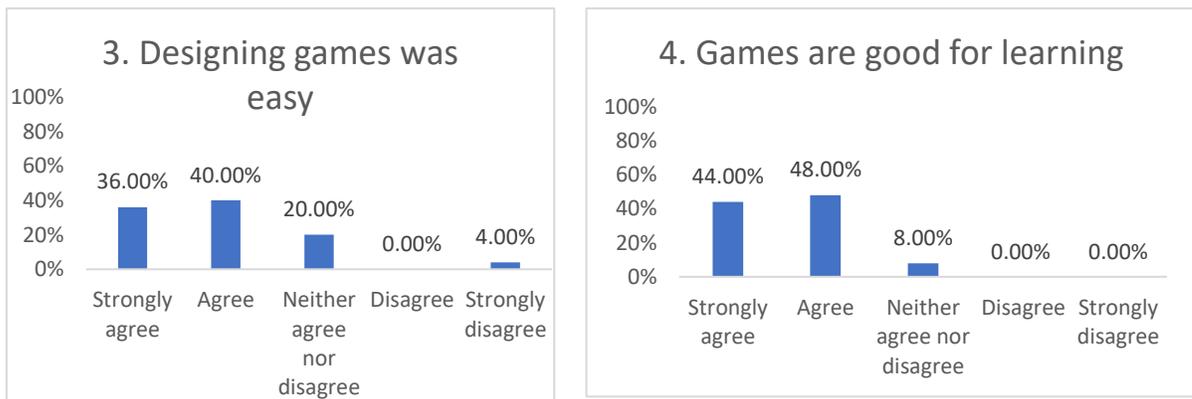


Figure 6.9 Participants thought that designing games was easy and games are good for learning.

We also found that 88% of the participants believed that games are good for learning in general, and 92% indicated that the game design workshop motivated them to learn something new, as shown in Figure 6.10. The participants elaborated on this in interviews, stating that while games are good tools for learning, there is still a need to learn using other methods, and it depends on the accessibility of these games, which their parents should approve. This is why it is important to engage parents in the process, as previous research found that co-design can offer a better understanding of issues around parental support for newcomer children’s transition to school through engagement with children and their parents (X. Li, Doyle, Lymburner, & Ghadi, 2016).

Moreover, participants were positive when asked if they had access to these educational games and would use them to learn about appropriate social behaviour. Furthermore, children believed that they learned something new during the workshop, and were motivated to learn more about game co-design and how they can use games to help other children adapt when they are moving to a new place.

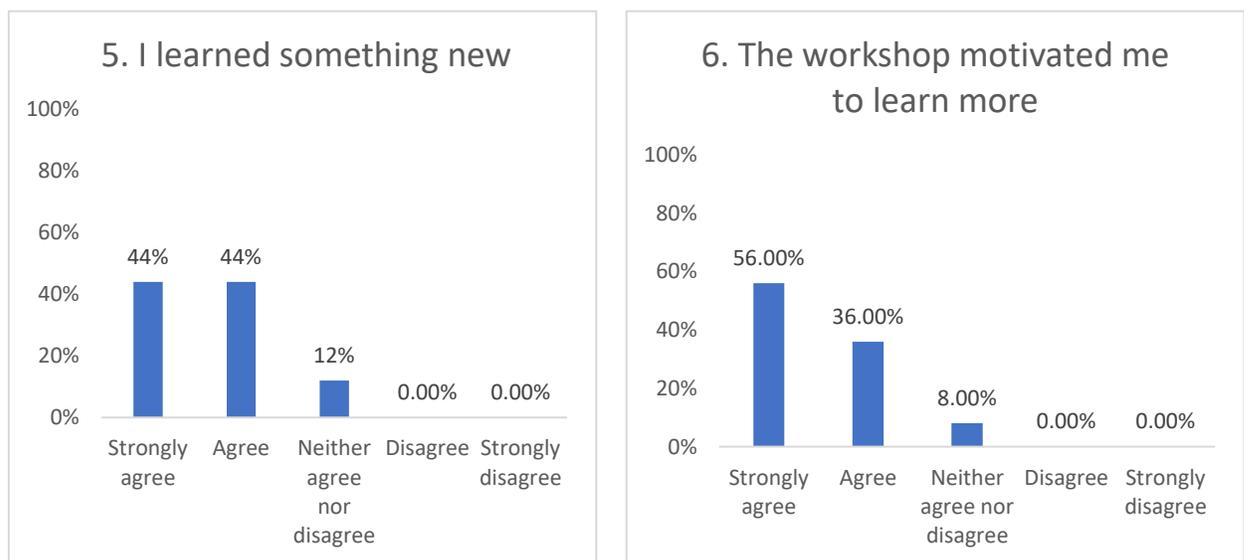


Figure 6.10 Participants’ evaluation of the workshops’ ease of use and usefulness.

- **Learning about Social Adjustment**

The participants found great value in discussing and generating games ideas to address social problems. We observed the children taking into consideration the perspectives and experiences of their migration process. This was evident in the analysis of the written and verbal notes of the researcher and the observer. For example, during sessions 3–6, evaluation activities were incorporated into the co-design process. Participants discussed their group ideas and those presented to them in previous group workshops, and they exchanged feedback verbally and in writing during these sessions. After that, the children evaluated the games they had suggested to solve social problems such as bullying, making new friends, feeling like they belong and fitting in, and not feeling alone. We identified several themes related to social adjustment that included:

- *How to adapt to a new environment*
- *Respect is a key*
- *What social adjustment is*
- *How to deal with bullying*
- *Learning new things*
- *Making friends*
- *Minding own behaviour*
- *Sense of belonging is important*
- *Storytelling is a powerful tool that supports the social adjustment process*

Workshop design sessions with children were crucial to govern the designed social adjustment game learning goals, which we synthesize as follows: a) The game should serve as a motivational tool to increase newcomer children’s interest in learning and involvement in their new place of living; b) The game should enable players to recognize the relationship between their actions and the larger social implications; c) The game should focus on the importance of social adjustment in children’s contexts and how to practice it to fit in within a real-life context; d) The game should be capable of explaining concepts such as identity, fitting in, social withdrawal, why it is important to adjust and fully engages with the local community; e) The game should explore social skills (e.g., cooperation, negotiation, problem-solving, giving back to community, etc.); and f) The game should reflect both the

children's own culture and the new culture to ensure that players will be introduced to both worlds.

We found that participating children clarified and elaborated on each other's design ideas and their own. Also, the facilitator played a vital role in encouraging this by asking probing questions of the children during the activity. When children made unclear statements in the recordings, the facilitator often asked them to clarify or add more details to their suggestions. For example, in Session 1, the facilitator asked participants to elaborate on their suggestions for a team game that would teach newcomer children tips and hints on making new friends and keeping them. A participant said, "It is true that making friends can be simple and difficult." So, the facilitator asked, "Can you give me an example of how making friends is easy and how it can be challenging?" Then, the participants offered additional valuable descriptive information that referred to their own experience when they moved to Canada. Also, they pointed out the worth of having a social computer game is that a newcomer child can learn these tips and get familiar with the game world, so they will be ready to experience real-life scenarios.

When we asked children about their willingness to play such social adjustment games, one explained: "*We wish if we had this kind of games when we arrived in Canada, in particular the first year, as it was enjoyable at the beginning, then we start to discover the differences and other problems arise, which sometimes too much to handle as a kid.*"

Our study results align with previous PD research (Ang, Zaphiris, & Wilson, 2010; Chen, 2012) that focused on an in-depth look at how serious games can support cultural heritage and art learning and discussed the social impact of these kinds of games.

Throughout this process, children were introduced to the notion of social adjustment, why it is important and how one should be adjusting to a new way of living. The workshops served and achieved some key objectives. Children learned new knowledge about the notion of social adjustments, and they were given the opportunity to define social adjustments, with some participants defining it as follows:

Social adjustment is the ability to start your life in a new place fast and successfully.

Being able to cope and make new friends similar o the one we used to.

Social adjustment for me is being able to live in a different culture while keeping your values.

Other children pointed out the importance of social adjustment. They mentioned that successful social adjustment means being successful in their lives and being able to explore it to their full potential. Also, they noted it is important to live and grow up normally without any social difficulties that may hinder someone's future life. The children discussed social adjustment's importance in terms of improving the quality of their life, stating:

Our parents make this big move for a better future, and they always support us to be part of every school activity and encourage us to engage with other neighbours' kids.

We found evidence that children had come up with new, unique game ideas and features for social adjustment games, which was encouraging. Children used a variety of methods to express themselves. Their ideas were verbalized in audio recordings and the observation notes. For instance, in workshop Session 2, children suggested a game storyline that depicted typical life in Ottawa; this included different examples of game features such as starting the scene at the parliament height and allowing children to meet other children who had placed their home country flags or other popular pieces of arts on the game board. Figure 6.11 shows a map of the children's ideation process.



Figure 6.11 Examples of the workshop Ideation process.

In the analysis of the audio recordings, we found evidence that newcomer children often required prompts or encouragement from facilitators to participate in the idea-generating process. The observer notes that children were supported to answer questions when the facilitator encouraged them using pre-existing knowledge of the children. For example, the facilitator motivated the children to answer some of the other participants' questions by prompting them to reveal their experience and interest in video games. In addition, the children pointed out several tips and advice they tried to cope with their new life; the majority of children believe that respect, minding their behaviours and making friends were the main keys to coping with their new life, and that this made them happier and helped them to forget what they missed back home. One participant said:

I consider the first few weeks one of the toughest times in her life; I missed my old friend and cousin. But fortunately, my life starts getting better after I connect with a couple of friends in school, and we have many things in commons, and they help me with lots of things, such as improving my English, especially my writing.

Children also discussed the idea of a sense of belonging; they believe that the lack of social belonging is correlated inversely with social adjustment. In other words, the more you feel you belong to a place, the more successful you will be in becoming socially adjusted. Conversely, one cannot say they are adjusted if they feel they do not belong to their new place.

We also asked the children to prioritize some selected social problems—that we learned from Phase 1—based on their importance to be solved through an educational computer game (similar to what we discussed in the workshop). We used the following Likert scale and asked the children to rate the importance of these problems, as shown in Figure 6.12. The post-workshop interview was conducted with 15 children. The majority of the participants believe that bullying and feeling out of place are the most important problems. Feeling loss and insecurity about appropriate behavior were ranked second based on 11 children rating them important and most important, and three children being neutral. Lack of cooperation skills was third, while personal space and peers perspective and interest in learning newcomer children’s culture were rated fourth in importance among the social problems.

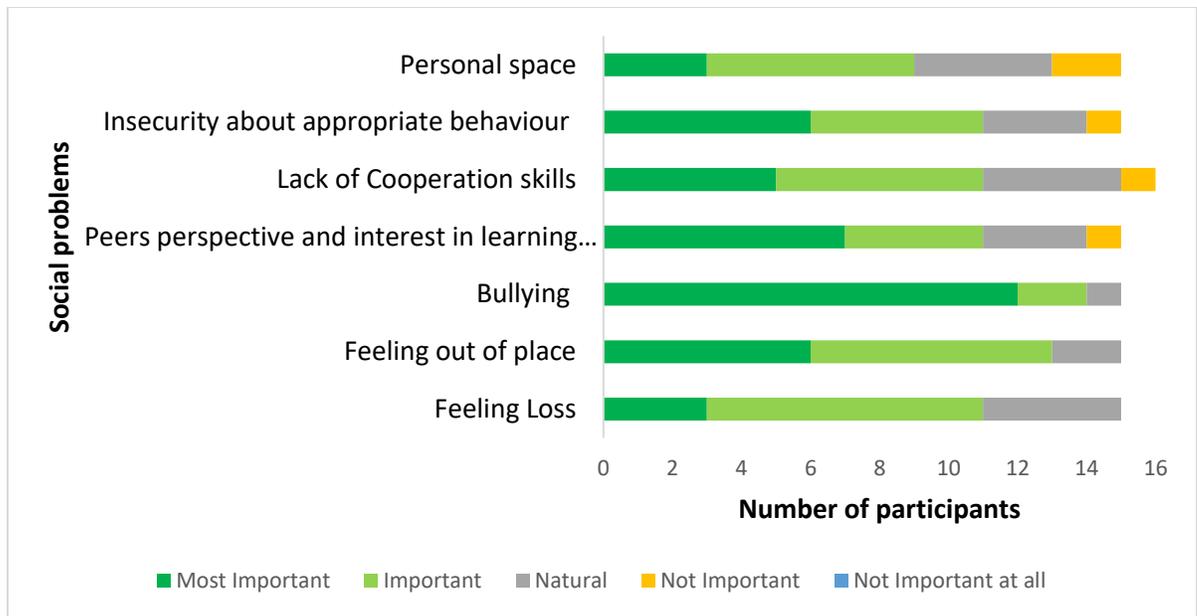


Figure 6.12 Participants’ Prioritization List of Selected Social Problems.

Another theme we uncovered is that storytelling is a powerful learning tool that supports the social adjustment process and is an excellent way to gauge children’s involvement in the co-design process. It can bridge the gaps in children’s understanding because their reasoning skills are still developing, and it is essential to developing children’s empathy. The story used to commence the workshop provided rich contextual details about the characters and the challenges they faced, and it engaged the children in the design process by stimulating their thinking.

Our study results in terms of how children tell their stories and experiences when discussing the game design ideas about social adjustment align with those of Benton, Vasalou, Gooch and Khaled (2014), a study based on two workshops in which children designed narratives for a literacy game inspired by the Day of the Dead festival. They explained how the participants of these workshops improved their understanding of children’s stories and games. Also, they discussed their approach to creating stories while designing games.

The co-designer children were very engaged, so they followed up with the facilitator and shared some of their drawings related to their group game-designed storyline—examples of these storylines are illustrated in Figure 6.13.



Figure 6.13 Drawing of a game storyline of a bully from Session 2 children's notes.

6.3.4. What game features and cultural aspects do the participating children use in the game design?

To answer research question R6, we analyzed workshop and post-interview data, similar to the previous questions. We analyzed this question by running three rounds of coding. First, the initial participants' responses were categorized based on the focus of the workshop co-design. Next, the type of learning that occurred during the co-design workshops (e.g., making games, learning about social problems) were coded. Finally, the major themes were revealed, which were generating game elements, ideas, game features, and Arabic culture aspects. The main steps taken to examine research question R4 are summarized in Figure 6.14.

Summary of Analysis and Findings for Research Question 6

Table 6.11 shows what we learned regarding game features and important cultural aspects to participating children. We found the general game elements and features to be aligned with the previous literature (Hull, Williams, & Griffiths, 2013; Moreno-Ger, Burgos, Martínez-Ortiz, Sierra, & Fernández-Manjón, 2008; Zin & Yue, 2009; Prensky, 2007; and Rooney & Whitton, 2016). While our study confirmed these, it also extends the discussion of such games feature and game ideas elements in the context of social adjustment for newcomer children. We also learned specific Arabic cultural aspects and preferences that newcomer children discussed and want to see in any potential social adjustment games. We also found that the co-design workshops effectively taught children about social adjustment through the game-making process. The full detailed answers and overarching themes of what we learnt about this question are as follows:

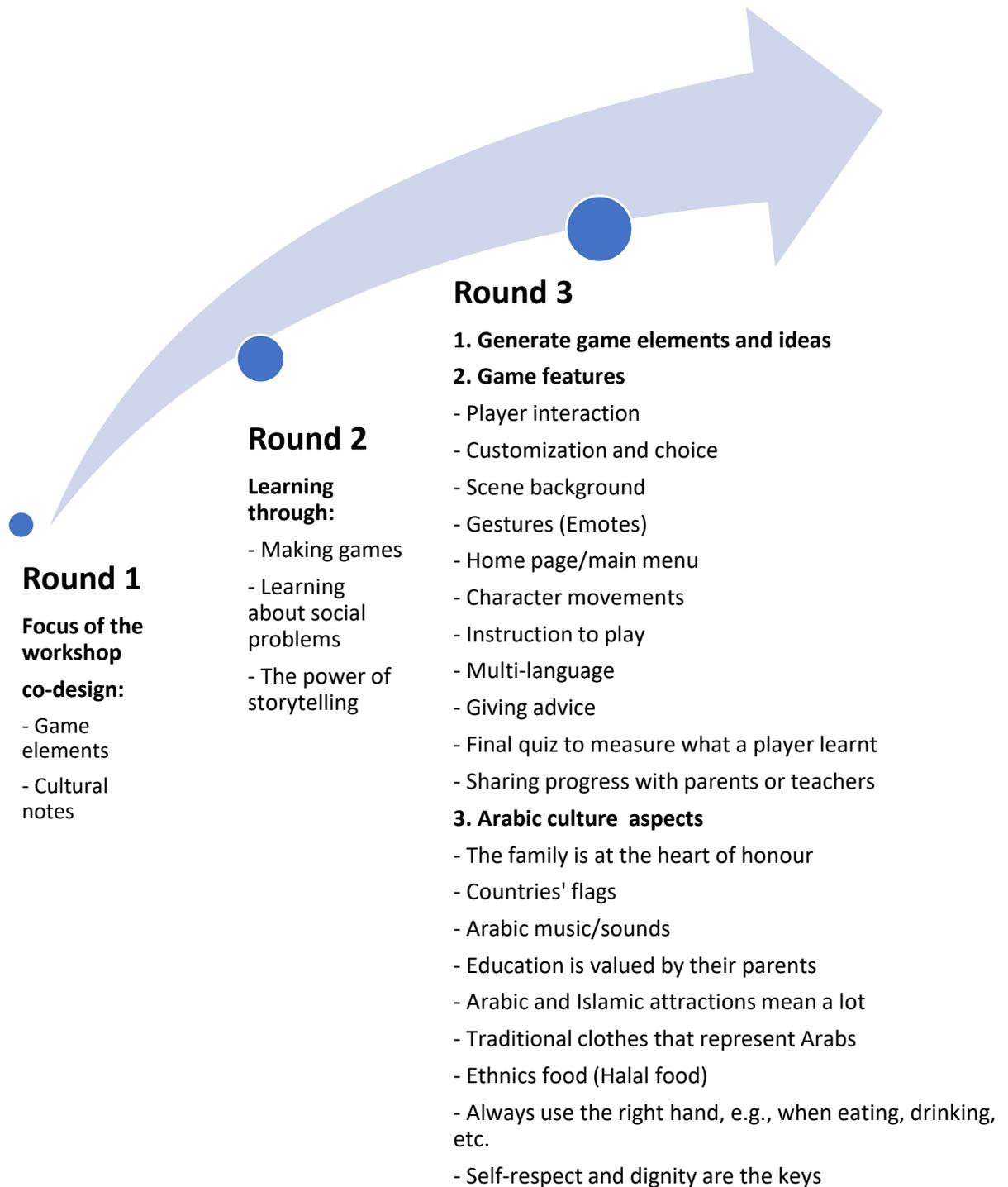


Figure 6.14 Main steps in the analysis of R6.

Table 6.8. Game features and cultural aspects that occurred throughout the workshops

Game features and cultural	Occurrence#	%
1. Generate game elements and ideas	-	-
- Solve bullying	15	20
- Teamwork and fitting in	20	26
- Exploring the new world	17	23
- Friendship making	23	31
Total/ average	75	100%
2. Game Feature	-	-
- Player interaction	33	15
- Customization and choice	21	10
- Scene background	19	9
- Gestures (Emotes)	23	11
- Home page/main menu	11	5
- Character movements	13	6
- Instruction to play	27	12
- Multi-language	16	7
- Giving advice	21	10
- Final quiz to measure what a player learnt	17	8
- Sharing progress with parents or teachers	15	7
Total/ average	216	100%
3. Arabic culture aspects	-	-
- The family is at the heart of honour	29	12
- Countries' flags	24	10
- Arabic music/sounds	19	8
- Education is valued by their parents	31	13
- Arabic and Islamic attractions mean a lot	19	8
- Traditional clothes that represent Arabs	25	10
- Ethnic food (Halal food)	13	5
- Always use the right hand, e.g., when eating, drinking, etc.	21	9
- Self-respect and dignity are the keys	31	13
- Hospitality	29	12
Total/ average	241	100%

Details of Analysis for Research Question 6

In the following sub-section below, I describe and discuss the overarching themes and insights related to R6 in details:

- **Generate Game Elements and Ideas**

The participants found great value and engagement in generating games ideas to address social problems, by taking into consideration their perspectives and migrations transitioning experiences. This is evident in the analysis of recordings and written and verbal notes from the children, researcher and observer observations. During sessions 3-6, evaluation activities were incorporated into the co-design process. Participants discussed their group ideas and those presented to them in previous group workshops, and they exchanged feedback verbally and in writing during these sessions. Next, the children evaluated the games they had suggested to solve social problems such as bullying, making new friends, feeling like they belong and fitting in, and not feeling alone. After the workshop, participants were asked a few open-ended and short rating questions. In more detail, a researcher also spoke with 15 children in one-on-one interviews about their group game ideas. Figure 6.15 is an example of participants' thoughts about the game elements used to expand the discussion of the co-design task



Figure 6.15 Example of brainstorming ideas of the game elements.

