Digital Literacy and Growth of Children in Urban China in the New Media Age

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Abstract

In order to understand how millennials adopt new media, including the Internet and explore their digital growth and digital literacy, the "Children and Media" research group under Children's Media Literacy Education Research Center of the China National Youth Palace Association has launched a nationwide research based on a digital-literacy framework that fits the media behavior and growth stage of local kids in urban areas. From September 2014 to September 2015, eighteen Children Palaces from different cities across China have participated in the research, which employed a mixed methodology of questionnaires and face-to-face interviews with over 20,000 children aged from 3 to 14 and their parents.

In this research, digital literacy, defined as the development of media literacy in the digital era, refers to the ability to make the most of digital media to develop themselves, the ability to take the initiative to deal with online opportunities and risks, and to become a qualified citizen in the digital age. As a part of the whole research, this article reveals access to new media usage and literacy among children and their parents, as well as an overview of digital literacy education in those new-generation families. This article also seeks to find out the growth path of new media adoption of millennials and pinpoint their key development stages in the digital age. Besides, by examining children's online risks, the research explores family influence and provides a set of recommendations for public policy-making.

Keywords: digital growth; digital literacy; digital divide

1   Introduction

In the first decade of the 21st century, digital technologies, such as smartphones and mobile Internet, has fundamentally changed human life, as well as children's growth. millennials -- those who are born after 2000 --, are especially influenced by the evolution. With the unprecedented access to technology, media and information, this new generation is significantly distinct from their parents. This generation, called the Net Generation (Don Tapscott, 2008) and iPad Generation (Sarwant Singh, 2012), has gradually captured attention from all over the world.

In China, millennials are the emerging force of adolescent netizens. However, there is a lack of large-scale studies on their media access, media use and media literacy. To enhance knowledge about this group, the Children's Media Literacy Education Research Center of the China National Youth Palace Association launched a national research aimed at exploring children's digital adoption growth and literacy and how this influences literacy education in school and family. By proposing this digital- literacy framework, this research offers reference for children's digital-literacy assessment and digital-literacy education in the digital era.

2   Literature Review

The research on children and the Internet answers some key questions that follow Schramm's "uses and gratifications model" which summarized children's behavior of watching television after years of research. Those questions include: 1) How and when children access media? 2) What are the duration, frequency and preference in children's media usage? 3) Why do children use media? 4) What factors shape children's media experience? 5) What is the effect of children's media usage? (Zhang, 2014)

Researchers have found that the Internet is now thoroughly embedded in children's daily lives and the age at which children initially access the Internet is getting younger (Livingstone, 2012; Ofcom, 2014a). Also, children's Internet consumption is diversifying: children use the Internet for school work, playing games, watching video clips and instant messaging (Livingstone, 2012). Based on a factor analysis of time spent on various media activities, Common Sense (2015) has identified six media profiles for children: video gamers, social-media users, heavy mobile gamers, heavy readers, heavy TV and video viewers, and light media users.

There are obvious relations between children's age, gender and socioeconomic status and their quality of access to and use of the Internet (Hargittai & Hinnant, 2008; Livingstone & Helsper, 2007; Ofcom, 2014b). Pew research center (2015) has found that in their adolescence, girls dominate social media, while boys are more likely to play video games, which can be seen in Ofcom's report (2014a) and EU Kids' report (2012) as well. Besides, at increasing age, children transit from passive consumers to

more active learners (Ofcom, 2014b). The Internet is used primarily as a source of entertainment and information by young children, whereas for teenagers, going online becomes increasingly communication-focused (Ofcom, 2014b). Most importantly, scholars pointed out that a digital inequality exists in this group of "digital natives", Livingstone and Helsper (2007) proposed that gradations in frequency of Internet use (from non- and low-frequency internet users to weekly and daily users) have influenced how they have utilized the Internet.