- **Game ideas**

In analyzing the facilitator and observer notes and the interview transcripts, we found that the co-designer children expressed and expanded their group game ideas. Throughout this study, the co-designer children came up with a few game ideas to help newcomer children solve selected social problems such as bullying, lack of collaboration with other children, feeling like they don't fit in and identity. We started the workshop by explaining the notion of co-design through a small discussion and then prompted the children to read a comic book story representing some of the social problems that newcomer children encounter. Then, after a discussion, each group decided what problem they wanted to tackle in the co-design workshops. Children were able to select the social problem they felt was imperative to solve within their group. Also, at the beginning of each workshop, we summarized what we had learned from the previous workshop and the children were given the option to either continue with previously identified decisions, which most of the groups did, and this helped us to develop some game ideas in more detail. Other groups opted to modify and talk about a different social problem. In the following section, we briefly explain some selected examples of game ideas (Participant names are made-up for anonymity):

Game idea 1: *How to deal with bullying*

The idea is to create a story-based video game that lets newcomer children step into the lives of five children who are in middle school – Adam, 11 years; Asma, 10 years; Zahra, 11 years; Rosey, 9 years; and Adi, 10 years. These five children are interconnected at different points in the game as each of these characters encounter specific complex problems related to bullying. Zahra is being bullied by Adam, a trouble-making kid in her grade. Rosey struggles with feeling lonely and not having a good relationship with the new school environment. Asma is experience anxiety and pressure from her parents to do well in the new school, but she can't keep up as everything is new to her. While Adi is trying to stick to a good resolution for the new school year as his reputation last year was not good; even though he's a good guy, he acts quickly without considering the consequences of his action, which make other kids avoid him. The participants emphasized the importance of learning about each of those kids' social problems so they can help them face these problems, stop the bullies and identify reasonable solutions for the other problems by figuring out different challenges and actions in the games.

The game focusing on building kindness, empathy, making friendship and bringing all kids to a mutual understanding through inspiring and attractive gameplay.

Game idea 2: *Teamwork and fit in*

We want to make a game to help a newcomer child be proud of themselves. We talk about two groups; one is newcomers who are new to the city and the other group is their classmates. The second group invites the first to the school to play a football game after the school day and on the weekend. The game has different levels, and each level has its own challenges. The kids will learn lots of playing skills and after each match, both teams have a break to talk with each other. One team found that their trainer needed to leave the team because of sickness. This team was the newcomer to the city team called “we are matter.” The kids started getting worried as they may lose the game if they do not get enough training and tips. While they were in training one evening, they noticed a guy in his 40s. He watches them all the time; he’s there every time they play, and it seems he lives in the neighbourhood. The following day, he started playing with a soccer ball, and he looked really good. One of the players, Hadi, told his friends that we need to talk to this guy and see if he could help. Adi, another player, refuses, while other team members, Mike and Nader, suggest talking to their parents to approach the guy. Two parents go to watch the guy and their kids. After a bit of time, the parents start talking with the guy, and they find that he was about to talk to the children, but he was afraid. Things are getting better, and he starts working with them to get them ready for the first match, which is supposed to be in a couple of weeks. The guy’s name is Moe, and he started giving the kids some fitness challenges; after a few days, the kids managed to stand up, and he starts teaching the kids different techniques. After another week, the other team’s trainer sends an invitation and time for the soccer match if they are interested. The newcomer team accept the challenge, play the game and it’s a tie. The other team is so amazed by their level of fitness and skills. Both teams agree to meet regularly to play and learn from each other. Of course, throughout this experience, the kids learn many things, and they go through a tough time, but in the end, it was worth it, and both teams form a local league and they start their sport journey together.

Note: During the workshops, participants were aware of social bullying and cyberbullying. However, they insisted that while generating a game to solve the bullying problem, they also wanted to ensure that the game will prevent any potential forms of bullying against newcomer children. Participants believe that while other participants can experience bullying, the consequences of bullying should be worst in the case of newcomer children

because 1) Newcomer children are highly susceptible to bullying, especially their first few months in the country, where they may face language barriers and cultural differences, all in which increase their potential to be bullied or sometimes bully others to escape from these stressful situations; and 2) Bullying is connected to other social problems such as social withdrawal, lack of confidence, lack of cooperation skills and academic performance, so any game focused on solving bullying can help solve other social problems. As such, the co-designer children used minigames to address several social problems related to bullying or even address the different forms of bullying.

Game idea 3: *Exploring the new world*

The co-designer kids proposed a Sandbox exploration game. It is a type of game that can let the player explore a world. Minecraft is an example of this game, where players can choose whether to explore the world or achieve a certain goal like defeat the ender dragon and beat the game. The Sandbox games could be helpful for newcomer children to navigate and explore new environments. In this case, the game could be based on a country, let's say Canada. The game would have the basic environment of Canada like its attractions, people and places. We can introduce different challenges and missions by exploring attractions, people and places, including advice and educating players about these three things in a friendly, fun way. By completing several game levels, a player can learn and engage in the new place and its people to finally learn to fit in the new community. Moreover, the game would allow you to interact with others. We suggest having both newcomer children and other local children, so each can introduce their values and discuss given scenarios related to one or more of the social problems such as lack of confidence, maintaining identity and learning how to cooperate with other kids.

- **Game level**

Figure 6.16 shows one of the game levels shared by the group in session five, who created Google Slides and mentioned that they customized these pictures using the *Roblox* game

platform. The group shared the graph in session 5, which created it in Google Slides. Also, they mentioned that they customized these pictures using the *Roblox* game platform.

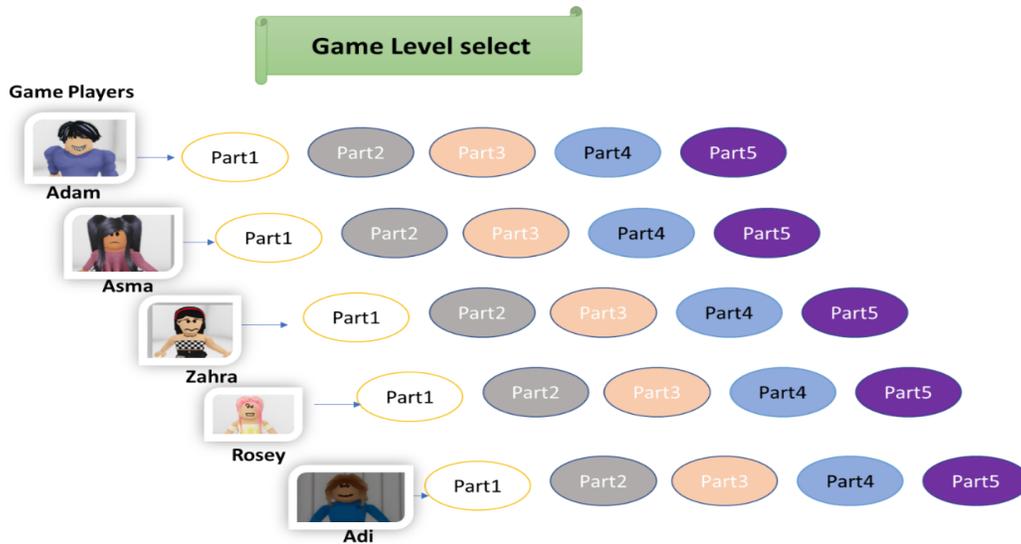


Figure 6.16 Game main characters and levels for game2.

- **Arabic culture aspects**

We found that co-designing educational games with and for newcomer children can potentially help in designing educational games that: incorporate children's cultural and social interests; tell their stories; and allow them to maintain and define their identities. Incorporating these elements can immerse newcomer children into the social adjustment discussion and then empower them to be creative and successful in their new way of living. Furthermore, we identified a group of Arabic culture characteristics mentioned throughout the co-design workshop discussion: the family is at the heart of honour, countries' flags, Arabic music/sounds, Education is valued by their parents, Arabic and Islamic attractions mean a lot, Traditional clothes that represent Arabs, Ethnic food (Halal food), Always use the right hand, e.g., when eating, drinking, etc., self-respect and dignity are the keys, collectivism vs. individualism, hospitality and constructive criticism can be viewed as insulting. We explained some of these themes in the following:

- **The family is at the heart of honour**

Children mentioned the role of their families in supporting their social adjustment. Also, some children pointed out the different expectations of their parents, which sometimes lead to different views of the family compared to peers.

My family support me through the process. They keep talking about the importance to engage with other kids and learn from them, respect them and trying to make friendship

I feel my family has different expectations and rules, which I respect, but at the same time, I learn new things from my friends at school, and after a long discussion, my parents agreed to be opened to discussing any topic with them as long as I kept my main values such as my religious-related things.

This result aligns with the previous research, reflecting the RAISED between cultures model. This is a collaborative model developed as a collaborative approach between academics, immigrant service providers, educators and policymakers who shared a similar goal of supporting the development of best practices for working with this population of immigrants. In other words, it can be used to understand the interaction between individuals and their surroundings as key aspects in influencing their experience and associated outcomes (Brosinsky, Georgis, Gokiert, Mejia, & Kirova, 2018).

- **Countries' Flags and Arabic Music/Sounds**

This theme is discussed in terms of what to include in the game, and the children believe integrating these elements, such as popular Arabic music, in a social adjustment game could benefit them by preserving a symbol of their identity. Also, these elements are common and can be useful in making connections with children from other cultures.

- **Education is Valued by their Parents**

The participants mentioned that their parents greatly appreciate education; while the children agree with this view, we noticed that some children felt that the lack of social adjustment can lead to poor academic performance. For example, one participant said:

The main focus of my mom is my academic performance, and it was tough for me as I was the first kid in my class back home, but things changed here, but after several months I started used to the system.

Previous studies have also highlighted immigrant families' involvement in determining their children's educational paths (Antony-Newman, 2019; Schnell, Fibbi, Crul, & Montero-Sieburth, 2015).

- **Self-Respect and Dignity are the Keys**

Children share the importance of respect and dignity, and that these values are important when making friends and collaborating with other children. One participant said:

I always treat people with respect, and I expect the same in return. However, sometimes this may cause conflict if I feel the other people show signs of disrespect.

- **Hospitality**

Participants explained that Arabs are known for their generosity and hospitality, and that therefore, one should expect a warm welcome whenever one travels in the Arab world. However, they also said to be aware of proper behaviour to maintain good relations such as: As soon as someone enters the room, stand up; one should not shake hands with an Arab woman unless she offers you her hand first; do not speak to an Arab woman before she introduces herself to you; and embrace gifts.

As one participant put it:

I always try to explain my family's rules and our cultures when I invite kids to a party. It may be hard to talk about these things, but my parents support and encourage me to communicate my cultural rules with my friends, especially if they visit our home.

- **Game features**

Table 6.9. includes examples of the most mentioned game features discussed by the children co-designers during the study workshops and the post-workshop interviews.

Table 6.9. Game features suggested and discussed by the co-designer children.

Game features	Co-designer children comments /quote
Customize Game Character	<i>I cannot play a game that does not support this feature.</i>
Characters representing different cultures	<i>Newcomer kids can use this to show and share different customers about their culture, encouraging other kids to learn about it and accept it with time.</i>
Avoid inappropriate language in the chat	<i>We also want the chat function to be monitored because if it is not, people could be toxic. And these are just Newcomen children, and they might not be able to handle that</i>
Create friendship-making spots in the game	<i>For example, we create a special bench seat in the school. This is for any student who wants to make new friends; it is like a place to start a talk- I wonder if you can have something like this idea in your game.</i>
Create storytelling station	<i>The game should include a place to tell or share a story or to read other kids' migration stories, and this can be useful to learn about these experiences through the beautiful world of reading.</i>
Sharing progress with other kids	<i>We learn from others, and we love to share our experiences with others. So, it is important to share and be proud of what we learn with our family and friends.</i>
Ability to invite other players to join the game	<i>I usually get invited by my school friends to join their favourite games, and I like to invite them to try out this game. So, I feel this is smart to talk about our cultural values with our friends through the game.</i>
The game environment should represent children's origin and the new place of living	<i>I like to include country flags or major attractions from my country, and I also like to see other kids' values and favourite places.</i>
Include a short tutorial of how to play the game	<i>It is a good idea to help kids know about the game, but as long as this tutorial includes a skip button, I like to figure things out by myself first.</i>
The game should be challenging and fun to play	<i>Including ongoing updates or new changes.</i>
The game should be continuous like a multi-level or never-ending	<i>Have the game be never-ending and unlimited levels, or when it ends, it shows a message that keeps you tuned up to try other levels or challenges.</i>
Getting rewards points	<i>This would be fun, so a player needs to work to get it.</i>
Giving players educational advice by voice and text	<i>I like to get advice whenever I have such a tough time or if I made a wrong choice.</i>
Include obstacles (e.g., traps, puzzles, etc.)	<i>Games without obstacles are not good; we like to have obstacles like roadblocks, getting lost in a jungle, or survival games.</i>
Allowing the player to walk through the given scenario.	<i>When I have options, I feel I have control of what I am doing; even in this game, this could be helpful to make a player make choices and realize the consequences of these choices. It is a real-life experience...</i>

- **Participants' Thoughts about Game Features**

We asked the children to rate their preference for some selected game features, and their responses are as summarized in Table 6.10. Overall, most children prefer to consider these game features according to the ones with the highest level of agreement.

Table 6.10. *Participants' opinions of selected features that may be included in the social, educational game.*

Game Features	Participant's response
The game starts with a short tutorial video.	56% strongly agree, 36% agree and 8% are on the borderline.
Getting rewards points.	58% strongly agree, 42% agree.
Giving players educational pieces of advice by voice and text.	72 % strongly agree, 24% agree and 4% are on the borderline.
A game having several levels.	64% strongly agree, 36% agree.
Including training levels to support the player when they most need it.	56% strongly agree, 44% agree.
Being able to choose a player partner.	61% strongly agree, 39% agree.
Characters representing different cultures.	67% strongly agree, 33% agree.
Include obstacles (e.g., traps, puzzles, etc.).	36% strongly agree, 58% agree and 6% on the borderline.
Allowing the player to walk through a scenario and decide what and how to do it.	68% strongly agree, 24% agree and 8% are on the borderline.
Giving players options for taking action.	60% strongly agree, 24% agree, 11% on the borderline and 5% disagree
Ability to share your stories.	36% strongly agree, 48% agree and 16% on the borderline.
Being able to share game progress with others.	55% strongly agree, 41% agree and 4% on the borderline.
Ability to add friends to join the game.	68% strongly agree, 28% agree and 4% on the borderline.
Losing points if players make mistakes for the first time. Instead, they should be able to try again.	36% strongly agree, 40% agree, 20% on the borderline and 4% disagree.
Other features such as multi-level or never-ending.	32% strongly agree, 60% agree, 4% on the borderline and 4% disagree.
Including a final quiz to see players' understanding of what they learnt from the game.	24% strongly agree, 68% agree, 5% on the borderline and 3% disagree.

As part of the sessions, the children were asked how they thought communication between the players within a game could be improved. They came up with some suggestions. It was suggested that there be three types of interaction: videocalls, voice calls and text messages. However, some children did not like the idea of showing faces through the game unless they used virtual avatars that could be personalized and used to make the communication feel closer while at the same time avoiding showing faces.

The children mentioned that they like to have a tutorial as an option, but they like to immerse in the gameplay and explore, and they can see what happens. Therefore, the game should be designed in a way that provides them feedback on their actions and then they can evaluate what to do next or how to achieve a specific task accordingly.

One participant said, *“Each time you complete a level, you would receive a message like congratulations, you have now learned how to deal with real-life situations, etc.”*

6.3.5. What can we learn about the process of running co-design workshops through some examples with newcomer children?

We analyzed workshop and post-interview data to answer R7, using a similar method to the previous questions. After three rounds of coding, the first round of the participants’ responses were categorized based on what we learned from the process of these workshop co-designs. Next, the learning process of running workshops was coded. Lastly, the major themes were identified: learning lessons; challenges/limitations; and special consideration. The main steps taken to examine research question R5 are summarized in Figure 6.17.

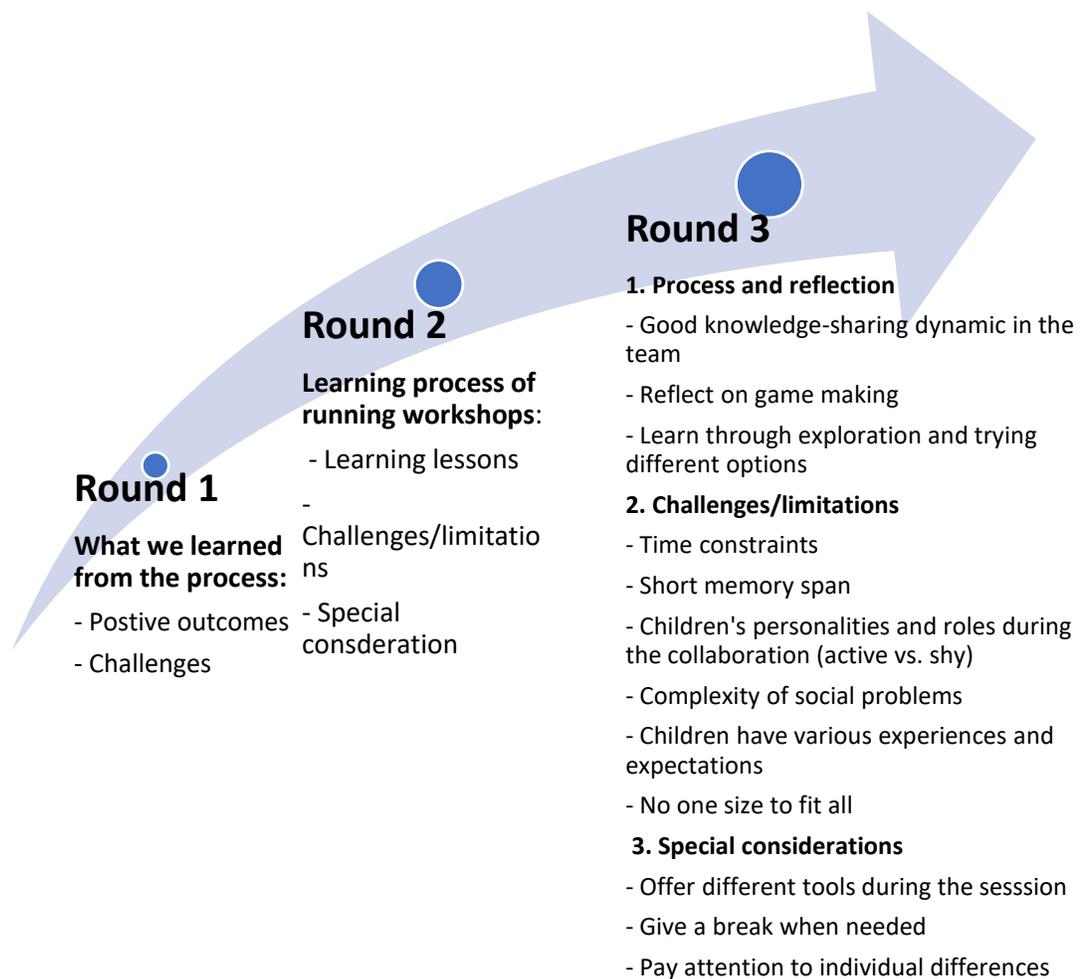


Figure 6.17 Main steps in the analysis of R7.

Summary of Analysis and Findings for Research Question 7

Table 6.12 shows what we learned from the workshop co-design process. The learning about the process of running such workshops was sorted into three main categories: Process and reflection; Challenges/limitations; and other special considerations.

Participants in the study found co-designing a positive learning experience. As part of the process, teams shared knowledge, reflected on game-making, and learned through exploration and trying out different options. Our results match the previous literature, which showed the pivotal role of the child as a “process designer,” in collaboration with children through designing a PD process (Benton, Vasalou, Khaled, et al., 2014; Ritterbusch et al., 2020; Schepers, Dreessen, & Zaman, 2018). However, our study

workshops increased our understanding of a particular research group that has not been adequately studied. The lessons learned throughout the workshop process can assist those conducting further work with and for newcomer children, including advice such as offering different tools during the session, giving a break when needed and paying attention to individual differences.