Most researchers agree that children's online activity brings opportunities as well as risks when considering the complexity of the Internet. Cyberbullying, contact with strangers, sexual messaging, and pornography are all perceived online risks to children, which raises continuous public concern among parents, educators and scholars. Livingstone, Mascheroni and Staksrud (2015) pointed out that the Internet poses several types of risk to children, including content risk (children as receivers of mass productions), contact risk (children as participants in adult-initiated activity), conduct risk (children as perpetrators or victims). Due to relatively distinct harm and policy tendency, aggressive risks (cyber-aggression and cyberbullying) and sexual risks (pornography, stranger danger and sexting) are prioritized in research. While Livingstone and Smith (2014) pointed out that not all online risks result in self-reported harm, a range of adverse emotional and psychosocial consequences is revealed by longitudinal studies, showing them to be increasingly intertwined with offline risks. And personality factors (sensation seeking, low self-esteem, psychological difficulties), social factors (lack of parental support, peer norms), digital factors (online practices, digital skills, specific online sites) make some children more vulnerable than others (Livingstone & Smith, 2014).

Compared to the fruitful research abroad, little research has been conducted on children in mainland China and their Internet habits. In face of the rapid development of the Internet and the huge number of children netizens in China, we need to have a better understanding of children's Internet usage and their digital literacy.

3　Research Framework
3.1　Rationale for developing a digital-literacy framework

In this digital era marked by technology evolution and information explosion, media literacy or digital literacy (in this research, digital literacy is the development of media literacy in the digital era) has gradually become part of national strategies in different countries. Governments are paying great attention to media and digital-literacy education. By conducting national research projects, they established their localized literacy framework as a guide to practice. The European Union, for example, has acknowledged digital competence as one of the 8 key competences for Lifelong Learning in 2006 (Ferrari, 2012) and has launched a series of

world-influencing research projects on it. However, through literature review, we have found that media literacy or the digital-literacy framework proposed by European or American scholars needs to be modified to match the situation of Chinese children. In China, a country with 649 million Internet users, with new media and the Internet impacting greatly on children's growth, there is an urgent demand for digital-literacy education. However, with its particular Internet environment and education system, China needs a framework that could provide solid evidence of related policies that suits the development and media behavior of Chinese children, and furthermore, offers an effective platform for educators and parents to enhance education on children's integral development in the digital age.

Therefore, based on numerous empirical researches, a digital-literacy framework is developed to trace Chinese children's growth path in the digital age.

This framework is grounded by three principles. First of all, the equal rights of development, participation and protection of children should be ensured; in other words, children should enjoy the right to access media and appropriate information, and the right to media participation. Secondly, every child should be able to choose his/her own way to develop, from dependency to autonomy, which means that through digital empowerment, children's digital skills could be fully developed. Lastly, the government and the community are obligated to create a healthy digital environment for children. Media environment (the environment formed by mobile intelligent information terminals, mobile Internet and application), as an integral part of the digital environment, deserves more attention.

3.2 Digital-literacy framework

As table 1 shows, this digital-literacy framework consists of three dimensions (media access and usage, ability to develop self and ability to protect against risks) and ten categories, which will be explained as follows.

Dimension	Category		
Media Access and Usage	Width	The numbers and categories of digital media products and applications that children can access	➢ Access to digital media products and applications that prevail among peers ➢ Able to use various digital media products and applications in daily life
	Depth	The age when children first use digital media and the time spent on digital media	➢ Use digital media products and their applications within a reasonable time ➢ Access certain digital media