Table 6.9 Learning about the process of conducting co-design workshops that occurred throughout the workshops.

Learning from the co-design workshop process	Occurrence#	%	Learning from: A. participants B. our observation & results
1. Process and reflection	-	-	
- Good knowledge-sharing dynamic in the team.	33	35	B
- Reflect on game making.	29	31	A B
- Learn through exploration and trying different options.	31	34	A
Total/ average	93	100%	
2. Challenges/limitations	-	-	
- Time constraints.	12	12	B
- Short memory span.	9	9	B
- Children's personalities and roles during the collaboration (active vs. shy).	21	20	A B
- Complexity of social problems.	14	13	A B
- Children have various experiences and expectations.	27	26	B
- No one size to fit all.	21	20	A
Total/ average	104	100%	
3. Special considerations	-	-	
- Offer different tools during the session.	12	33	A,B
- Give a break when needed.	7	19	B
- Pay attention to individual differences.	17	47	B
Total/ average	36	100%	

Details of Analysis for Research Question 7

In the following sub-section below, I describe and discuss the overarching themes and insights related to Q7 in details:

1. Process and Reflection

The process of co-designing with newcomer children was a useful learning experience for the children who participated in this study. This process comprises the knowledge-sharing dynamic in the team, reflecting on game making, and learning through exploration and trying different options. Past research revealed that a co-design process offers innovative and creative solutions; it can also be seen as a process of knowledge sharing and creation, which gathers the skills and experiences of multiple participants to achieve a novel solution (Vaajakallio et al., 2009).

We observed children negotiating through interactions and designing game ideas with other children in the groups. At the same time, some co-design aspects may be challenging for some children, such as staying on task and understanding abstract concepts. We dealt with that by taking care to enable all children to participate and ask for clarification and offered explanations when needed.

In terms of the process, children participated in ideation and brainstorming to come up with game goal elements to solve selected social adjustment problems. Then, they discussed their game features and storyline preferences, evaluated the overall game ideas designs and presented their group work. Our overall observation indicated that children were positive and engaged in the co-design workshop activities, as shown by the following participant quotes:

I like the process of creating a game with a bunch of kids in this workshop; I like brainstorming and designing making the most; I felt that when we work in our group, we can make things better.

We share our experience and knowledge, which lead to many useful ideas, and the good thing is that we try and discuss the different options of the game idea and features.

2. Challenges/Limitations

- **Time Constraints: Prioritize and Structure Co-Design Activities**

Pre-planning the goals and activities of this co-design research was extremely helpful. As a result, the facilitator was able to keep participants on track for each session. For co-design study, recommendations include examining the workshop activities, encouraging ideations and adding practical design constraints, all of which would increase children's focus, improving the quality of collected feedback. Furthermore, a meditation session at the beginning or in the middle of the workshop would also be beneficial, especially when co-design activities last longer than 30 minutes. Our last two workshops included a meditation break, and the children's attention spans improved compared to the previous workshop.

Previous research examined how social environments can support collaboration through co-design and how to better structure such activities, highlighting the importance of collaboration and its impact on action-research participants (Alvarado & Díaz, 2015; Calvo & Sclater, 2021; Giaccardi, Paredes, Díaz, & Alvarado, 2012), all findings that align with the experiences of the researcher in this study.

- **No One Size Fits All**

During the co-design, we observed some differences in the design preferences among the participants; this result is normal, reflecting individual differences and the wide experience of humans. As such, designers need to be aware of this and support different design styles.

These results align with previous research that showed that in co-design, there is no one size fits all technique; rather, co-designers employ a variety of methods and strategies for including stakeholders as design partners, depending on the project's nature and the stakeholders involved (Boulicault, Phillips-Brown, Kory-Westlund, Nguyen, & Breazeal, 2021; Gooberman-Hill, Horwood, & Calnan, 2008).

- **Short Memory Span**

A few children seemed to struggle to stay focused, as one might expect when working with this age group. Even though this was not a surprise, it serves as a good reminder of the facilitator's crucial role in the co-design process. The facilitator contributes to the design, but they also ensure that the children do not lose focus. As such, children were frequently reminded of the research goals and their role in co-design. Some children were unsure what to do in Session 1, and one child asked, "Excuse me. Could you tell us how we are going to create these social games?" In addition to explaining the concept of co-design, the workshop's problems or tasks were displayed on a Google Jamboard during the session so that children could keep track of what they were working on. Observer parents told us after Session 3 that 60-minute sessions were too long for children of this age to stay focused, so we gave the children an option to take a quick 10-minute break in the middle of the session to ensure they could move around and relax, plus stay focused for the remainder of the workshop.

- **Children's Personalities and Roles During the Collaboration (Active vs. Shy)**

Participants in this study were aged 9–12-year-olds and had not yet been involved in gaming co-design experiments. Generally, the children were motivated and showed positive signs of collaboration. Nevertheless, we observed the impact of children's personalities and roles during the collaboration; in a few cases, the more active children appeared to lead the team activity while the shy children stayed quiet. However, the facilitator observed such dynamics closely and reminded the children that it is vital that every child take a turn and share their thoughts. Therefore, we encouraged equal participation by asking every child to share and present their ideas. Similarly, Schepers et al. (2018) explore the role of children in a co-design process based on an empirical participatory study named 'Making Things' with 60 children aged 6–10 and eight youth workers. The case study showed that engaging with children provides a way to make sense of children's interactions with each other, designers, tools, and their context, which are

essential to the emergence of the children's role as a 'process designer,' which involves a collaboration with children for co-designing in the PD process (Scheepers et al., 2018).

- **Complexity Of Social Problems**

Social adjustment problems are complex. For example, newcomer children's identity formation is impacted by several social, cultural, emotional, and economic elements related to their transition processes and that shape their identities. For example, some researchers note that the integration of minorities and socioeconomic inclusion within the Canadian social fabric are critical matters that still need to be addressed for the current migrants and newcomers (Madibbo, 2008). Nevertheless, several scholars have shed some light on the identity formation problems among newcomer adolescents (Ngo & Schleifer, 2005; Sarros, Reed, & Hartican, 2006).

- **Children Have Various Experiences and Expectations**

Designers should help children understand how their work contributed to the final design. As such, each time we checked in with the children, we made sure to tell them how their work had impacted the design process. Further, each stage of the co-design process should be explained. As the research shows, this can ensure openness and transparency in the design process of child-centred interaction in designing games (Tan, Goh, Ang, & Huan, 2011).

3. Special Consideration

- **Offer Different Tools During the Session**

In designing, creation tools provide an engaging stage for constructing and expressing different ideas. The Jamboard was a good starting point for ideation, and the participants began to generate ideas using sticky notes and some simple drawings. Two groups chose to use Google Slides to make a simple minigame, and they asked the facilitator for extra

time to complete their designs and share them with the researcher after the workshop. Other participants hand-drew their designs, and they shared their drawings with the researcher.

- **Abstract Activities are Challenging for Children to Grasp**

The analysis revealed that some of the participants were confused by the abstract nature of some of the design tasks at various points in the design process. The children did not always limit their suggestions to the game's purpose. Their suggestions sometimes expanded the focus of a single game to include a variety of themes—this was to be expected, but when co-designing for a specific problem, the designer team should stay focused on that particular problem, and if the participants have any additional suggestions, they should be heard at the end of their task. This approach was necessary to ensure that the children remain focused and were productive in solving one specific problem at a time.

- **Virtual Learning Environment**

The experiment was conducted virtually using the Google Meet platform, and the design task was connected to the learning practices and the available virtual tools such as Jamboard and Google Slides. While the children were excited and participated well, it seemed that the virtual learning environment was more challenging compared to the face-to-face learning mode. PD entails many challenges, especially when children are involved. Moreover, due to the recent COVID-19 pandemic, further barriers to PD with such groups arose during this study. Among the key barriers were the emergence of social distancing and the implementation of government-imposed restrictions due to the added risk posed for children and families vulnerable to COVID-19 (Constantin et al., 2021; Dong, Cao, & Li, 2020).

Fortunately, the workshop sessions took place after several months of virtual learning as the primary learning method due to the COVID-19 pandemic school closure. We noticed that the participating children were very comfortable using technology, and they even offered help and suggestions in this regard when needed. The children's familiarity with virtual school requirements was pivotal in successfully conducting this study, especially in challenging times. Also, the virtual meeting setting and having the

participants on live mode and using their cameras most of the time helped ease the collaboration and keep them engaged.

6.4. Discussion

Our main objective was to examine the roles, beliefs and attitudes of newcomer children co-design and evaluate computer video games that would assist them in dealing with pressing social adjustment problems in an engaging and meaningful way. As part of this section, we consider the co-design of social adjustment games. We also provide guidelines for designing with and for newcomer children and synthesizing the learning lessons and observations associated with co-design workshops, which may be valuable for researchers conducting future co-design studies with newcomer children. Finally, we discuss the study's shortcomings and summarize its findings.

6.4.1. Co-design Social Adjustment Games

Throughout our co-design study, we focused on addressing selected social adjustment problems collectively using the making games as a connecting platform that facilitates solving such issues while maintaining children's engagement and ensuring the process is fun and intuitive. This aligns with previous research about how problem-solving can be learnt through making. Also, traditionally, problem-solving skills are taught to children through computer programming and, more recently, game design (Akcaoglu, 2014).

It was imperative to conduct workshop sessions with children to develop social adjustment games that achieved the following learning goals: a) The game should serve as a motivational tool to encourage newcomer children to learn and participate; b) The game should enable players to recognize the connection between their actions and the larger social contexts in which they live; c) The game should emphasize social adjustment as a key component of fitting in the real world, and how to practice it; d) The game should be able to teach concepts such as identity, fitting in, social withdrawal, and how essential it is to adjust to the local community; e) The game should give the players the opportunity to practice social skills (e.g., cooperation, negotiation, mobilization, problem-solving, giving

back to the community, etc.); and f) The game should reflect both the children's own culture and the new culture to ensure that both are appreciated.

We found that newcomer children were actively involved in the co-design process and engaged in the discussion as we observed them elaborating on each other's design ideas and their own. Also, the facilitator played a vital role in encouraging this by asking probing questions of the children during the activity. Even when the children made unclear statements in recordings, the facilitator often asked them to clarify or add more detail to their suggestions. For example, in Session 4, children elaborate on their design options of designing an anti-bullying social game. One said, "when design an antibullying game there are different level of game play, as bullying takes different forms, so a plyer needs to pick and chose, and a game need to support theses various situation".

Our study results regarding the importance of co-design in fostering the newcomer children's inspiration and motivation and empowering them align with previous PD research (Benton, Varotsis, & Vasalou, 2019; Hussain, 2010; Iivari & Kinnula, 2018; Liebenberg, Jamal, & Ikeda, 2020; Light, Page, Curran, & Pitkin, 2007; Melo & Baranauskas, 2003; Read, Fitton, & Horton, 2014; Sanders, 1999; Van Mechelen, Laenen, Zaman, Willems, & Abeele, 2019).

In addition, our study found the importance of leveraging the co-design techniques in facilitating children's engagement and expressing their feelings and migration experiences. For example, Brown et al. (2020) conducted a scoping review to explore what is known about participatory visual research (PVM) with newcomer children. The review searched nine databases, screened 692 articles, and included 21 articles for synthesis and analysis. Five common and connected areas were identified as important when envisaging, planning and conducting this type of research with newcomer children. The researchers synthesized the reviewed literature and found that PVM offers an opportunity for children to communicate complex feelings and disrupt discrepancy discourse; participation in PVM research is vastly reliant on varying cultural, economic, and relational factors; and that offering a variety of data collection activities enables deeper engagement and good quality data (Brown et al., 2020).

Our observations and analysis show that children talked about various school initiatives supporting newcomer children's social adjustment. These results are supported by previous research that indicate the importance of school intervention approaches to support social inclusion. In an ideal world, all schools would be diverse; integrate cooperative, group-based learning; and facilitate positive interactions between students with different backgrounds and characteristics to foster social inclusion (Caidi & Allard, 2005; Mamatis, Sanford, Ansara, & Roche, 2019).

In terms of guidelines to design educational computer games in the context of social adjustment, we found that there is a need to engage newcomer children in all stages of the design process and include other local children and schoolteachers to ensure that any design solution encompasses diverse expertise and the different viewpoints of the stakeholders who offer support to newcomer children or interact with them. In addition, our study confirms previous research that showed participants' input could lead to new and unexpected directions in the design of a project (Guha et al., 2013). Co-designing educational social adaptation games, on the other hand, comes with its own set of challenges. For example, many co-design examples in the literature involve having children create low-tech prototypes by drawing or sculpting, then connecting and combining those prototypes (Guha et al., 2013; Yip et al., 2013).

Based on our observations of the participants' interactions during the educational game co-design, we found that videogames were cited as a favourite pastime by most of the children who took part in the study. Fortnite, Minecraft and Roblox were the most popular videogames cited, with more than one child mentioning them in every session. In addition, the children discussed different game genres that could create social adjustment games. However, children are against the use of Fortnite in the context of social adjustment because they believe that it is too violent for the environment and could have negative psychological consequences for newcomer children who have a variety of social adjustment issues. Similarly, prior studies have indicated that violent games, and a large amount of game-playing, are related to problematic academic and behavioural outcomes, whereas educational games may result in positive outcomes (Hastings et al., 2009;

Willoughby, Adachi, & Good, 2012). Additionally, previous studies show the importance of choosing the right educational video games that prevent violence to enhance children's gaming and learning experience (Granic, Lobel, & Engels, 2013; Toh & Lim, 2022).

The children suggested educational games such as math, trivia or even logic games to teach children various social skills and be exposed to indirect advice while making learning fun. On the other hand, some participants believe that these games could become monotonous over time and should be made more appealing to children to keep them interested. Other categories and genres were mentioned, but not in all sessions and sometimes just by one or two children. Some of these were collaborative building games such as Minecraft or animal-care games in which players feed and play with virtual pets and interact with other players in the game to reach goals. For the latter, participants suggested adding social adaptation advice to these games so children could learn from each other about how to deal with specific situations. Besides suggesting games, the participants also said it was important that players receive feedback from the games while playing them. These results align with those of Tan, Goh, Ang, & Huan (2011), who employed child-centred interaction to design an interactive game for Social Skills Intervention. Specifically, they developed a game called 'SocialromeR' that aimed to provide an engaging and educational environment for children aged 9–12 to improve their social skills.

6.4.2. Guidelines and Learning Lessons to Co-design with and for Newcomer Children

Our observation and experience of co-designing with and for children corresponded with previous research that showed children of the same age as our research target group could participate effectively in such co-design activities (Mazzone, Read, & Beale, n.d.; Melonio & Gennari, 2013; Ramos-Vega, Palma-Morales, Pérez-Marín, & M. Moguerza, 2021; Vaajakallio, Lee, & Mattelmäki, 2009). Further, our findings confirmed prior research that this age group is old enough developmentally to perform co-design activities but young enough to think like children (Guha et al., 2004). In addition, we found that co-designing educational games with and for newcomer children can potentially help by incorporating children's cultural and social interests, empowering children to share their stories, and

allowing them to maintain and define their identities. Fostering these elements can immerse newcomer children into social adjustment discussion and then enable them to be creative and successful in their new way of living. These results are also supported by the literature (Ang et al., 2010; Chen, Lien, Annetta, & Lu, 2010; Iivari & Kinnula, 2018; Kirkland & Williamson, 2010; Speek & Van Mechelen, 2018). Throughout our observation and analysis, we identified a few key co-design guidelines and learning lessons regarding working with newcomer children. These were obtained via our study workshop facilitator notes, observer notes and post-workshop interview data. The following co-design guidelines are in the context of designing educational computer games to solve social adjustment problems that newcomer children encounter:

- **Initial Stage (Preparation and Setting the Design Tasks)**

The first step of this study was to conduct a literature review to examine various co-design practices in conducting research with children or newcomer youth in general. While there is scarce research on co-design of social and educational games with newcomer children aged 9–12, the co-design practices we identified still informed the design of our current study (Alvarado & Díaz, 2015; Costa, Rebelo, & Rodrigues, 2017; Fisher, Bishop, Magassa, & Fawcett, 2014; Mazzone, Read, & Beale, 2011; Melo & Baranauskas, 2003).

Participants must first understand how technology works before designing it (Bratteteig, 2013). Therefore, we found it helpful to spend the first ten minutes of the workshop explaining educational game design elements to the participants and the research goals. A pre-workshop package with learning materials and the workshop agenda was also sent to help prepare children for their workshop design session and explain the main aspects of co-designing a game.

Based on this research—and to ensure with children prior to the co-design activities—we recommend that the researcher volunteer with children prior to the co-design sessions and collaborate on activities unrelated to the research, such as in the role of homework helpers or by teaching them new tools such as coding with Scratch (or

something similar). In this way, researchers and children would have a chance to get to know each other in preparation for working together to become design partners.

- **Determine Appropriate Group Size and Meeting Time for Co-Design Sessions**

During our co-design experiments, we found that groups of 4–5 children was ideal to optimize these co-design activities and enable the full engagement of the children. Generally, working with fewer number children is better. As a result, a higher facilitator ratio would improve children’s participation, facilitate data collection, and make recognizing their ideas and contribution in the co-design process easier. These results align with previous research into co-design participant group size and how to tailor tasks to different groups sizes (Slattery, Saeri, & Bragge, 2020).

We held the workshops every Saturday because this was the preferred option of the parents, as the participants had no school on that day, and their parents were available to give their consent and assist in setting up their children for the workshops. In addition, because our study’s meetings were weekly, we were able to spend time reviewing the data in between sessions.

- **Pay Ample Attention to Children’s Preferences and Reactions:**

Co-design supports verbal, no-verbal communication and interpersonal communication (Durrant et al., 2013; Klofutar Hergersič, Pungerčar, & Zupančič, 2013). We found that positive nonverbal communication is essential when running a co-design activity with children. We observed that even though some participants may repeat the same ideas, it is crucial to acknowledge their efforts verbally and nonverbally and ask more questions to encourage the child to think aloud. Also, some children pointed out the importance of ensuring that the designed game should rely on non-verbal communication. When we asked why, the children said that body language is very important when communicating with them. Children use body language to learn how to relate to and get along with other people, which is a crucial life skill for children to develop. As such, the importance of the

communication mode was highlighted as valuable to gain deeper insights (Beleslin, 2014; Hasler, Salomon, Tuchman, Lev-Tov, & Friedman, 2017; Wong et al., 2021).

Similarly, other studies show that co-design supports verbal, non-verbal and interpersonal communication (Durrant et al., 2013; Klofutar Hergeršič et al., 2013). Also, we recommend that designers working with newcomer children pay special attention to nonverbal communication. In addition, it would be recommended that facilitators learn more about other cultures and their specific non-verbal communication to ensure engaging and successful co-design experiences with children from other cultures.

- **Ensure a Mutual Value**

Co-design activities should not only gather ideas from children but also children should benefit as well. The children in our study had the opportunity to learn about co-design and social adjustment knowledge, self-regulation and problem-solving. For future co-design studies, we recommend that children who want to participate in co-design activities should complete a learning task directly related to the workshop's topic. The first session taught me that children do not always have the foundational knowledge to complete a task (i.e., they do not fully understand what co-design is). Therefore, some pre-learning tasks would ensure that children are comfortable and fully understand what to expect from the workshop. Additionally, researchers should help children understand how their work contributed to the final design. Each time we checked in with the children, we told them how their work impacted the design process. Overall, it would be helpful to also highlight in advance that each stage of the co-design process should be explained to ensure openness and transparency in the design process.

- **Learning Lessons**

PD supports design thinking, social and emotional learning, and creative thinking; through PD, children's ideas are shaped, their creative thinking is supported, and their self-confidence and social and emotional skills are developed (Paracha, Hall, Clawson, Mitsche, & Jamil, 2019). Similarly, our study demonstrated that newcomer children were

involved in the design thinking process, as made evident by their co-designer contributions, such as role-play scenarios, game features, storylines, characters and adapting strategies.

Our observations and notes yield some key learning lessons from working with the newcomer children throughout this study, as summarized in Table 6.13.