			products and their applications at appropriate ages
	Attitude	Preferences for digital certain media products and applications	➢ Have independent judgment on different digital media products and applications
Self-development Ability	Entertainment	Use digital entertainment products and online applications	➢ Identify suitable entertainment products and applications with increasing age ➢ Autonomy in choosing, installing, learning entertainment products and applications ➢ Autonomy in reasonable online consumption
	Communication	Communication and online collaboration	➢ Ability to interact with family and peers online ➢ Ability to interact with people in online games ➢ Ability to interact with strangers online ➢ Ability to interact and collaborate by joining and establishing online communities
	Learning	Search and obtain information, authenticate information, use Internet to solve problems	➢ Ability to scan and search information online ➢ Ability to teach themselves and solve problems online ➢ Ability to obtain information and communicate with others through digital media products like official accounts in WeChat ➢ Ability to authenticate information
	Expression	Post and spread message online, establish we-media	➢ Share content actively online ➢ Create appropriate messages/pictures/videos/audi

			os online
			➢ Establish we-media and have followers
Anti-risk Ability	Safety	Consciously protect personal information, safety and property	➢ Effective protection of online accounts and private information ➢ Awareness of potential harm to life and property caused by social activities online ➢ Awareness of online violence, fraud and other crimes
	Healthy activity	Keep physical and mental health	➢ Identify and defend inappropriate information ➢ Tempered usage in digital media products ➢ Awareness of the potential harm of Internet addiction
	Civilized behavior	Obey ethics, morality, etiquette and the law, as well as not harm others on purpose	➢ Practice ethics, morality, and etiquette online ➢ Know, abide by, accept laws on Internet ➢ Express rationally, avoid harm to others and violation

Table 1: Digital-literacy framework

In this framework, digital literacy refers to children's ability to make the most of digital media to develop themselves, take the initiative to deal with online opportunities and risks, and become a qualified citizen in the digital age. According to this definition, digital media is the essential tool for children's development, the living environment for children's growth, and the powerful engine for social evolution.

Based on this definition, questions about how digital media impacts children and how we should educate them are proposed: 1) since digital technology is an essential tool for children to obtain social capital and develop themselves nowadays, how could children make the most use of it? 2) As digital technology is gradually shaping children's upbringing, how could they take the initiative to deal with online opportunities and risks? 3) With the unprecedented change with which technology pushes human society into the digital age, how could a child grow into a qualified citizen in the future?

Compared to previous research on children and the Internet, our research has

initiated some paradigm shifts: 1) The perspective of research has expanded from "Information Learning" to "Growing with the Environment"; 2) The research has expanded beyond "students", tracing the multiple identities of children (we classified children as players, users, and creators) who engage in various online activities in different categories (e.g. entertainment, communication, learning and expression in our research); 3) The context of research has moved from school to family, the place that children's digital-literacy practice mainly occurs. As a consequence, their relationship with media is observed and explained from the interaction between children and parents; 4) The aim of digital-literacy education has broadened from "critical thinking" to "taking the initiative to deal with opportunities and risks", and combined the achievement of self-development and social involvement.

Armed with those principles, we have developed a digital-literacy framework from three dimensions:

1) Media access and usage

This dimension is designed to assess children's media access and usage, namely, the proficiency of digital skills. Three categories are delineated: width, depth and attitude. Width means "whether children could widely access popular digital media products"; depth means "time spent on digital media (mainly on weekends)"; attitude means "children's preference in digital media products and application". In this dimension, traditional media such as newspapers, books, films and television are examined in comparison to new media. Notably, we asked children's media behavior on weekends and at home, the time and place for most children using new media in mainland China.

2) Self-development ability

This dimension is used to assess how children make use of digital technology to aid their development. This dimension is divided into four categories: entertainment, communication, learning and expression. These four activities are identified by years of observation and empirical research that proved to exert most significant influence on kids, trying to reflect children's rich online behavior thoroughly. Besides, we have found age differences for those activities and in their relationship to children's growth. This dimension has formed four parts of children's socialization as well.

Entertainment: Entertainment is the top activity children use digital media for, which nonetheless has been seldom studied by scholars in China. In our opinion, playing games is a crucial part of children's development. Through games, children can construct their identity, improve ability and shape their personality. Besides, online entertainment such as listening to music or watching videos opens a window through which children can see the outside world that would impact their values. Youth subculture, at the same time, is formed with their participation in fun-generating activities. That is why we argue that the ability to use digital products

serves as a part of children's integral ability.