Table 6.10. *Learning Lessons That We Observed Throughout The Co-Design Workshops*

Learning Lessons	Occurrence#	%	Learning from: A. Kids A. Our observation & results
- Children’s role as a ‘process designer’	23	7	B
- Co-design offers a learning opportunity	27	9	B
- Children’s interaction is key	31	10	A, B
- Increased confidence	21	7	A,B
- Positive relationships with design partners	25	8	A,B
- The importance of nonverbal communication	29	9	B
- Mutual benefits	19	6	A, B
- Support children’s self-discovery	30	10	B
- Children can give sound advice	35	11	A
- Children learn from game making	29	9	A B
- Children want a game maker tool/platform	24	8	A
- Engage teachers and parents in the design process	17	5	B
Total/ average	310	100%	

These learning lessons are synthesized and explained as follows:

- **Children’s Role as a Process Designer**

We observed 23 occurrences related to children’s role as a ‘process designer.’ We found that children feel like co-creators, not just users or test subjects. This result was mentioned in other studies that show children’s capability to have various roles in the co-design process (Garzotto, 2008; Iversen, Smith, & Dindler, 2017; Mazzone et al., 2011). Along with taking notes and observing the children during their co-creation sessions, co-designers should be prepared to provide feedback or guidance when needed. Finally, it is vital to gain deep insights and benefits from the co-design workshops by taking notes and observing children without interfering or influencing their experience.

Similarly, previous research has showed that children of the same age as our research target group could participate in such co-design activities (Mazzone, Read, & Beale, n.d.; Melonio & Gennari, 2013; Ramos-Vega, Palma-Morales, Pérez-Marín, & M. Moguerza, 2021; Vaajakallio, Lee, & Mattelmäki, 2009). Further, our research confirmed this age group is old enough developmentally to perform co-design activities but young enough to think like children (Guha et al., 2004).

Prior studies have enabled researchers to understand children's interactions through making things and how they can take on the role of 'process designer.' The process designer's role is put into practice in five ways: developing a research plan, developing events, engaging in play and exploring the field (Schepers et al., 2018). Similarly, Vasalou, Khaled, Holmes, and Gooch (2017) found that children spontaneously discuss game performance, content, action, and experience in "game talk." The game talk also facilitated a sense of playfulness and social engagement while also providing a new learning opportunity by sparking tutor- and student-initiated interventions.

Likewise, our study results found that children define the game design in their group. We learnt how to ensure children's engagement; how they discuss and construct a sense of belonging; and how they make design decisions on what to include and exclude from their design ideas. Most crucially, we observed the role of newcomer children in co-designing social adjustment games (what they think and learn, and how they reflect on the process).

- **Children's Interaction is Key**

In each design session, we observed the children's active participation. This result is quite similar to that of the child-centred game development (CCGD) approach utilized to guide the involvement and participation of 10–14-year-olds in game development (Alvarado & Díaz, 2015; Moser, 2013). It was evident that pre-planning the game co-design activities was exceptionally helpful to ensure the active participation of children.

Even though co-design is often seen as offering the co-designers full freedom to influence the product design, staying focused on a particular subject may limit full freedom.

Thus, it is important to maintain the children's attention on a topic while still allowing them to explore their creativity. To ensure the balance between structural and technical constraints, we pay enough attention to the workshop activities, encourage ideation and including design constraints. Those factors would improve the quality of gathered feedback by enhancing the child focus. In addition, if the co-design activities extend beyond 30 minutes, a mediation session is beneficial. We included a meditation break in our last two workshops, and the children's attention spans improved, all in which helped to maintain the sense of design freedom.

- **Increased Confidence**

As a result of observing their behaviour, we noticed that, as the workshops went on, the participants did not spend as much time reading or listening to instructions and rules, suggesting their self-confidence increased. This was evident when we asked if a tutorial should be included at the beginning of the designed game. Although most of them agreed that it would be beneficial, they insisted on having a skip button since they said they like to figure out how the game works by themselves first. In most interviews, children said they would not use the instructions unless they could not figure it out themselves. Additionally, they asserted that game design should be intuitive and aligned with other well-known educational games. This finding supports Bushnell's Law (Barton, 2019), which proposes making games easy to learn but hard to master. In other words, all games should be designed to excite players and encourage them to play, learn and have fun; however, whenever a game is too easy or too difficult, it becomes boring for the user. Therefore, challenges must be introduced gradually to get players used to the controls and strategy of the game.

Overall, PD supports design thinking, social and emotional learning, and creative thinking. PD methods help shape children's ideas, foster their creative thinking, and help them build their self-confidence and social and emotional skills (Paracha, Hall, Clawson, Mitsche, & Jamil, 2019).

- **Mutual Benefits and Supports Children’s Self-Discovery**

Co-design activities should gather ideas from children, but children should also benefit (Hansen, 2017). Children in our study had the chance to learn about co-design and social adjustment knowledge, self-regulation and problem-solving. For future co-design studies, children should have their scaffolded prior to the workshop via a learning task directly related to the topic. Our experiences in undertaking this research revealed that children do not always have the basic knowledge needed for such tasks (i.e., they do not fully understand what co-design is). Putting in effort prior to the workshop will mean children are comfortable and familiar with the topic before workshop the commences.

We found that newcomer tweens can be described as *identity explorers*. They want to be part of their peer group but still strive to discover their individuality. Research has shown that identity exploration involves “seeking and processing information in relation to the self” (Flum & Kaplan, 2006, p. 100). Therefore, when co-designing with newcomer children in this age group, children should be empowered to express themselves freely and creatively. We discovered the best way to do this is to set up structures and provide the children with technical insights on what is possible.

As participants described:

“Have levels and ladder board to be more intrigued to play and battle against other players to race up the ladder board.”

“The game should be never-ending and unlimited levels, or when it ends, it shows a message that keeps you tuned up to try other levels or challenges.”

- **Children Can Give Sound Advice**

Our observations of the workshops revealed that participants were able to offer valuable and practical advice through their discussion of making a game to help children make friends. For example:

- *“Try to make an excellent first impression and talk and play with people in the neighbourhood.”*

- *“Just be a good neighbour, and someone might want to be your friend, or you could introduce yourself and ask, you should never give up even if you know it might take a while but do not give up, keep going, and in the end, you will accomplish something beautiful.”*
- *“You are not the only one who is and went through this because most of us have been newcomers, you, me, your parents, so do not feel discouraged because, in the end, you will not be a newcomer for long, you can be whatever you would like.”*
- *“Always believe in yourself. If others try to discourage you or let you down, ignore them because what matters most is what is happening in your head, and the most important thing is; do not to give up and always be nice.”*

While children offered a range of advice, we found that they also accepted suggestions to modify this advice when they understood and were convinced of the reasons behind such adjustments. These results are rooted in research that indicates a child’s existing opinion will be systematically revised in response to another person’s advice. Also, our findings agree with prior research that children preferred a competent advisor as a source of future information (Rakoczy, Ehrling, Harris, & Schultze, 2015). Notably, our study also showed that children trust parents, schoolteachers and direct cousins for advice related to any problems they may encounter.

- **Children Learn from Game Making**

Our workshops’ success can be attributed to Participatory Design (PD) principles, such as play, cooperative and mutual learning, and design-by-doing. These components are well-established in PD literature, especially in the context of games (Arya et al., 2013; Calvo & Sclater, 2021; Deterding, Dixon, Khaled, & Nacke, 2011; Nicholas, Hagen, Rahilly, & Swainston, 2012; Yip et al., 2017).

Games designed for tween newcomers need to incorporate a certain degree of complexity, and the game should include levels to introduce different real-life scenarios related to social adaptation. We found that this point reflects the reality of the complexity of social adjustment.

For example, some participants describe this as, *“We understand that moving and living in a new country is exciting, but it is tough as we lost our connection with our relatives and friends. So having games to represent this reality is helpful, but the game creator should understand the process we go through and introduce these challenges nicely and easily so other newcomer kids can learn and be ready to deal with these problems.”*

Our results regarding the learning that can occur from making games are reflected in previous research that showed PD offers the ability to construct games, also known as constructionist gaming; by making games, Kafai & Burke (2016) argue, children can learn a range of technical skills and develop a better sense of community. Also, making games involves great potential to address the persistent problems of access and diversity in traditional digital gaming cultures (Kafai & Burke, 2016). This aligns with our results, which indicated that making games can be used as a vehicle to facilitate newcomer children’s learning about social adjustment and to support them in designing games they enjoy that represent their reality.

- **Children Want a Game Maker Tool/Platform**

In designing, creation tools provide an engaging stage for constructing and expressing different ideas. However, if we do not take into consideration what Sanders and Stappers have called a participatory mindset, then PD can be reduced to a collection of stand-alone tools and techniques (Sanders & Stappers, 2008).

During our workshops, we used Jamboard, which was a good starting point for ideation, and the children began to generate ideas using sticky notes and some simple drawings. Two groups also used Google Slides to make a simple minigame; they even requested extra time to finish their designs after the workshop and then share them with the researcher. Other children hand-drew their designs, and shared these drawings with the group. Many participants expressed a desire to use game-making tools to bring their ideas to reality, with one stating, *“I wish we had a game maker platform, so we could jump in and start putting what we learn and design together in an actual game!”*

Some children asked if they would be able to participate in the game's development and mentioned Scratch as an example of a game-making tool. Another student mentioned that he used to make games through Roblox, which is a platform that allows players to design and customize their games. Based on these useful comments, we believe that part of the solution in the future will be to offer a game-making tool or platform on which newly immigrated children can engage even further with game-making to design a particular social adjustment game or for other goals. For example, a free social adjustment game platform could be offered in schools and community centers that provide support to newcomers' families.

6.4.3. Limitations

As with any research, this study has limitations. Therefore, any interpretation of this study's findings should consider the limitations of the research. In terms of the literature review, while recognizing that it is not possible to include all studies in the area of co-design practice with children, we sought to focus on a representative variety of the different points of view on the related research that would be useful for contextualizing and understanding this study.

The researcher is not a game designer; however, he bridged this gap by designing the workshop materials and identifying several parameters based on the PD literature, plus consulting with a couple of game designers who reviewed and provided feedback on the workshop structure. Also, the researcher ensured that children who took part in co-design had complete control over design decisions, which is crucial to co-design research.

Due to the COVID-19 health restrictions, we had to switch this study to online mode. Online co-design with children adds some limitations to the study in terms of restriction of the workshop length and lack of face-to-face communication with the participants, a drawback that was pointed out by some participants. Nevertheless, the research team took reasonable steps to ensure a quality study was completed despite these obstacles, such as conducting a dry run to test out the workshop materials beforehand,

adding a meditation break in the middle of the co-design session to decrease online learning fatigue and ensuring children were engaged fully.

6.5. Summary of findings

This chapter investigated our study's claim that using a co-design approach can enable newcomer children to effectively design educational, inclusive social computer games for and with other children who could be at risk of social adjustment problems. We presented a series of co-design workshops to engage newcomer children in learning about game-co-design technology and exploring its potential to support social adjustment play experiences. During the workshops, newcomer children identified various game design requirements, other concerns and ideas for using game elements in the design of educational social adjustment games. Based on our evaluation of the co-design workshop, pre-and post-workshop questionnaires, and analysis of interviews with children, we found that newcomer children benefitted from this educational, social adjustment GBL solution, and they can contribute effectively as co-designers throughout the entire migration experience. Notably, they contributed to the process of co-designing educational social adjustment games by taking on the roles of experts about their own lives. Using our findings, we present several useful co-design guidelines for working with and for newcomer children. The participants contextualized and richly described their needs and requirements for educational games that support newcomer children's self-adjustment. This research may be helpful for future researchers and designers interested in conducting more co-design workshop studies related to newcomer children's social adjustment.

CHAPTER 7: Reflection And Re-Design

There are several definitions of reflection. Schon defines reflection as the practice by which experts become aware of their implicit knowledge base and learn from this experience (Schon, 2008). In McGill and Brockbank's pragmatic guide, they defined reflection as: "... a process by which experience is brought into consideration ... to achieve meaning and the capacity to look at things as potentially other than they appear (Brockbank, 2003, p. 105). Reflection on re-design has been studied and used widely in many disciplines (Endsley, 2016; Hopcroft, 1990; Sutcliffe et al., 2019). As such, we conclude this thesis project with a reflection and re-design to revisit, rethink, and reflect on this research's accumulated knowledge and experience.

This chapter looks back at the research presented in this thesis and what we learned from phase three to reflect on the co-design of educational computer social adjustment games. Then, we construct and present two games that we will continue working on upon the completion of this thesis. To achieve this, first we revisit and reflect on the thesis proof-of-concept game, *New Beginning*, and then also create a new game called *Together-WeCan*. We conclude with a summary and the next steps.

7.1. New Beginning

7.1.1. Overview

The purpose of the proof-of-concept game was to investigate the effectiveness of educational computer games as a tool to help newcomer children adjust socially. We developed an educational game called *New Beginning* to help newcomer tweens (9–12 years) learn more about a few selected behavioural issues. The game includes social behaviour advice focusing on bullying and personal space. The participants were assigned randomly to one of the following activities:

- a) Playing a computer game that contains behavioural advice about social interaction in a space fantasy story.
- b) Reading a brochure taken from Canadian school material related to the same topics.

To assess the effectiveness of the games, we used a set of six behavioural questions as an objective test of knowledge, while Likert Scale questions were used to evaluate the participants' subjective preferences. After analyzing the pre-and post-questionnaires for both the Game Group and Brochure Group, the data showed that the children's knowledge of social adjustment improved with a significant increase in the correct answers, with the Game Group showing even more robust results. Furthermore, while the brochure was easy to read, the children found the digital game more useful and enjoyable compared to the brochure. Hence, the study confirmed that educational games could be more effective and preferable in enhancing newcomer children's understanding of social interaction and behaviour in conflict situations, compared to other conventional mediums such as educational brochures. Although children were the primary target group of this study, the participants' parents were also allowed to express their opinions. They were positive toward using the digital game in our study because of its ability to keep children engaged and connected, alongside providing a safe place to simulate behaviours and adapt to the given situation that might otherwise be unavailable.

In this section, we reflect on the re-design of this proof-of-concept game to improve the game, integrate what we learn from newcomer children throughout this study, and validate the impact of integrating the learned lesson in the modified game design.

7.1.2. Original Design of the Proof-of-Concept Game Design

New Beginning 1 is an interactive educational and cultural video game. This video game was created especially for newcomer children aged 9–12. It contains some daily life behavioural advice in a fun, educational way. The game was developed in two stages: pre-production—developing the game's concepts and designs; and production—the actual asset collection and game development.

In the pre-production phase, the complete game was designed based on best practice from relevant research. Every aspect, from character to environment, was discussed, and decisions were made in the early stages, with the intention of using the game as a proof of concept; that is, it was the first iteration of the *New Beginning 1* game development. Thus,

we categorized the problems and advice we gathered from the cultural liaison officers and the relevant literature review and divided it into three phases. Undoubtedly, there were changes regarding presenting the advice and the appropriate action taken after each advice to properly represent that advice; those were discussed, and additional possibilities were explored, but the main concepts remained as planned and accepted by the officers. The game characters are summarized in Table 7.1.

Table 7.1: *The proof-of-concept of New Beginning 1 game characters.*

	<p>She is the main character. She should learn from the advice given to her to adapt better to the new environment.</p>		<p>He only appears to advise Sarah on level one. He came from Sarah's planet before her.</p>
<p>Sarah</p>		<p>Adam</p>	
	<p>It moves automatically toward Sarah when he senses her coming. The disturbance will hurt her when he touches her.</p>		<p>Barbarian is the first Helper in level three. He cannot be controlled. He gives Sarah the fourth piece of advice.</p>
<p>Disturbance</p>		<p>Barbarian</p>	
	<p>Sarah will meet him after she feels lost. She asks for directions, and he guides her on the right way to go.</p>		<p>In level three, he will give Sarah the fifth piece of advice. He cannot be controlled. Moreover, he does not move from his place.</p>
<p>Guider</p>		<p>Wizard</p>	
	<p>Sarah will meet the Police Helper in level two and inform him that she has seen the Armed Man. Moreover, he knows what to do in this situation.</p>		<p>Sarah will meet the Armed Man in the second level. He will stay in his place while swinging his sword.</p>
<p>Security Guard</p>		<p>Armed Man</p>	

New Beginning 1 Gameplay (goals, rules, obstacles, actions)

The new arrival character *Sarah* wants to adapt to the new planet C. To do so, she must follow the rules and avoid obstacles and do her best to adjust to the new environment.

The game is divided into **three levels**.

Level 1: *Sarah* meets *Adam*, who decides to support her to adapt to the new environment. *Adam* will provide *Sarah* with three pieces of advice.

Level 2: *Sarah* faces a dangerous situation. She sees someone holding a weapon, and she must move away from him and do as *Adam* had advised her to by telling an adult about the situation.

Level 3: *Sarah* is introduced to two other living groups: Helpers and disturbance. The Helpers will support *Sarah* by giving her three pieces of advice, while the disturbance will discourage her. *Sarah* must gain three "Advice Keys" to help her open the "Advice Door." At the end of each level, she will win a key. To collect the key, *Sarah* must pass through several challenges.

After this brief description of the *New Beginning* game's design development, we now turn our focus to evaluating the proof-of-concept study's findings, reflecting on the *New Beginning* game based on the co-design insights and guidelines, and concluding with a research hypothesis and open research questions for the new re-designed game.

7.1.3. Design Revisions

7.1.3.1 Reflection on the study Finding

The study identified the primary gap, which was the lack of investigation on GBL to help newcomer children in their social adjustment journey. The overall success of our GBL approach not only provides a positive answer to our thesis research questions listed in phase two but also is a decent indication that digital technology, in general, can be used effectively to help newcomer children, not just for behavioural interventions, but also in

other aspects of social adjustment. However, further research is required to address other technologies and social issues.

We also learned a few lessons and insights that can be used as guidelines for future studies:

- Educational games are appropriate methods for visual learners and children who enjoy playing games, potentially regardless of cultural background. This is also helpful in acquiring the approval of parents who may not favour too much screen time and playing computer games.
- Games are a friendly approach to educating newcomer children to respect social behaviours. Developing games with more universal themes that are not culture-dependent helps make games more applicable for newcomer children.
- Games should support a variety of subjects and characters, which are vital to providing enough appeal to children.
- Game customization (such as avatar, gender, etc.) is particularly important.
- We chose not to use a realistic setting to avoid unintentional harm for children who may remember negative experiences from their own life if subjected to a similar situation in the game.
- Easy control and use of games are essential. While children may tolerate a "hard" game if it is fun and valuable, we do not want to frustrate them.
- Making games more social not only increases their appeal but also helps with the learning as the goal is "social adjustment."
- A group of children mentioned virtual Reality (VR) and Augmented Reality (AR) through this research study, and we can see that providing such modalities may ensure the game's ease of use and offer extra attraction and engagement.

7.1.3.2 Reflection on the New Beginning Game based on the co-design study Insights and Guidelines

Our reflection on the re-design the proof-of-concept game is divided into a few themes as follows:

Improve the Existing Advice

In this section, we will list the original advice given in the initial game, *New Beginning I*, and then we will comment and suggest ways to improve the quality of that advice:

1. *“Each planet has its own rules, and we have to respect those rules even if it is different from our planet.”*
2. *“Personal space is the area immediately surrounding your body. Personal space can even be different from culture to culture. Getting inside someone's personal space can make them uncomfortable.”*
3. *“Do not fight back, even if someone wants to hurt you physically. Try to get away from him/her and tell an adult of what is happening to you.”*
4. *“Talk politely and pick your words carefully; make sure not to use expressions which may be understood differently in other cultures.”*
5. *“Do not get depressed if you feel that nobody understands you. Instead, try to tell your parents about your feelings and concerns; also, you can chat with your teachers.”*

Based on our experiences and collected insights from the co-design study, we found that the narrative of the *New Beginning* game can be improved further by incorporating a more personalized experience to make the game closer to presenting the reality of newcomer transition life. We understand that the game should be based in an imaginary, fantasy setting for good reasons. However, the story's narrative could still be developed and reviewed by a children's storytelling specialist to ensure it is age-appropriate and to increase its impact and relateness to newcomer children.

Another general comment is that the given advice can be further improved in several ways. First, advice can be included in the game story to come naturally as part of the conversation and thus avoid using a narrator, which many children may not like and could be distracted by. Further, it would be effective if the advice given in the story could be communicated in children's voices, with equal opportunity to present different genders.

Second, the advice may sound too abstract for this age group and it is difficult to know how children will perceive or comprehend such advice. The first piece of advice is an excellent example of how the tone is too abstract.

Third, the advice given should avoid assumptions, like assuming the kids know the culture; in fact, we should present the advice in natural language to avoid assumptions and ensure that children can interpret the advice correctly. Also, there is a need to consider the emotion of the newcomer children, which was noticeable during the workshops. Children do not like to be shown that their feelings or emotions are inadequate. This can be avoided by smoothing the language or wording of the advice. For example, instead of saying "Do not feel depressed," it could say, "If you feel upset or frustrated."

Ease of Use

During the co-design study, the children mentioned the importance of keeping the game easy to play and, at the same time, challenging enough to keep them motivated to continue playing. When we asked the co-designer children about the reasons behind that, they stated that the game interface should be intuitive and easy to learn for most players. Then, once they master the basics of the game, the game's difficulty or challenges could be introduced gradually; this way, we can ensure that the designed game is accessible and learnable by a newcomer child who may already be stressed out about the immigration process. The co-designer also emphasizes that introducing new and ongoing challenges should be considered; otherwise, the player may only play the game once and leave.

During the initial proof-of-concept game, it was noticeable that some of the children found that the game was difficult play, and that the brochure was easier to read and we explained the reasons behind that and how to solve it in Ch 5.

Also, to overcome this problem in the new re-designed game, *New Beginning 2*, we will make the game available on the mobile store so the potential participants can play the game on a familiar device to avoid technical issues. Also, we will run a technical test on the newly designed game to eliminate any potential errors. We want to validate the game's functionality and efficiency in learning about selected social, behavioural problems and not be distracted by technical issues that may hinder the children and researchers' ability to measure the functionality and efficiency successfully.

Game ideas and objectives

Sessions with newcomer children co-designer were crucial to determining the game's learning goals: (1) The game should function as a motivational tool to engage children in learning the appropriate behaviours; 2) Help game players make links between distinct actions and other social consequences of behaviours; (3) The game should induce reflection about social behaviour and how it can be applied in the newcomer children's context; and (4) The game should explore various social skills such as cooperation, persuading, negotiation, problem-solving and conflict solutions. The *New Beginning* game's initial design aligned with these objectives, but it needs to be fine-tuned to increase the game's impact. Also, further co-design sessions with children can define game elements that can meet users' needs, preferences, and learning goals generated by the newcomer children.

Game characters

Customizing the game character was one of the most emphasized features by the co-designer children; as such, the *New Beginning* game should enable players to personalize and customize their characters. Also, the children pointed out that these characters can be dressed up to represent the newcomer children's cultural background, which would be an excellent way to make these cultural signs visible and known by other players of the game.

Game levels

While the *New Beginning* game's levels appeared reasonable and were evaluated as such in the proof of concept, this could be improved by introducing different challenges and

obstacles together with the learning material that is covered in the game. The player can learn the pieces of advice in the first level and then explore, play, and be penalized if they do not apply what they have learnt in subsequent levels. As suggested by the co-designer children, players should, however, receive another chance or reminder before losing a point.

Game Features

Several desirable game features were identified by co-designer children and can be integrated into the revised *New Beginning* game, such as:

- Include a short tutorial of how to play the game
- Customize game characters
- Characters representing different cultures
- Create a storytelling station
- Share progress with other kids and ability to invite other players to join the game
- The game environment should represent children's origin and the new place of living
- The game should be continuous like a multi-level or never-ending
- Allow the player to walk through the given scenario and decide what and how to do it
- Give options to educate players in the game.

7.2. Together-WeCan

7.2.1. Overview

Newcomer children (the children of migrant families) go through a critical transition period as they integrate into a new society. They must deal with various external and internal conflicts that impact their personality, social interaction in the community, and academic life. The migration process can result in many personal and social problems if the newcomer children do not receive adequate and meaningful support (Alaswad & Nadolny, 2015; Gee, 2007; Lankshear, 2008). While several social services are dedicated to supporting newcomers (for example, in Canada, where this study is performed), most services are aimed at adults. Most importantly regarding this study, despite the potential illustrated in other areas, the role of emerging interactive technologies such as GBL, including cooperative games, in newcomer children's social adjustment has not been adequately investigated. Our research is built on the premise that children are willing to invest a great deal of their time in digital gameplay (Alaswad & Nadolny, 2015; Gee, 2007; Gibson, Aldrich, & Prensky, 2007; Lankshear, 2008; Prensky Marc, 2007).

To bridge this gap, we proposed and designed a 2D computer game prototype called *Together-WeCan* to assist newcomer tweens (age 9–12) to better adjust socially to their new way of living, focusing on interacting and collaborating with others. The game comprises teamwork skills advice, which the player may not be aware of, and we anticipate that it will improve their understanding of how to apply such skills in their daily lives when interacting with other children. *Together-WeCan* was designed based on: 1) Our ongoing research on co-designing educational computer games with and for newcomer children; 2) Application of the PLEX Playful Experience Framework (Lucero, Holopainen, Ollila, Suomela, & Karapanos, 2013), which includes 22 categories of playfulness based on previous theoretical work on ensuring pleasurable experiences of computer games; and 3) Using the main characteristics of effective teams (Larson & LaFasto, 1989). The game consists of three levels, and the primary goal is to teach

children the value of teamwork in solving problems. The children will learn collaboration skills throughout each level; for example, the turtles must cooperate to avoid losing their lives and overcome obstacles. They also learn how to collaborate to collect big and small stars, which are essential to continue their playful journey, as seen in Figure 7.1.

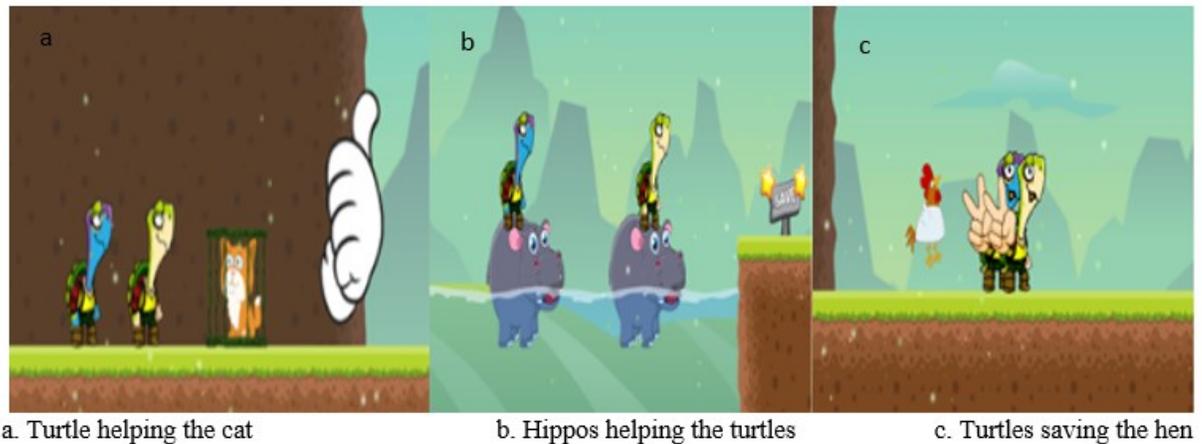


Figure 7.1. Proposed *Together-WeCan* Game Layout

To achieve the goal of the *Together-WeCan*, we focus on fostering the playfulness experience as it was highlighted as one of the main components of our previous co-design study. This approach aims to increase the potential role of the game in creating charming child user experiences and ultimately increasing the impact of the game in helping newcomer children. As such, we applied the Playful Experience Framework (PLEX) when designing this game. The features that make games fun have been examined by many researchers (Garneau, 2001), (Hunicke, Leblanc, & Zubek, 2004), (Koster, 2013) and (Lazzaro, 2007). The PLEX framework was motivated by Lazzaro's work, which makes computer games enjoyable and full of playful experiences. For this reason, we selected this platform over others when designing this game.

Following the PLEX Platform, the game should have an imagined experience that generates excitement derived from risk, danger, and keen senses. The players should be part of a group, take care of others, and share emotional feelings that connect them with their fellowship. This also aligns with the co-design results, in which the participating children emphasized the importance of working in a group and sharing this emotional

moment with the rest of the team players in a designed game. Many game features expressed by our co-designer newcomer children are also covered in the PLEX framework. The current framework consists of 22 Playful Experience categories, as shown in Table 7.2.

Likewise, the game should be tested for its ability to teach the essential tasks and be full of fun, making the player forget their physical surroundings. Also, the player should be given a specific task that requires them to follow certain regulations and cooperate with others to explore the game and reach a particular goal (Arrasvuori et al., 2011; Li, Van Der Spek, Hu, & Feijs, 2017; Lucero, Holopainen, Ollila, Suomela, & Karapanos, 2013).

Table 7.2. *Description of the PLEX playful experience categories.*

Experience Categories	Description
Captivation	Forgetting one's surroundings
Challenge	Testing abilities in a demanding task
Competition	Contest with oneself or an opponent
Completion	Finishing a major task, closure
Control	Dominating, commanding, regulating
Discovery	Finding something new or unknown
Exploration	Investigating an object or situation
Fantasy	An imagined experience
Fellowship	Friendship, communality, or intimacy
Humour	Fun, joy, amusement, jokes, gags
Nurture	Taking care of oneself or others
Relaxation	Relief from bodily or mental work
Sensation	Excitement by stimulating senses
Submission	Being part of a larger structure
Sympathy	Sharing emotional feelings
Thrill	Excitement derived from risk, danger

We also used the eight characteristics of effective teams that were identified by Larson and LaFasto, which are: 1) clear and elevating goal; 2) results-driven structure; 3) competent team members; 4) unified commitment; 5) collaborative climate; 6) standards of excellence; 7) external support and recognition; and 8) principled leadership (Larson & LaFasto, 1989). Several studies have adapted those eight characteristics, and most confirmed that they are key to creating a capable team (Cameron & Green, 2019;

Highsmith, 2010; Mayer, Davis, & Schoorman, 1995). Therefore, we suggest that for the *Together-WeCan* game to follow these eight characteristics of effective teams, it should adhere to the following criteria: The team who would like to work together must have a clear goal; the team should have a unified commitment with a results-driven structure; the players must have high standards that all team members understand; they should collaborate to reach the standards; the team should support each other; and finally, the team should have a results-driven structure.

7.2.2. Game Design and Development

We have designed a computer game called *Together-WeCan* based on our understanding and experience of the newcomer children through several studies of this thesis project and on the previous well-established literature that we reviewed. The game's goal is to assist newcomer children (aged 9–12) in better adjusting socially to their new way of living. The game is a Two-Dimensional (2D) educational video game that aims to help newcomer tweens learn more about teamwork skills and cooperation. The game comprises teamwork skills advice, which the player may not be aware of, and we anticipate that it will improve their understanding of how to apply such skills in their daily lives when interacting with other children.

More precisely, *Together-WeCan* is a cooperative game. It is not realistic in the sense that it represents a fantasy world. This was decided based on the inputs of newcomer co-designer children who emphasize choosing a fantasy world to avoid any unintentional harm to the game player, which could happen if real-life situations included in the game reminded children of previous stressful situations. As such, the events and characters of the game are imaginary ones.

Playing *Together-WeCan* will help build relationships with new friends and improve newcomer children's social networks. This will enhance those children's teamwork skills and develop the spirit of providing support to others. By playing this video game, the tweens will learn effective teamwork and help their community reach a better level of social adaptation. A computer game that looks like the games they play daily would

be considered a powerful tool for the newcomer tween to be engaged and cooperate with other students.

Goals

The primary goal in this game is to use teamwork to save the captured animals. During each level, the turtles must cooperate with each other to avoid losing their lives and to overcome the obstacles, which is also an important goal. Another goal is to collect big and small stars that are essential throughout their journey and for opening the cages.

Rules

There are two turtles (green and blue) that can be controlled using the keyboard keys. The green turtle can be controlled using the arrows (Up- Right -Left). The blue turtle can be controlled using the WASD keys (W=Up, A=Left, D=Right). Both turtles have a Boosting Power. This kind of power can be used to break the wooden boxes, which may block their way. Boosting Power can be activated by pressing the Shift + right key (right arrow for the green turtle or D for the blue turtle). The other animals and creatures in the game are not controllable. The mouse will only be used at the beginning of the game to start the game by pressing a start button on the game menu.

While the turtles are moving, they must collect three big stars to be able to open the cage, and they will be collecting small stars. The small stars are used to give Boosting Power and to exchange for more lives. There is one life for each turtle. Once any turtle loses its life, they both must restart the level. More lives can be purchased from the shop by paying with collected stars.

Challenges

Throughout the game, the turtles will face several challenges. First, staying together and cooperating with their moves is considered a challenge. One turtle cannot keep on moving if the other does not move behind the first one. Another critical challenge is to avoid the obstacles to stay alive. Touching or falling into those obstacles from either turtle will result

in losing their lives. The most frequent obstacles are Metal Spikes, Water Bonds, Holes, Bee, Rocky Blocks, Wooden Blocks.

User Interface & Story

Sam had a lovely farm with animals (Dog, Cat, Sheep, Donkey, Two Turtles) who like to play with each other in a friendly cooperative way. Witchy (Sam's neighbour) does not like animals and hates to see them playing with each other. One day, she captured the animals (except the turtles) and put them in cages. Sam and the turtles are in an unfortunate situation. The turtles wanted to save their friends, but they are slow and too weak to do so. So, Sam gives the turtles a magic drink; this drink makes the turtles fast and smart to overcome the obstacles and be able to save the animals.

Game Levels

The game consists of three levels. The turtles face different obstacles at each level and must be careful not to lose their lives. While moving at each level, the turtles must collect small stars, which improve their health, and big stars, necessary to fulfil their goal. At the end of each level, the two turtles reach a cage with an animal inside. When the two turtles touch the cage, the animal will be released, as illustrated in Figure 7.2.

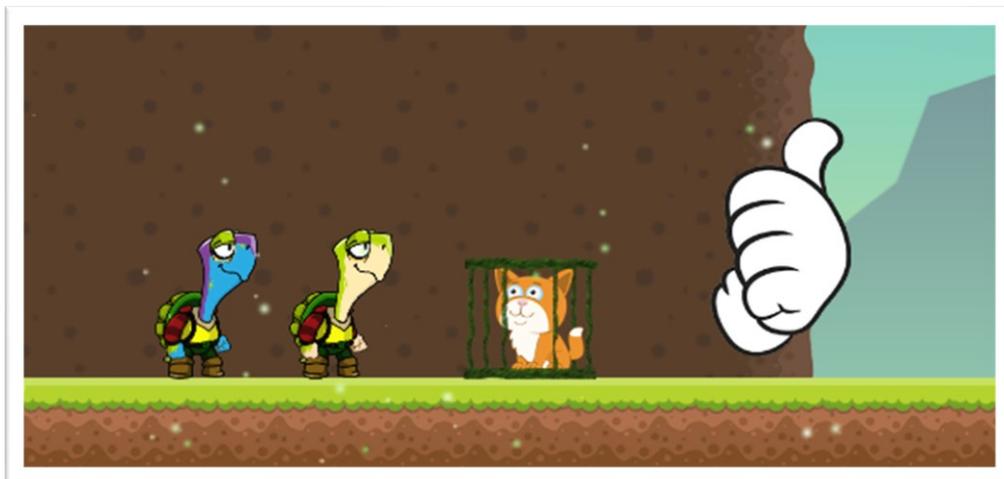


Figure 7.2. *The turtles heading to the cage to save the cat.*

🚩 Level one

At the beginning of level one, Sam (the farmer) will provide the first piece of advice to the turtles: “It is better to cooperate with each other to save the captured friends. You can only open the cages if you work together.” That advice will be given to encourage them to cooperate and work as a team to reach their goal in each level. Then the turtles start their journey together, collecting stars and jumping over holes. When they reach the stacked boxes, one of the turtles will use the power gained from collecting the stars and break the boxes (press Shift + Forward), then the turtles will reach the cat trapped in a cage. Both turtles should touch the cage together to open it and release the cat. Then they reach the thumbs-up sign indicating they have both finished level one successfully.

🚩 Level two

Level two starts with Sam providing the second piece of advice: “Our friend ‘Hippo’ will help us in this stage since we all have a common goal. This will encourage you to continue your journey.” The turtles will continue their journey, and they will get some help from two hippos who will help them cross the pond, in Figure 7.3. It shows the hippos and how they are helping the turtles. After collecting the required stars and crossing the obstacles together, the turtles will reach the chicken's cage and open the cage together.

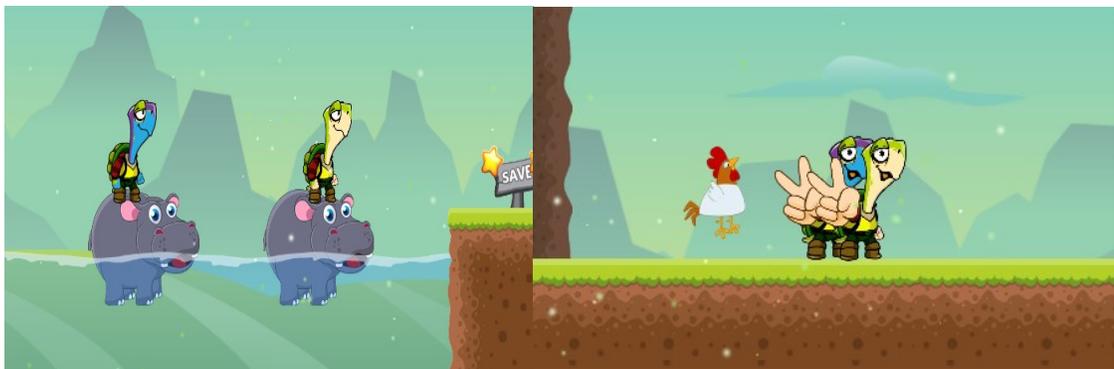


Figure 7.3. *Hippos helping the turtles (left), Turtles saving the chicken (right).*

🚩 Level three

Sam will give the third piece of advice at the beginning of level three: “In this stage, you will face new obstacles that require you to stay together to pass them. Both of you have an extraordinary ability, so use it to help you reach your goal.” The turtles will face different kinds of obstacles (Figure 7.4.), which require them to stay near each other and cooperate to pass them. If one of the turtles moves more quickly than the other, they may end up having to restart the level because one of them may lose its life.

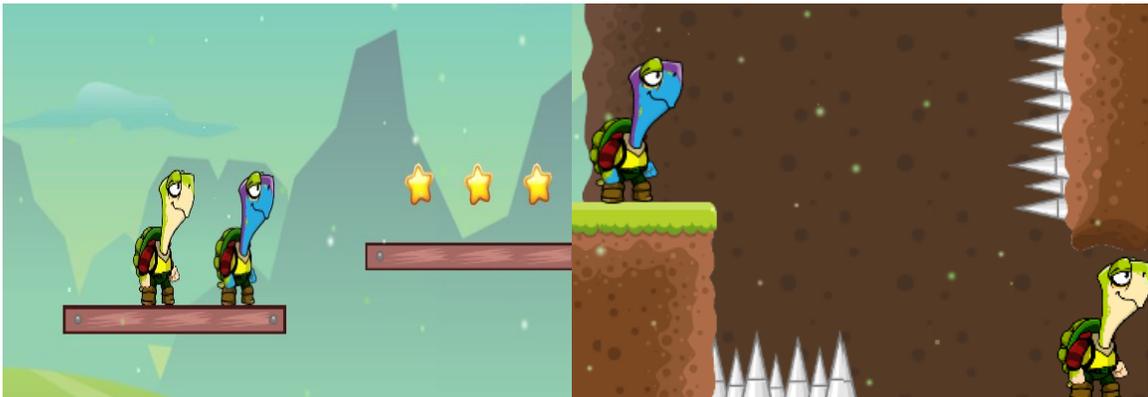


Figure 7.4. *Level three obstacles*

7.2.2.1. Game Development

To develop *Together-WeCan*, we used the Unity Game engine platform (Unity Official cite, n.d.). The characters and assets found in this game were imported from the Unity Asset Store. The assets were gathered to represent an ideal environment that the player does not face in this daily life (imaginary). This game has no shooting, violence or disturbing scenes since it is developed to be GBL for tweens. *Together-WeCan* is a cooperative platform game. The players can only control the two turtles using the arrows (Up- Right -Left) for the green turtle and the WASD keys for the blue turtle. Sam, the farmer, will appear at the beginning or restarting of each level and disappear once the player left-clicks the mouse. A dynamic camera was used, which follows the player while they are moving. To achieve this, the camera was given the necessary velocity to accelerate when the player runs and slow down when the player's movement slows down. The two turtles must be within the

camera borders; other than that, the turtles cannot move. That is why the two turtles must move with each other. If one of the turtles catches a star during the game, the star will disappear and be added to the total of stars found on the upper left corner of the screen. The cage was given the collide feature, animating it as broken only when the two turtles approach it. The wooden boxes will animate as broken then disappear once one of the turtles breaks it. The hippos will move up and stop if one of the turtles jumps on its back, which will help the turtles cross the pond.