Communication: Communication is an essential function of digital media. Children enhance their range of association and interpersonal skills through communication. Along with the deepening of children's communication on the Internet, the differences between online and offline life have blurred. As a result, the ability for effective and reasonable online communication and collaboration online should be cultivated.

Learning: Digital media offers more approaches for children to teach themselves and solve problems. Learning skills is one of the core competences in the 21st century. The ability to acquire knowledge, solve problems and authenticate information are critical aspects in this category.

Expression: Digital media empowers everyone to create we-media, through which citizens have the right to express themselves and participate in social activities. Children, at the same time, should be treated as citizens that could speak for themselves, and transform from passive content consumers to active information sharers and content creators. In this category, we pay attention to the content, form and influence of children's words.

3) Anti-risk ability

In this dimension, we evaluate how children take the initiative to avoid online risks. Three categories: safety, healthy activityand civilized behavior are considered in this dimension, which reflect three major fields that confront children online.

Safety refers to children's ability to protect themselves from potential harm in the digital environment. Due to immaturity of mind and lack of social experience, children are more vulnerable to risks, such as personal-information or property theft, life threats, etc.

Health refers to children's ability to keep themselves physically and mentally healthy in the digital environment. We highlight the multiple implications of health, including physical health (moderate time and right posture to use media), mental health (avoiding Internet addiction, cyber-bullying, identifying and keeping away from inappropriate information).

Civilized behavior refers to children's ability to behave themselves within the confines of ethics, morality and laws in the digital environment. In contemporary China, education in this field is underdeveloped. Because of a lack of proper instruction, children are likely to violate related regulations without noticing it.

3.3 A digital-literacy framework for research

"Children and Media" research group focused on understanding millennials' media behavior and media life in families. Therefore, children, parents and education are studied at the same time.

As for the children research, media access and media activities of children were

explored as well as online risk awareness by noting online risks such as encountering pornography and violence, privacy management, making friends online, bullying or being bullied, and online scams. Children's media preference and values, Internet knowledge and parent-child relationship were also examined to understand their family life.

In order to have a better understanding about children's digital literacy, we examined parents as well. The questionnaire asked their children's media access, media usage and digital literacy, as verification of results from children's questionnaire. Besides, we explored how parents know about their children's media life. Moreover, parents' media access, media usage and literacy were also addressed at the same time.

Parental media mediation was also included in the research, which concentrated on understanding parent-child relationship such as digital media education.

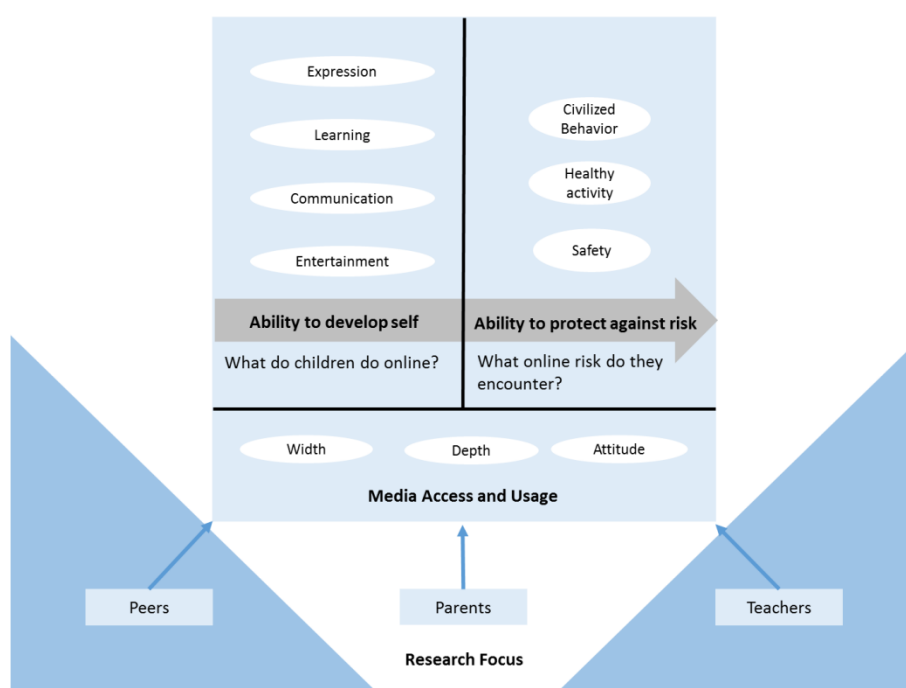The framework can be seen in Figure 1.