7.2.3. Design Reflection

7.2.3.1 Reflection on How Together-WeCan Game follows PLEX Playful Experience Framework

Together-WeCan is an exciting imaginary game. The player's senses will be stimulated while playing this game because they will be captivated by its story. The game is full of action, which gets the player to forget their surroundings and test their ability to perform demanding tasks. The players who control the two turtles should demonstrate teamwork skills, take care of each other, and share emotional feelings that connect them with their fellowship. The turtles face some opponents and obstacles while searching for their captured friends. They have a significant task to finish each level to save other animals. The turtles will explore hidden paths through each level and meet helpers and enemies during their adventure.

7.2.3.2 Reflection on How Together-WeCan Follows the Eight Characteristics of Effective Teams

- 1 **The team must have a clear goal:** The team has a clear goal: to save the animals captured by the witch. However, they also should stay safe to meet their objectives.
- 2 **The team must have a results-driven structure:** The two turtles should cooperate to overcome the obstacles to reach the same result at the end of each level.

- 3 **The team must have competent team members:** The two turtles must be motivated enough to save the other animals, and they discover that they have extraordinary abilities (flying, rolling like a ball, jumping high, and others) to fulfil their task.
- 4 **The team must have a unified commitment:** Both the turtles have a unified commitment to save their friends from the witch and release them from the cages.
- 5 **The team must have a collaborative climate:** One of the game's features is that the two turtles should cooperate to reach the final goal at each level. If only one turtle arrives at the cage, the cage will not open. It needs two turtles to open the cage.
- 6 **The team must have high standards understood by all:** This game has no tasks dedicated to each turtle separately. They should both cooperate and wait for each other and overcome the obstacles so that they can both reach the end of the level.
- 7 **The team must receive external support and encouragement:** After the achievement of each level, the turtles will not only save the trapped animal but also get a "thumbs-up" as an encouragement to support them and motivate them to move on to the next step.
- 8 **The team must have principled leadership:** At the beginning of each level, the farmer will tell the turtles particular teamwork advice, which will help them cooperate to save the farm animals.

7.2.4. Summary and Next steps

In this chapter, we revisit the original proof-of-concept game and reflect on and redesign the game considering the learning lessons of co-designing with newcomer children. We present the original design and expand on guidelines of what should be altered to improve the game design, ensure the game is customized to the target group, and ultimately increase the game's impact. As such, we designed a new game called Together-WeCan based on some suggested ideas that we learned through co-designing process and working with newcomer children. Likewise, this reflection on redesign ideas presented in this chapter is

still iterating. Therefore, we will continue working on the following steps to hone and finalize the game design:

- Continue working on the design aspects of each of these two games (New Beginning 2 and Together-WeCan) in more detail.
- Conduct a heuristic evaluation for these with a group of game designers who work closely with children and invite other educators and Multicultural Liaison Officers to attend and be part of this discussion.
- Write a professional game design document of these two games.
- Run a pilot study with a group of newcomer children to check and validate the design of these games.
- Perform any required tweaks on the design game document.
- Finally, develop the actual game and test it with a group of newcomer children.

CHAPTER 8: Conclusions

In this chapter, we synthesize the findings and contributions of this thesis and its limitations. Finally, we discuss opportunities for future research that fit the current thesis's trends

8.1. Summary of Findings

This thesis introduced a GBL and co-design approach in the context of newcomer children's social adjustment. Three phases of user studies were implemented to gradually investigate the motivation and effectiveness of our educational GBL social adjustment solution. The three primary user studies results showed that our core hypothesis is held and using GBL for gamification of social adjustment activities, as well as using a co-design approach for generating customized social adjustment educational games, is feasible.

In *phase 1*, we conducted an extensive literature review about newcomer children's social adjustment problems, and we reviewed various digital technologies such as GBL, digital storytelling, and co-design technology in the context of newcomer children's social adjustment. The review identified a lack of research about GBL and digital storytelling, and co-design technologies in the context of newcomer children's social adjustments, despite potential identified in other areas. As a result of the literature review, we designed and conducted a primary study survey with newcomer children, their parents, and teachers to identify the social adjustment problems in Canada for newcomer children aged 9–12 years old. Our study confirmed several social adjustment problems: a) feeling loss; b) Feeling out of place (feeling not fit in); c) Bullying; d) Newcomer concerns about their peer's perspective and interest in newcomer kids' culture; e) Lack of cooperation skills; f) Insecurity about appropriate behaviour; g) Personal space. These findings are especially important in informing the focus of our thesis and the remaining work, regarding the most pressing issues that we learned from our study.

The results of *phase 2* establish that the approach of using GBL for newcomer social adjustment is fruitful and promising (Bani-Taha, El Kouzi, Arya, & Taylor, 2019).

The participating children showed great satisfaction with the social behaviour game, enjoyed the experiences of learning, and simulated appropriate social behaviour greater than traditional methods (i.e., the brochure). Also, participating children provided several comments and insights that we intend to implement when revising the *New Beginning* social adjustment game. Based on results of the first computer game study, the game features and interface will need to be adjusted (and fixed—e.g., provide a more customized game that reflects cultural perspectives of newcomer children; build 3D games instead of 2D) for more testing. These findings can inform the design of customized cultural inclusion social adjustment educational games and potentially other comparable applications in social integrations and educational contexts. As discussed in the first two phases of this study, we have answered research questions RQ1-3.

Phase 3 focused on co-designing educational computer games with and for newcomer children in addressing selected newcomers' children pressing problems. Examples of these problems that we learnt from phase one include: bullying and how to cope with it, not fitting with in their new way of living and social withdrawal, or lack of cooperation to interact with children from other cultures. The co-design phase provides a few benefits: 1) Creates a concrete understanding of ways of knowing and ways of doing co-design computer games with and for newcomer children; 2) Constructs design guidelines for educational, social adjustment games; and 3) Provides guidelines to work with newcomer children and offers a synthesis of children's experience throughout the co-design workshops regarding game ideas, goals, character, and game features to include in the future design of such social adjustment games for this target group. In *phase 3* we answered research questions RQ4-6. The co-design study showed the great potential of co-designing educational, social adjustment games with and for newcomer children. Also, we learned the benefits of using the co-design approach to hone the design of the game and immerse newcomer children in the process of the social adjustment topic, all of which were used in constructing the design guidelines and recommendations for research, schools and service providers who are working with or for newcomer children.

8.2. Contributions

Phase 1:

- Identification of a group of most pressing social adjustment problems among newcomer children aged 9–12. This problem was used to conduct the other thesis's user study, which is critical for two reasons. First, it allowed us to identify the most important problems of our research group before jumping to the solution. Second, it increases the impact of our research by focusing on solving problems identified by our targeted group directly, which helps us get to know our target research group closely.
- Enrichment of the social adjustment literature in general and an increase in our understanding of the social adjustment for newcomer children in particular by identifying and presenting these social problems among newcomer children from Arabic-speaking backgrounds, which has not been studied precisely before we did in this fundamental research.
- Collection of data via a questionnaire from three pillars (children, parents, and teachers) meaning children's insights are validated by their parents and teachers, which was not mentioned in previous studies.

Phase 2:

- Development of a game prototype called *New Beginning*, a social, behavioural game used to test and validate the thesis proof-of-concept study.
- Confirmation of the feasibility and effectiveness of computer games in solving social, behavioural problems
- Gathering of substantial insights and feedback due to the opportunity to test and validate our thesis hypothesis primarily with newcomer children. This contributed vital new knowledge about newcomers' ways of learning through

computer games, figuring out their preferences and how to construct research questions that were beneficial to guide phase three of this thesis.

Phase 3:

- Offering of a customized co-design workshop structure and material for newcomer children and devising of a group of game features and game ideas given the newcomer children's insights and preferences, which have not been reported before.
- Creation of a conceptual framework called WeCan, which is built based on previous children co-design research to guide the co-designing process with newcomer children aged 9–12.
- Construction of some guidelines to work with and for newcomer children, which can be used in a larger scope future study that focuses on doing research with newcomer children worldwide. Also, we offer a few guidelines for designing educational, social adjustment games with particular attention to the cultural perspectives of newcomer children.
- Reflection and re-design of the proof-of-concept game and construction of a new game considering our learnings from our research journey.

8.3. Limitations

There are several limitations to this study. Firstly, we acknowledge the burden that COVID-19 puts on our research, particularly the limitation of recruiting newcomer children and adapting to the online mode of study. For example, we experienced a delay in recruiting kids, and when we discussed with participants about their availability to take part in the study, some of them were hesitant, and they referred to the fatigue of being online for a long time. Some parents pointed out that their kids prefer face-to-face study mode over virtual mode. Also, some parents stated that they are trying to keep screen time for regular school activities only.

Secondly, the thesis user studies results focused on newcomer children from Arabic-speaking backgrounds and may not fully apply to all newcomer children from different ethnic groups. Therefore, our study focuses on customizing the design to meet the target group's cultural perspectives. In addition, every culture has its own identity and values, which are worth investigating solely to provide excellent customized GBL solutions to their specific social adjustment problems.

Thirdly, the time span for children is different from adults; this introduces some challenges in keeping the children on task for a lengthy time, and it sometimes influences the depth of insights. To remedy this limitation, we devised short activities and included a meditation break time to ensure that the children were focused and attentive to the tasks at hand.

Fourthly, we set specific inclusion criteria for our studies, which should be considered when applying its results to other comparable situations or cases. While we limited our participants to a specific group for logistic reasons that are common among research projects, this implies limitations when applying the findings to other groups. Arabic-speaking children of tween age have many similarities with other ethnic groups and ages, as discussed in Chapter 2. But there are also cultural and other differences. Our study is primarily suggestive rather than indicative of how the findings can be applied to other groups. For example, typically, to be considered a newcomer, the person must have arrived in Canada within the previous five years. However, our research specifies two years (as recruitment criteria) to ensure we would be working with newly arrived children and to focus on capturing their experience in the first two years of the transitional period. Also, this will increase the impact of our research in helping newcomer children during the most critical time of adjustment, which usually occurs in the first two years. Moreover, given that we are dealing with the same ethnic group, to some extent, the results could be generalized to future generations of Arab children. They can continue to work on what the older generation has done in co-designing social adjustment games once they are no longer newcomers after five years of their arrival time to Canada. Also, the study results may not

be applicable to newcomer children in all age ranges; our study applies only to children aged 9–12 years

Finally, due to the time-constraints of the study and the impact of the COVID-19 pandemic restrictions, we could not study all the identified social adjustment problems; as such, we instead focused only on selected examples of social adjustment problems. Therefore, it is recommended to investigate other social problems in future studies.

8.4. Future Research Opportunities

This thesis shows GBL and the co-design approach have a positive effect and efficiency in helping newcomer children with their social adjustment transitional process. Although the findings of this study indicate promise and feasibility, we have identified the following directions for our future research to fulfill its potential:

- Implement this research on a larger scale with different ethnic groups to examine further the hypothesis presented.
- Refine this research further to develop a social adjustment package that can be shared and introduced to school educators and organizations that support immigrants in order to broaden our research impact and help newcomer children to improve their social adjustment. Teachers and parent involvement is necessary to define what components (such as examples, guidelines, etc) are needed in such a package and how to make them.
- Apply a co-design study to a face-to-face setting once the COVID-19 restrictions are over and compare the results of virtual and face-to-face models.
- Develop more educational games based on the outcomes of this research to solve other social adjustment problems that we did not cover in this research.
- Investigate GBL and a co-design approach to design educational, social adjustment games using other emerging technologies such as VR and AR that could be effective in the context of social adjustment problems.

- Conduct a longitudinal study with newcomer children's groups to better understand their growing needs as they progress during their transitional period of migration.
- Consider using or developing a standardized questionnaire design to quantify and examine newcomer children's social adjustment problems. We believe that several study questionnaires can be used and expanded on to create a standardized measure that could be very helpful for larger-scale project(s) and serving an ongoing research purpose. This would be useful for comparison purposes throughout different target groups and various periods of study. As such, while development of these standardized measures (which requires longitudinal studies to test and validate them) was beyond the scope of the current study, this could form a future research direction.
- Expand the involvement of newcomer children toward other phases of the game co-design process and conduct a user study to validate the two new re-designed games that we presented in chapter 7.
- Based on our findings from the design experiments, make recognition of children as co-designers the foundation when exploring future research questions and conducting co-design studies with and for newcomer children.

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Appendices

Appendix A: Summary of Selected literature review studies for Phases 1-2

An overview of selected studies examining the potential of game-based learning and digital storytelling in the context of social adjustment of newcomer children

Technology type and Author	Study Focus	Description of technology/Methods	Conclusions	Gaps for improvement
Newcomer children: social adjustment and technology (K. E. Fisher et al., 2014)	Analysed co-designing interactive technology with immigrant teens.	Develop Teen Design Day.	Teens are competent partners in design. Teens can also help refine the design processes.	While they used a paper-based survey (n=575) in six Seattle high schools, the results and discussion need to be expanded. In addition, there is a need to explore and test their proposals with a formal evaluation process.
(Gallagher, Di Cesare, & Rowsell, 2019)	Explored newcomer families' thoughts on digital literacy.	Using a participatory program within two school communities to understand technology access and the nature and processes of families' digital lives.	This participatory project contributes to a great positive working relationship among the schools, newcomer families, and the local university.	While the work covers several areas, but the focus was broad. Not enough details were given about the children.
(Dunwell et al., 2013)	Scrutinized the use of mobile assistance for social inclusion and the empowerment of immigrants.	Generate feedback communicated through the game itself.	There are general challenges posed by assessing cultural learning and behavioural changes.	The proposed games were accessible by migrants registered with a non-governmental organization, excluding other nonregistered migrants' groups from participation.
(Oberhuber, Kothe, Schneegass, & Alt, 2017)	Explored how children handle a creative and complex, and playful task that involved AR technology and compared it to a traditional way	Focus on qualitative outcomes by supporting creativity, self-initiated learning, and structured working processes of the children.	Qualitative analysis suggests that AR technology could indeed be used to complement educational settings.	The study had an exploratory focus, which warrants to be expanded. In addition, the group sample size was slightly small, and only a descriptive statistical analysis was reported.

(Yohani et al., 2019)	Examined the psychosocial adaptation of Syrian refugee families with young children	Uses the RAISED Between Cultures framework to discuss their strengths. Community-based participatory research	As children and families adapt to their host country, educators can use these findings to identify families and children's strengths and challenges during early resettlement.	The research was based on interviews with families. Cultural officers were of Middle Eastern descent, but it would be more beneficial if the study engaged children directly in this work.
Game-based learning (Lee & Lau, 2018)	Analyzed the use of digital games for children's health.	Investigate the communication design and effects of serious games to promote and educate users about children's health concepts.	The use of serious games is a suitable means to deliver health promotion and education to children.	We recommend that the proposed serious game be tested from an HCI perspective to assess the usefulness, game design elements, and how it could be improved.
(Sousa & Rocha, 2018).	Discussed whether a new leadership style can emerge through a collaborative gaming process.	Measure the motivation, facilitation, coaching, mindset changing, and communication.	Game-based learning helps develop leadership styles and skills.	While the study questionnaire had content validity, its construct validity was based on a theoretical or conceptual justification. Therefore, it may be useful to follow up on their study with an applied experiment.
(Kirkland & Williamson, 2010).	Examined how classroom teachers define game-based learning, primarily because it affects their curriculum goals and cultural assumptions.	Develop two experimental projects in the UK (Teaching with Games; Computer Games School for Young People).	It is essential to consider cultural and curriculum assumptions in designing and implementing games before they become part of school education practices.	There is a need to justify these projects based on various cultural and curriculum assumptions. So, they can identify and validate them in greater evidence.
(Gouveia et al., 2014)	Used a serious game to teach various competencies related to intercultural and internationalization skills.	Develop a serious game called GLOBAL.	Without motivation, there is no learning, and games' engagement is hard to match with any other training methods.	The game needed further improvements to attain the desired results. Also, players mentioned that the game could become tedious and that the 3D models did not appear natural.

(Oosting, 2014).	Investigated parental perceptions and strategies in dealing with children's gameplay in the home.	Measure parents' attitudes towards gameplay. Qualitative research approach	Parents believe in having concise information about game content, including possible pros and cons.	The study results were promising, and they should be further validated. The small sample size makes it hard to generalize the findings.
Digital storytelling (Anderson & Mack, 2019)	Explored digital storytelling as a group narrative method for positive identity development.	Gather new insights and perceptions regarding the effectiveness of narrative tools.	Develops narrative tools that produce a coherent discussion and adaptive self-concepts contributing to a proactive identity system.	While the paper includes some details about a few six-week sessions, no formal participant evaluation of the proposed tools' usefulness. .
(Cullen & Metatla, 2018)	Developed a codesign study for children with mixed visual abilities.	Design and develop multisensory storytelling technologies.	Create a multisensory joint storytelling platform; present the outcomes and challenges of mixed visual-ability groups in participatory design.	Preliminary findings were based only on a small sample of 5 sessions. Not enough details or evidence.
(Eder, 2010).	They had discussions with children about such ideas as power, equality, respect, justice, community, and a sense of belonging.	Interviews elementary school children and analyses their responses.	Digital storytelling has many benefits for children, such as its ability to engage children in an in-depth and very descriptive manner, regardless of the topic.	They provide a qualitative analysis, but the paper should be expanded to review their ideas and values.
(Moutafidou & Bratitsis, 2018)	They are focused on the role of digital storytelling to enable ordinary people and marginalized communities to strengthen their voices.	Report on inductive stories. Theoretical framework	Identifies the ability of digital storytelling to act as a means for raising the voices of various social groups.	There is a need for a user experimentation evaluation study.
(Göttel, 2011)	Examined children's collaboration practices in storytelling environments.	Perform a contextual analysis based on a literature review of 13 research papers.	They present three understandings of storytelling within the reviewed articles (remote authoring, collocated	The reviewed papers were selected from reputable conference proceedings. However, the author does not consider other journal articles which may be potentially valuable.

<p>Other Emerging technology (Trapp, Teytelboym, Martinello, Andersson, & Ahani, 2018)</p>	<p>Explored machine learning and how it could be optimized to improve refugee integration.</p>	<p>Match refugees with appropriate communities through machine learning and optimization algorithms accompanied by complex data computation.</p>	<p>authoring, and enriched experiences). Has software suggesting optimal placements while giving substantial autonomy for the resettlement staff to fine-tune recommended matches.</p>	<p>Their software needs to be built on comprehensive analysis, including multiple objectives from different integration outcomes.</p>
<p>Bansak et al., 2018)</p>	<p>Investigated the use of a data-driven algorithm to improve refugees' integration process</p>	<p>Combine supervised machine learning and optimal matching.</p>	<p>Develops a flexible data-driven algorithm that assigns refugees across resettlement locations.</p>	<p>Subject to criticism due to other problems such as social segregation. Also, these tools are still in their early stage and require additional work and refinement to achieve higher positive outcomes.</p>
<p>(Liang et al., 2017)</p>	<p>Proposed a new hand gesture-based puppetry storytelling project.</p>	<p>Measure the improvement of children's competencies and motor coordination.</p>	<p>A novel digital storytelling system shows positive pedagogical results with children's narrating ability.</p>	<p>While the system's usability is preliminarily examined, there is a need to expand the evaluation with larger sample groups of children.</p>

Appendix B: Summary of Selected literature review studies for Phases 3

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
Selected paper from Nick Graham and his colleagues							
(Schneider et al., 2020)	How to design engaging games for children with Fetal Alcohol Spectrum Disorder (FASD).	10-week study (18 sessions 40 mines/session) with Eleven children were recruited from an elementary school (nine male, two female), ages 7-11. Children diagnosed with FASD participated in social exercise activities using the existing Liberi exergame.	-Observation -Thematic analysis -Data was analyzed using Braun and Clarke's. Reflexive thematic analysis process (Braun & Clarke, 2006).	The play of Liberi is structured as seven mini-games, which can be entered from a central island area. The island contains the shops where the game coins can be spent and portals that lead to the individual mini-games.	games for FASD be designed to have: -low cost of failure -avoid retracting options -account for taking breaks when needed -show progression in Rewards - enable cooperative play.	LIBERI: The game chosen for this study was Liberi, a suite of seven multiplayer games initially designed for children with Cerebral Palsy (CP) (Hernandez et al., 2014)	understand how children with FASD play digital games? How can this experience inform our research group's design of digital games? Also: the potential of leveraging off the shelf games
(Schneider & Graham, 2017)	Apply the concept of nudges ⁴ to keep players from going too quickly, and describe the	They added nudge-based feedback techniques to two pedal-to-play exergames, and data were collected:	A one-way repeated measures ANOVA	Gekku Race, more fast-paced, and the other, PlaneGame	This study participants were adults. Behaviour.		Learn from the design of the guidelines of nudge-based interfaces.

⁴ Nudges: Any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives.

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
	<p>-How effective are nudge techniques at convincing players not to over-exert?</p> <p>- What effect do nudge techniques have on players' immersion in the game?</p>	<p>1. the game itself logged Players.</p> <p>2. after each segment of gameplay, participants filled out a brief questionnaire</p> <p>3. participants engaged in a semi-structured interview exploring their subjective impressions and rankings of the game's three versions.</p>	A non-parametric Friedman test	PlaneGame and Gekku Race. Both feedback systems were designed			<p>Where existing games have used</p> <p>nudges to control player behaviour</p>
Specific co-design papers with children							
(Yip et al., 2013)	<p>1. what behaviours do child leaders and co-designers exhibit when children initiate design sessions. 2. What supports, and guidance are needed for children to become session initiators and leaders?</p> <p>3. what opinions do child leaders and co-designers hold about child-led sessions?</p>	<p>Use an exploratory case study approach:</p> <p>Detail three case studies of Cooperative Inquiry (CI) in which children led the design process.</p> <p>A semi-structured interview</p>	<p>They conducted data analysis through a comparison of videos, interviews, artifacts, and field notes to explore evidence related to</p> <p>our research questions on child-led CI sessions</p>	A simple drawing of a math game delivered by a child co-design leader	<p>Child- adult participation, but child lead the session.</p> <p>Design sessions are typically broken up into four sections: 1) snack time. 2) circle time to discuss the upcoming design session. 3) Design activity Depending on the total. 4)The big ideas group meeting.</p>	<p>Use the technique of Stickie, bags of stuff and a low-tech prototype (art craft)</p>	<p>Evaluate other design techniques and the supports needed for children to lead these sessions.</p> <p>Examine the possibility of children leading design sessions.</p>

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
(Yip, Lee, & Lee, 2020)	<p>What roles can a librarian play in co-design partnerships with youth?</p> <p>How do the experiences of a librarian inform?</p> <p>Our understanding of co-design partnerships with youth?</p>	<p>They employed a case study method (Merriam, 2009) to examine design partnerships of digital learning activities for youth patrons of a library.</p> <ul style="list-style-type: none"> - analytic memo - interviews, - and photographs <p>They conduct 12 co-design sessions.</p>	<p>Methodological Rigor:</p> <ol style="list-style-type: none"> 1. validated our findings by triangulating the analytic memos, interviews, and photographs to ensure all evidence supported each other (Creswell & Miller, 2000). 2. Interpretive rigour presented their analysis to an external reviewer (third author) who did not initially plan and conduct the study by following initial arguments, questioning findings, and determining if findings had grounding (Creswell & Miller, 2000) 	<p>No games but the activated was around using Finch Robotics, littleBits and TaleBlazer</p>	<p>Each of the 12 co-design sessions began with 1. snack time (~15 minutes) to help the adults and children</p> <p>develop closer relationships.</p> <p>2. In circle time (~15 minutes), participants engaged in an introductory activity called</p> <p>"Question of the Day" to help prime everyone to think about the session's goals.</p> <p>3. design time (~45 minutes) to create artifacts, evaluate technologies, and design learning activities.</p> <p>4. discussion time to present their designs and make final suggestions for the designs</p>	<p>how to design partnerships in libraries would work in cultures in which children are more encouraged to listen to adults and follow instructions, rather than the adult-child</p> <p>collaborations. Differences exist between broader cultures</p> <p>(macrosystems), policies and infrastructure (exosystems).</p> <p>Neighbourhoods, libraries, and communities (mesosystems).</p> <p>And families (microsystems; Bronfenbrenner, 1977).</p>	

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
(Kawas, Chase, Yip, Lawler, & Davis, 2019)	<p>RQ1: What are the design considerations to spark children's interest in their natural surroundings?</p> <p>RQ2: In what ways can embody these design considerations in the features of the Nature Collections app contribute to triggering children's situational interest in nature?</p>	<p>Conduct an in-situ evaluative case study with 18 children ages 7–11 in an outdoor setting, using the Nature Collections app.</p> <p>Cooperative Inquiry method.</p> <p>Conduct three 90-minute co-design sessions with KidsTeam over three months.</p>	<p>Video-recorded and photographed each design session.</p> <p>Researchers took field notes and produced analytic memos immediately following each session.</p>	mobile appS NatureCollections	<p>We co-designed with seven children ages 7–12 a set of interest-centred design strategies to implement each of the following principles:</p> <p>(1) personal relevance, (2) focused attention, (3) social interactions, and (4) opportunities for continued engagement</p>		<p>Scalability of the study interest-centred design framework to guide the design of mobile technologies to support children's interest development.</p>
(Raman & French, 2021)	This paper focuses on the genuine participation of young people with learning disabilities in PD framed around their lived experiences.	<p>Methods and tools were framed using an asset-based approach.</p> <p>(Teal & French, 2016).</p> <p>Eighteen young people over 16 years old, with mild to moderate learning disabilities, and six Local Area coordinators providing training and support volunteered to participate.</p>	<p>Abductive sensemaking approaches (Kolko 2010)</p> <p>Supported prioritization and synthesis of insights and ideas with participants during the sessions.</p>	Building personas, identifying problems in scenarios, and creating solutions, exploring conceptual design of the game, including role play.	<p>Creating storyboards and low-fidelity prototypes using Lego, craft materials, photographs, drawing, 3D game scenarios, role-play, and video</p>	<p>Participants were given a visual diary of the sessions. using visuals, simple text and stickers</p> <p>Testing in pairs,</p>	<p>Focus group with visual tools.</p> <p>sharing scenarios usingLego.</p> <p>comic strips tools</p>

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
						focuses groups.	
(J. Read, Horton, Mazzone, Cassidy, & Mcknight, 2009)	Irrespective of technology is it possible for mainstream children to provide design ideas for interactive products that might reduce the marginalization that can be experienced by some of their peers?	A field trial of a technique called 'Designing for Mr. Hippo.' The method is motivated by some background literature on marginalization, exclusion and inclusion, and then a 'Mr. Hippo is Designed for', the session is explained and unpicked.	Content analysis and observation	Children were asked to design a game using dominos and playing pieces from board games), and Mr. Hippo (big stuffy toy) Note: Clearly, Mr. Hippo can be another animal! However, some animals are probably better suited to this method than others.	Designing for Mr. Hippo is described in two stages: Preparation and Play. Preparation takes place before the children get involved; the play takes place with the children.		The study field trial of a technique called 'Designing for Mr. Hippo' could be used to explore how local children can design for marginalized users, including those very different from themselves. It can be helpful in a future study that targets to engage newcomer children and native-born children to design something universal that works for everyone
(Sim, Horton, & Read, 2016)	to what extent can be sensitizing techniques help children design a serious game for a surrogate population? Explores the area of participatory design with children in the UK designing a serious game for	The participants were 25 school children from a UK primary school; they were 7–8 years old.	A set of criteria to measure to what extent the participants understood the culture of the target users include: 1. Culturally Situated 2. Culturally Un-situated	children design a serious game to teach children in rural China about food hygiene	There were four activities: <i>1. Knowledge</i> <i>2. Imagination</i> <i>3. Learning:</i> They were required to produce a storyboard using these images telling of a day in rural China.		I learnt that for children to design a serious game, they need to design learning, game mechanics, understand the technology, and design culturally appropriate content into a game in this instance or any global market.

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
	children from another culture		3. Experientially Situated		4. <i>Reflection</i>		
Generating child-personas with children							
(Sim et al., 2019)	whether children could generate realistically personas? Determine whether differences could be identified within the narratives in the personas?	56 children aged 7–10 in the UK and India created elementary school children's personas, describing school life, family life, and technology.	Survey Content analysis of the personas	No game	The Child-Generated design can inform the design of the technological solution in various contexts.	Child- generated personas can be a viable method to help designers and developers understand children within the context of design.	Great potential to generate various examples of newcomer children personas that will be used as an asset for future researchers and services providers in the context of newcomer
(Itenge- Wheeler, Winschiers- Theophilus, Soro, & Brereton, 2018)	design and implement an interactive tech library, 19 young learners engaged in weekly participatory design workshops to redesign their school library	Different activities and the consideration of personas as a tool to enable child designers to explore multiple perspectives	Qualitative approach Reflection	Na	The children first created four distinct Personas for which they then modelled spaces and technologies.	Personas technique Personas as a technique provided structure, helped children to empathize,	Empirical work on personas with children. Child-created personas are a valuable tool for child designers to diversify

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
						remember and reflect.	their design contributions
Related work with newcomer children (still under review)							
(Roxas, 2011)	examines the reality of building community in public schools and identifies explicitly the obstacles faced by teachers who try to create a community with refugee students	implemented creative expression workshops for kindergarten, elementary schools, and high school to help the children bridge the gap between past and present, a culture of origin and host society.	Critical qualitative analysis	Na	Na	Workshop description and collected insights	presents multiple ways of thinking about how to build community through a description of different classroom strategies
(Brown et al., 2020)	a scoping review to explore what is known about participatory visual research with newcomer children.	A Scoping Review	The review included 21 articles which they synthesized and analyzed	Na	Na	----	Pointing out some research concerns of researching with newcomer children.
(Li et al., 2016)	This study explored the issues around parental support for	Qualitative study	Data were drawn from semi-structured	Na	Na	Useful thought about	Synthesis examples strength and

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
	newcomer children's transition to school	Content analysis to identify, code, and categorize the primary patterns in the data.	interviews with 11 newcomer parents, five children, and one settlement worker			creating the creation of a mediated space between newcomer families and the school	challenges of parent support to their children.
(Li, 2018)	Newcomer Integration and Academic Support in Newfoundland and Labrador	summarize information from multiple data sources	extracts eight points for discussion from many years of research in newcomer academic support and social integration in Newfoundland and Labrador	Na	Na	Expand knowledge of newcomer experience	

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
(Gallagher, Di Cesare, & Rowsell, 2019)	<p>What at-home resources (digital and non-digital) do families use to support their children's literacy learning?</p> <p>2. How can English learners be supported to collaborate, access, and use 21st-century literacy learning tools in their homes?</p>	<p>Using a participatory program within two school communities to understand technology access and families' digital lives' nature and processes.</p> <p>Surveys</p> <p>Workshops</p>		Na	Na	<p>Confirmation of two emerging findings within digital literacy:</p> <p>Digital lives are variable and strongly influenced by culture, linguistic systems, social class, ethnicity and race, and personal beliefs</p> <p>There are clear and present digital divides manifested not only in terms of access but also—and potentially more importantly—in terms of literacy practices applied to digital engagements.</p>	
(Yohani, Brosinsky, & Kirova, 2019)	Examined the psychosocial adaptation of Syrian refugee families with young children	<p>Uses the RAISED Between Cultures framework to discuss their strengths.</p> <p>Community-based participatory research</p>	Qualitative Content analysis	Na	Na	As children and families adapt to their host country, educators can use these findings to identify families and	The research was based on interviews with families. Cultural officers were of Middle Eastern descent, but it would be more beneficial if the study engaged

phase 3- co-design Author/ Date	Research Question(s)/ Hypotheses	Methods/Methodology	Data analysis	Game description	Game design with kids	Potential techniques and tools	Implications For future works
						children's strengths and challenges during early resettlement	children directly in this work
(Karen E. Fisher, Bishop, Magassa, & Fawcett, 2014)	How do immigrant and refugee youth help others in everyday life, fielders, friends, strangers through information and technology? How can youths support these behaviours?	Teen Design Day methodology with youth from Africa and Asia, and consider our approach concerning others for supporting interaction design with youth	Mixed approach	No games but there are: 1. Teen Design Days (TDD)—a method used with immigrant youth in Seattle, Washington (USA). 2. paper-based survey (n=575) in six Seattle high schools	Participating youth is 16-18; divided into 4-5 working groups with at least one adult facilitator.	InfoMe is an example of how research programs are about sometimes digging deep at other times casting broadly	
(Sabie, Sabie, & Ahmed, 2020)	Explore what cultural identities immigrants associate with the physical layout of house structures.	Three methods were used to collect data: observations, semi-structured interviews, and participants' final designs.	Qualitative Approach Co-design session	"Home Sketcher": a paper-based home drafting tool that allows novice users to design their homes by sketching and implicitly expressing their space, light, and privacy preferences.	NO KIDS Age Min: 18 Max: 45 Avg: 31	show a strong longing for reclaiming the past, narrating space-related oral history, and designing beyond current limitations.	

Appendix C: Children Questionnaire

Participants saw the questions, not the «group labels.»

Rating Questions

How much do you agree with the following statements?

Group 1: Feeling loss:

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
I feel supported in my new life in Canada						
I communicate with my old friends and relatives regularly.						
I have new friends in Canada.						

Group 2: Feeling out of place

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I am happy with my new life in Canada						
I am confident to talk and play with kids from different cultures.						
I feel that I fit in my new life here.						

Group 3: Bullying

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
I get along with other children well.						
I know how to deal with a bully.						
My school helps stop bullying.						

Group 4: Social withdrawal

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
I enjoy playing with other kids at school.						

I enjoy spending time with other kids at birthday parties and playdates.						
I enjoy doing group projects with other students.						

Group 5: Newcomer children concerns about their Peers' perspective and interest of newcomer kids culture.

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My family supports me to engage with kids from different cultures.						
Kids from different cultures happy to hear more about my own culture.						
My parents respect my opinions and interests (for example, to choose friends or clothes).						

Group 6: Lack of Cooperation skills

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I work well with other students in group projects.						
I feel more comfortable hanging out with kids from my native culture.						
I prefer to work with kids from different cultures.						

Group 7: Self-perception

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I can share my feeling and thoughts freely with other kids.						
I need help for making new friends and keeping them.						
I am proud of my native culture and like to talk about it.						

Group 8: Insecurity about appropriate behaviour

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I am comfortable interacting with kids from other cultures.						
The way people treat me is because of who I am, not where I am from.						
My classmates and I have many things in common.						

Group 9: Identity formation & Sense of belonging

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I love my native culture.						
I enjoy living in Canada.						
I feel that I belong here.						

Group 10: Personal Space

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
People sometimes need personal space.						
I respect my classmates' personal space.						
At school, we have no problem with personal space.						

Open Questions

1. Do you have any specific social problems at school? If yes, can you tell us about them?
2. Would you like to tell us any story about yourself when you moved to Canada?
3. How often do you play computer games? Can you give us some examples of your favourite computer games?

Demographic Questions

1. What is your age?
2. What is your gender?
 - a. Female
 - b. Male
 - c. Prefer not to say
 - d. Other

Appendix D: Parents Questionnaire

Participants saw the questions, not the «group labels.»

Rating Questions

How much do you agree with the following statements?

Group 1: Feeling loss:

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
My children feel supported in their new life in Canada						
My children communicate with their old friends and relatives regularly.						
My children have new friends in Canada.						

Group 2: Feeling out of place

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My children are happy with their new life in Canada						
My children are confident to talk and play with kids from different cultures.						
I feel that my children fit in with their new life here.						

Group 3: Bullying

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
My children get along with other children well.						
My children know how to deal with a bully.						
My children's school helps them stop bullying.						

Group 4: Social withdrawal

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
My children enjoy playing with other kids at school.						

My children enjoy spending time with other kids at birthday parties and playdates.						
My children enjoy doing group projects with other students.						

Group 5: Conflicts between parents' expectations and peer group lifestyle.

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I support my children to engage with kids from different cultures.						
Kids from different cultures are happy to hear more about my children's culture.						
I respect my children's opinions and interests (for example, to choose friends or clothes).						

Group 6: Lack of Cooperation skills

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My children work well with other students in group projects.						
My children feel more comfortable hanging out with kids from their native culture.						
My children prefer to work with kids from different cultures.						

Group 7: Self-perception

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My children can share their feeling and thoughts freely with other kids.						
My children need help for making new friends and keeping them.						
My children are proud of their native culture and like to talk about it.						

Group 8: Insecurity about appropriate behaviour

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My children feel comfortable interacting with kids from other cultures.						
The way people treat my children is because of who they are, not where they are from.						
My children and other kids in school have many things in common.						

Group 9: Identity formation & Sense of belonging

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
My children love their native culture.						
My children enjoy living in Canada.						
My children feel they belong here.						

Group 10: Personal Space

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
People sometimes need personal space.						
My children respect their classmates' personal space.						
At school, my children and their classmates have no problem with personal space.						

Open questions

1. Do you think computer games and digital storytelling can help children socially adjust and learn about appropriate behaviour in school?
2. Can you give examples of how you help your children adapt to their new life in Canada?
3. Would you like to tell us any story about your children when they moved to Canada?
4. Are there any specific problems at school that your child talks about and would like to solve? If yes, please tell us about them.
5. Please list any other concerns or comments you like to share related to your interaction with newcomer children.

Demographic Questions

1. What is your age?
2. What is your gender?
 - a. Female
 - b. Male
 - c. Prefer not to say
 - d. Other
3. What is your highest level of education?
4. What is your country of origin?
5. How long have you been in Canada?

Appendix E: Teacher Questionnaire

Participants saw only the questions, not the «group labels.»

Rating Questions

How much do you agree with the following statements?

Group 1: Feeling loss:

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
Newcomer children feel supported in their new life in Canada						
Newcomer children communicate with their old friends and relatives regularly.						
Newcomer children have new friends in Canada.						

Group 2: Feeling out of place

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
Newcomer children are happy with their new life in Canada						
Newcomer children are confident to talk and play with kids from different cultures.						
Newcomer children fit in their new life here.						

Group 3: Bullying

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
Newcomer children get along with other kids well.						
Newcomer children know how to deal with a bully.						
The school helps newcomer children stop bullying.						

Group 4: Social withdrawal

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure

Newcomer children enjoy playing with other kids at the school.						
Newcomer children enjoy spending time with other kids at birthday parties and playdates.						
Newcomer children enjoy doing group projects with other students.						

Group 5: Conflicts between parents' expectations and peer group lifestyle.

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
I support newcomer children to engage with kids from different cultures.						
Kids from different cultures are happy to hear more about Newcomer children's culture.						
Parents respect newcomer children's opinions and interests (for example, to choose friends or clothes)						

Group 6: Lack of Cooperation skills

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
Newcomer children work well with other students in group projects.						
Newcomer children feel more comfortable hanging out with kids from their native culture.						
Newcomer children prefer to work with kids from different cultures.						

Group 7: Self-perception

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
Newcomer children can share their feeling and thoughts freely with other kids.						
Newcomer children need help for making new friends and keeping them.						
Newcomer children are proud of their native culture and like to talk about it.						

Group 8: Insecurity about appropriate behaviour

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
Newcomer children feel comfortable interacting with kids from other cultures.						
Newcomer children understand that people treat them because of who they are, not where they are from.						
Newcomer children and their classmates have many things in common.						

Group 9: Identity formation & Sense of belonging

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
Newcomer children love their native culture.						
Newcomer children enjoy living in Canada.						
Newcomer children feel they belong here.						

Group 10: Personal Space

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly disagree 5	Not sure
People sometimes need personal space.						
Newcomer children respect their classmates' personal space.						
At school, we have no problem with personal space.						

Open Questions

1. Do you think computer games and digital storytelling can help children socially adjust and learn about appropriate behaviour in school?
2. Can you give examples of how you help your newcomer students adapt to their new life in Canada?
3. Would you like to tell us any story about your newcomer students when they started at your school?
4. Are there any specific problems at school that your newcomer students face? If yes, please tell us about them.
5. Please list any other concerns or comments you like to share related to your interaction with newcomer children?

Demographic Questions

1. What is your age?
2. What is your gender?

- a. Female
 - b. Male
 - c. Prefer not to say
 - d. Other
3. What is your highest level of education?
4. Which grades are you teaching? And what subjects do you teach?
5. How many years of teaching experience do you have?

Appendix F: Children Quantitative Collected Data

The overall responses of newcomer children who rated their experiences to ten selected social integration problems

Problems/ Questions	Strongly Agree %	Agree%	Neither agree nor disagree%	Strongly disagree%	Disagree %	Not sure%
Feeling loss						
I feel supported in my new life in Canada	8	41	22	24	5	-
I communicate with my old friends and relatives regularly.	51	41	3	-	3	3
I have new friends in Canada.	16	59	11	8	-	5
Feeling out of place						
I am happy with my new life in Canada	8	30	30	14	5	8
I am confident to talk and play with kids from different cultures.	7	33	24	11	12	13
I feel that I fit in my new life here.	8	14	30	27	3	14
Bullying						
I get along with other children well.	17	53	17	8	-	6
I know how to deal with a bully.	18	16	31	30	4	3
My school helps stop bullying.	11	42	22	17	-	8
Social withdrawal						
I enjoy playing with other kids at school.	14	64	14	3	2	4
I enjoy spending time with other kids at birthday parties and playdates.	14	44	19	17	3	3
I enjoy doing group projects with other students.	19	47	14	14	-	6
Newcomer children concerns about their Peers' perspective and interest of newcomer kids culture.						
My family supports me to engage with	28	50	17	6	-	-

kids from different cultures.						
Kids from different cultures happy to hear more about my own culture.	3	19	39	25	3	17
My parents respect my opinions and interests (for example, to choose friends or clothes).	25	61	3	11	-	-
Lack of Cooperation skills						
I work well with other students in group projects.	17	64	14	3	-	3
I feel more comfortable hanging out with kids from my native culture.	42	47	8	-	3	-
I prefer to work with kids from different cultures.	-	14	56	17	6	3
Self-perception						
I can share my feeling and thoughts freely with other kids.	11	17	39	25	8	-
I need help with making new friends and keeping them.	6	61	8	17	6	3
I am proud of my native culture and like to talk about it.	17	50	25	6	-	3
Insecurity about appropriate behaviour						
I am comfortable interacting with kids from other cultures.	11	22	31	31	-	6
The way people treat me is because of who I am, not where I am from.	12	52	16	8	-	12
My classmates and I have many things in common.	11	64	19	-	3	3
Identity formation & Sense of belonging						
I love my native culture.	50	36	8	-	-	6

I enjoy living in Canada.	11	39	36	8	-	6
I feel I belong here.	11	25	39	11	-	14
Personal Space						
People sometimes need personal space.	39	56	6	-	-	-
I respect my classmates' personal space.	14	64	14	-	-	-
At school, we have no problem with personal space.	20	13	8	35	23	3

Appendix G: Parents Quantitative Collected Data

Problems/ Questions	Strongly Agree %	Agree%	Neither agree nor disagree%	Strongly disagree%	Disagree %	Not sure%
My children feel supported in their new life in Canada	21	22	35	9	4	9
My children communicate with their old friends and relatives regularly.	19	52	14	14	-	-
My children have new friends in Canada.	29	57	10	5	-	-
My children are happy with their new life in Canada	17	22	33	-	18	11
My children are confident to talk and play with kids from different cultures.	20	47	14	5	-	10
I feel that my children fit in with their new life here.	18	24	45	5	7	-
My children know how to deal with a bully.	4	30	41	14	-	11
My children's school helps them stop bullying.	20	18	33	24	-	5
I support my children to engage with kids from different cultures.	29	59	6	4	-	-
Kids from different cultures are happy to hear more about my children's culture.	5	20	35	15	-	25
My children feel more comfortable hanging out with kids from their native culture.	27	33	34	6	-	-
My children prefer to work with kids from different cultures.	6	24	60	4	-	6
My children can share their feeling and thoughts freely with other kids.	15	40	30	15	-	-

My children need help with making new friends and keeping them.	5	25	40	20	10	-
My children are proud of their native culture and like to talk about it.	15	50	25	5	-	5
My children feel comfortable interacting with kids from other cultures.	10	27	34	6	19	4
My children love their native culture.	30	60	-	5	-	5
My children feel they belong here.	19	18	22	10	26	3
My children respect their classmates' personal space.	25	45	20	10	-	-
At school, my children and their classmates have no problem with personal space.	12	23	28	22	15	-

Appendix H: Teachers Quantitative Collected Data

Problems/ Questions	Strongly Agree %	Agree%	Neither agree nor disagree%	Strongly disagree%	Disagree %	Not sure%
Newcomer children feel supported in their new life in Canada	15	32	23	-	-	30
Newcomer children communicate with their old friends and relatives regularly.	8	31	7	6	11	38
Newcomer children have new friends in Canada.	8	60	17	-	-	15
Newcomer children are happy with their new life in Canada	5	55	23	8	-	9
Newcomer children are confident to talk and play with kids from different cultures.	15	25	23	15	6	15
Newcomer children fit in their new life here.	8	36	23	8	14	12
Newcomer children know how to deal with a bully.	-	25	45	29	-	-
I support Newcomer children to engage with kids from different cultures.	30	38	22	-	10	
Kids from different cultures are happy to hear more about Newcomer children's culture.	15	20	40	10	15	-
Newcomer children feel more comfortable hanging out with kids from their native culture.	30	48	12	-	-	-
Newcomer children prefer to work with kids from different cultures.	-	10	50	40	-	-
Newcomer children can share their feeling and thoughts freely with other kids.	8	32	38	40	12	-

Newcomer children need help for making new friends and keeping them.	20	51	10	13	-	6
Newcomer children are proud of their native culture and like to talk about it.	10	42	40	-	-	8
Newcomer children feel comfortable interacting with kids from other cultures.	-	48	22	10	12	8
Newcomer children love their native culture.	22	38	27	13	-	-
Newcomer children feel they belong here.	10	32	30	-	-	28
Newcomer children respect their classmates' personal space.	10	20	20	39	-	11
At school, Newcomer children and their classmates have no problem with personal space.	10	-	20	53	10	7

Appendix I: Workshop description

Title: Co-designing Social Adjustment Educational Games with and for newcomer Children

Purpose

Our research goal is to investigate the design of educational computer games that help newcomer children in social adjustment. In this study, we aim to engage a group of newcomer children aged 9–12 in a co-design workshop to see their priorities and game features that are of interest to them.

Study location: all study activities will occur online (using emails to schedule the study, the Qualtrics platform to collect surveys, and Google Meet to conduct the workshop and the interview).

Participants

We are looking for **newcomer children** aged 9–12 from Arabic-speaking countries who have been in Canada for two years or less. The participating children need to have the ability to study in English-speaking schools without the need for a translation. Therefore, the study activities (co-design activities and surveys are online) are available only in English.

Workshop description

Participating children will be invited to participate in a collaboration activity for about **one hour** with a group of children. They will discuss creating a computer game to solve social adjustment problems such as bullying, self-identity and a sense of belonging.

Social problems

The co-design workshop discussion focuses on addressing a couple of the most pressing social adjustment problems that we have identified from our recent study with newcomer children in 2020, which are:

- A. **Lack of sense of belonging and feeling not fit in their new way of living:** our survey study revealed that **74% of newcomer children are unsure** or do not feel they fit. Also, 80% are not sure people want to hear about their culture. While 64% of newcomer participants were either on the borderline or did not feel that they belonged here
- B. **Lack of Cooperation skills with children from other cultures:** Newcomer children are concerned about other kids' interest in learning about their culture. 84% of study participants were unsure if other kids wanted to hear about their culture. Also, 73 % of participants are not comfortable. They were borderline about sharing their feelings and thoughts freely with other kids. Parallely, 89% are more comfortable working with people from their own culture.

Solution

Our solution focused on using Game-Based learning by co-designing Social Adjustment Educational Games with newcomer children to help them overcome the selected social problems. In this workshop, we will be discussing the following two games:

- a. ***Together-WeCan***: A cooperative computer game designed to improve newcomer children's (aged 9–12 years old) teamwork skills and enhance their cooperation with other kids in school and society.
- b. ***You Belong Here***: A storytelling computer game where multiple players collaborate on telling a spontaneous story about their experience to move to a new way of living. Each player takes care of one or more characters in the developing story.

Suggested Game features

- The game starts with a short tutorial video
- Getting rewards points
- Giving players educational pieces of advice by voice and text
- A game having several levels
- Include training levels to support the player when they most need it.
- Being able to choose a player partner
- Characters representing different cultures
- Include obstacles (e.g., traps, puzzles, etc.)
- Allow the player to walk through a scenario and decide what to do and how to do it.
- Giving players options for taking action
- Ability to share your stories
- Being able to share game progress with others
- Ability to add friends to join the game
- Avoid losing points if players make mistakes for the first time. Instead, they should be able to try again.
- Including a final quiz to see players' understanding of what they learnt from the game.

Learning materials

To prepare the children for the game co-design session and gauge their interest, we will share links to some online material on the game design created explicitly for youth. For example, <https://ggjnext.org/course/game-design> also includes a brief description of the social problems discussed.

Guidelines

We will be discussing potential game design ideas for the selected social behaviours problems using the prompting workshop activities are explained in Table 1 -2 and Figure 1. The facilitator will adhere to the workshop scenarios and agenda.

Workshop Scenario

Workshop scenario

Eve is 11 years old, and her brother Jacob is nine years old; they moved to a new place called *the wonderland*. Eve and Jacob are scared to talk and play with people in *the wonderland*. Luckily, they just met Adam, Adam was 11 years old and from the same place they lived before. Adam lived in *the wonderland* for five years, and he would like to help them. So, Adam invites Eve and Jacob to a playdate in the nearby park. He introduced Eve and Jacob to his friends (Stacy 10 years & Mike 9 years old), who also were excited to meet them.

All the kids talked with Eve and Jacob about their feeling and experiences about *the wonderland*. Eve & Jacob liked their new city so far, but they were worried about a few things, like

how they will keep their culture

and how they can share their experiences in their new town,

They asked Adam if he also had the same feeling uncomfortable and not fit in the wonderland. Adam said it is ok to feel nervous when talking with new kids from other cultures.

After a good conversation, Stacy and her friends suggest they will help Eve and Jacob learn about all of these problems in a fun way. Adam and his friends liked the idea. So, they agreed to design something like a computer game with their summer coding teacher where all of them can play and help Eve & Jacob adapt to their new life in a fun way.

Based on this scenario:

Imagine yourself in the Eve and Jacob situation:

What can you do to adapt to this new way of living?

Workshop program

Workshop Agenda [This agenda will guide the workshop discussion].

Activities	Description	Participants	Time
pre-session	Children will be answering a short pre-questionnaire to collect demographics and capture the existing general knowledge about the co-design activity.	The pre-session package will be sent to the children's parents' email a few days before the actual workshop.	
Warm-up	<ul style="list-style-type: none"> ○ Welcoming the participants' children ○ Obtaining children's verbal consent. ○ Explain what they expect to see and do during the session. 	<ul style="list-style-type: none"> • Children • parents (optional) • Facilitator (will be game designer) • Observer 	10 mins
Exploration: Brainstorming ideas and sharing their stories	<ul style="list-style-type: none"> ○ Children will engage in a group brainstorm session via Online Google Meet. In addition, we will be using Google Jamboard to share their ideas and stories collaboratively with other children in the session. ○ Children will be given scenarios (Fig .1) related to social adjustment common problems [e.g., how to maintain self-identity, sense of belongings] ○ Children will be promoted to discuss game ideas that may help solve such problems Fig. 1. ○ In a group of 5 kids, each group has a few minutes to think up ideas for a given theme (e.g., the ideal game goals, stories, characters) before moving to the next. ○ The facilitator may derive game topics from the selected ideas to be developed further 	<ul style="list-style-type: none"> • Children • parents (optional) • Facilitator (will be game designer) • Observer 	20 mins
Generation design and expand ideas	<ul style="list-style-type: none"> ○ Using Jamboard, children can construct ideas and comment and share their thoughts. ○ During this time, the facilitator assists the children, asks questions about their design decisions, and makes suggestions. The researchers also take notes in small notebooks that include group dynamics, individual children's likes, dislikes, and how children are co-designing. 	<ul style="list-style-type: none"> • Children • parents (optional) • Facilitator (will be game designer) • Observer 	20 mins
Discussion and presentation	<ul style="list-style-type: none"> ○ Children present their design ideas. During the presentations, the facilitator writes on the shared screens children: ideas, suggested game features, likes, dislikes, etc. ○ Children may ask any questions or add any comments they may have. ○ The facilitator can provide clarity or ask small follow up questions 	<ul style="list-style-type: none"> • Children • Facilitator (will be game designer) • Observer 	10 mins

Appendix J: Study pre-questionnaire

1. Participant Code:
2. Demographic Questions
 3. What is your age?
 4. What is your gender?
 - a. Female
 - b. Male
 - c. Prefer not to say
 - d. Other

3. How long have you been in Canada?
 -----years ----- months

4. Rating Questions

How much do you agree or disagree with the following statements?

Statement	Strongly agree 1	Agree 2	Neither agree nor disagree 3	Disagree 4	Strongly Disagree 5	Not sure
1. I enjoy playing computer games						
2. I like to play computer games with other kids						
3. I enjoy working in a group with other kids						
4. I like to talk about computer games to other kids in school						
5. I feel that Kids should be involved in making educational computer games.						
6. I learn through playing educational games such as prodigy, Kahoot.						
7. I like to participate in teamwork activities						
8. If there is a video game to solve social problems such as bullying, would you play it?						

5. Have you ever made a computer game (if yes, explain)?

Appendix K: Study Post-questionnaire

1. Participant Code

2. How much do you agree or disagree with the following statements about your experience?

Statement	Strongly Disagree, 1	Disagree, 2	Neither agree nor disagree, 3	Agree, 4	Strongly Agree, 5	Not sure
Designing games was easy.						
Games are good for learning.						
I learned something new.						
The workshop motivated me to learn more.						
The workshop was well organized.						
The workshop was fun.						
It was easy to work with other kids.						
It was helpful to work with other kids.						

3. How much do you agree or disagree that a social, educational game should have the following features?

Game features	Strongly Disagree, 1	Disagree, 2	Neither agree nor disagree, 3	Agree, 4	Strongly Agree, 5	Not sure
1 The game starts with a short tutorial video						
2 Getting rewards points						
3 Giving players educational pieces of advice by voice and text						
4 A game having several levels						
5 Including training levels to support the player when they most need it.						
6 Being able to choose a player partner						
7 Characters representing different cultures						
8 Including obstacles (e.g., traps, puzzles, etc.)						
9 Allowing the player to walk through a scenario and decide what to do and how to do it.						
10 Giving players options for taking action						
11 Ability to share your stories						
12 Being able to share game progress with others						

13	Ability to add friends to join the game						
14	Not losing points if players make mistakes for the first time. Instead, they should be able to try again.						
15	Including a final quiz to see players' understanding of what they learnt from the game.						

3. Are there any other game features that you would like to see in the social game? If yes, please give examples?

4. Are there any other game features that you do not like to see in the social behaviour game? If yes, please write them here?

5. Do you have any other comments or suggestions?

Thank you!

Appendix L: Post-Semi-Structured Interview Script

Note: this will be semi-structured, and that the given questions are only general ideas, we will discuss the details based on what the participant does and speaks. Also, the researcher will make every effort to communicate in a simple language

Part 1 – Introduction [5 minutes]

The researcher will introduce himself, explain the purpose of the interview, what the participant expected to do during this short interview, and then collect the oral assent from children as described in Appendix D. Once the assent is obtained, the interview will be started.

Part 2 – Game co-design activity [20 minutes]

Note: we will present screenshots with the questions.

1. Can you tell me what happened during the workshop session?
2. What was the idea of the game that you talked about with your group?
3. What do you think the players can do in your group's game idea?
4. What do you think the game players can learn from the game?
5. Sometimes a game has a story, and sometimes it does not. Does your group's game have a story?
 - If "yes."
 - "Can you tell me what the story is?"
 - "What are the most important parts of the story?"
 - If "no."
 - Can you think of a good story for the game to have?
6. Who are the main characters in your group's game? What do they do in the game?
7. What game features would you like to include in your group's game? Why are these features important?
8. What game features do you think it is not good to have in your group's game? Why not?

Part 3 –can you put the following social problems based on their importance to be solved through an educational computer game (similar to what we have discussed in the workshop)

1-most important 2-important 3- neither important nor less important 4- not important 5-not important at all

- Feeling Loss
- Feeling out of place
- Bullying
- Newcomer concerns about their Peers perspective and interest of newcomer kids' culture
- Lack of Cooperation skills
- Insecurity about appropriate behaviour
- Personal space

Do you like to tell us about your feeling or experience with any of these social problems when you move to Canada?

wrapping up the interview [5 minutes]

1. What PART of the workshop did you like the BEST? Why?
2. What PART of the workshop did you not like? Why?

3. Do you have any other comments or suggestions about the workshop?

Note: If there are no questions or comments, the interviewer may ask follow-up questions to clarify some points and expand the discussion based on the participant's information.

Appendix M : phase 2 Questionnaires.

Section 1. Pre-Questionnaire

[This questionnaire will be given to all participating children at the beginning and before they do any activity.]

Please choose the best action in the following situations:

1. **You are in the playground, and one of your classmates pushes you hard.**
 - Push back as hard as you can to teach that classmate not to do that again.
 - Just Push back and say that you can defend yourself.
 - Leave that classmate and go to the teacher on duty and tell them what happened.
 - Ignore that classmate's misbehaviour and walk away.

2. **It is time to eat in the cafeteria. Unfortunately, the cafeteria is crowded, and you cannot find an empty seat to sit in except near another student. So, you go and sit in the available seat, but the student looks at you and asks you not to sit too close because that will be disturbing.**
 - Tell that student to change the seat if not feeling comfortable.
 - Leave the seat and stand until another spot becomes available.
 - Just start eating your food and ignore the student's request.
 - Tell the student nicely that it is time to eat and there are no other seats available.

3. **You are walking with your friend when your friend starts to yell mean words to another student.**
 - Do nothing; it seems fun.
 - If the other student is not angry, it is ok because nobody is hurt.
 - Do nothing; you are not the one saying those words.
 - Tell your friend to stop, or you would tell the teacher.
 - Tell your friend to lower their voice so nobody else can hear these mean words.

4. **You are in the playground, you want to play on the slide, but there is a student who always blocks your way.**
 - Push the student hard to not block your way anymore.
 - It is ok; you can try to play another game.
 - Come very close to the student and ask the student to step away.
 - Try to talk to the student and if it does not work, tell the teacher on duty.

5. **There is a new student in your school who struggles with English but can speak your first language. Unfortunately, sometimes in the classroom, the student yells or uses swearing words in that language that the teacher does not understand.**
 - Tell the teacher the meaning of those words.
 - Tell that student that it is not acceptable to use those words with the teacher, and it is more appropriate to speak English in the classroom.
 - Tell the student to talk to you using that language even in class but not to the teacher.

6. **Students are playing Tag. One student does not like to be touched, so will not play.**
 - Try to touch the student and run away. Students should get used to being touched.

- Leave that student alone. Let other kids do what is comfortable for them as long as they are not bothering others.
- Tell the teacher to help that student play such games.
- Tell the student's friends about this situation to force that student to play this game.

Section 2: Post-Study (Game Questionnaire)

[This questionnaire will be given to the children who participate in the game group once they complete their gameplay activity.]

Multiple-choice Questions: [Questions 1-6 of Section 1 will be given again.]

Circle the numeric answer to each sentence below

Questions	Strongly Agree 5	Agree 4	Natural 3	Disagree 2	Strongly disagree 1
The game was useful to learn about good behaviours					
The game was enjoyable to play					
The game was easy to play					

Do you have any other comments?

Section 3: Post-Study (Brochure Questionnaire)

[This questionnaire and will be given to the children who participate in the brochure group once they complete their reading activity]

Multiple-choice Questions: [Questions 1-6 of Section 1 will be given again.]

Circle the numeric answer to each sentence below

Questions	Strongly Agree 5	Agree 4	Natural 3	Disagree 2	Strongly disagree 1
The brochure was useful to learn about good behaviours					
The brochure was enjoyable to read					
The brochure was easy to read and understand					

Do you have any other comments?

Parents Questionnaire (optionnel)

General Questions:

- How old are you?
- What is your highest level of education?
- Which gender do you identify with?
 - Male

- Female
- Other (Specify)
- Prefer not to say
- What is your country of origin?
- How long have you been in Canada?

Open Question: Please tell us your thoughts about the use of educational games and other technologies in helping newcomer children to adjust socially. Please note that there is no right or wrong answer, so feel free to express your thoughts.