Figure 1: A digital-literacy framework for research

4 Methodology

The research was conducted by Children's Media Literacy Education Research Center of the China National Youth Palace Association[1], which was established in

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[1] China National Youth Palace Association, founded in 1988, registered under Ministry of Civil Affairs as first class association, provided public youth service for taxpayers by the government. The association is a non-profit-making organization composed of the Youth Palaces, Children's Palaces, Youth Activities Centers, Children's Activities Centers, Activities Center for women and children and Youth and Technology Museum (stations) from

April 2014 in Children's Palace Guangzhou. A total of 15,646 of children aged 3-14 who are Internet users and their parents were interviewed from September 2014 to September 2015, across 18 major cities in China.

1) The sampling population from the 18 cities basically covers:

   Municipalities in China
   - Beijing, Shanghai, Tianjin, Chongqing;
   National central cities
   - Beijing (North China), Tianjin (North China), Shanghai (East China), Guangzhou (South China), Chongqing (Southeast China);
   Regional central cities
   - Shenyang (Northeast China), Nanjing (East China), Wuhan (Central China), Shenzhen (South China), Chengdu (Southeast China), Xian (Northwest China) .

2) By stratified sampling, 5,000 children aged 3 to 14 and their parents were surveyed; 20,000 questionnaires were distributed, with 15,646 valid data collected, including 8,281 parents' questionnaires and 7365 children's questionnaires (ages 3-6 excluded).

3) Based on the development stages of children, five age groups are separated as follows:

   - Kindergarten: 3 to 6 years old.
   - Grade one to grade two: 7 to 8 years old.
   - Grade three to grade four: 9 to 10 years old.
   - Grade five to grade six: 11 to 12 years old
   - Grade seven to grade eight: 13 to 14 years old.

4) On top of the survey questionnaires, in-depth interviews were conducted according to the gender of the five age groups. Researchers of some of the cities have also used the following methods to collect data, including parent-child interactive interviews, group interviews, email, phone, QQ, WeChat interviews.

5) The research was conducted in Children and Youth Palace of different provinces, as Children and Youth Palace is the only platform in each city to provide services and activities for children aged 3 to 18. The representativeness is higher than distributing through school networks.

6) All researchers are the senior tutors and instructors of Children and Youth Palace, who have a strong understanding of children's development patterns from kindergarten to high school.

7) For children in Kindergarten aged 3 to 6, considering their language ability, the data were abstracted from their parents of this age group.

Though every effort has been made in designing, administering and analyzing the survey to account for children's Internet usage, a number of questions limit the research:

1) Limits on sampling: sampling in children palace brings lots of benefits while it has not reached the most vulnerable and rural children.

2) Questionnaire limits: Children and parents need to spend a long time filling in the questionnaires, which affects the reliability of the outcome to some extent.

5 Digital Literacy and Growth of Children in the New Media Age

5.1 A Sketch of digital natives

Our report shows that, as digital natives in our age, millennials can be characterized as the following "generations":

Touching generation: millennials are a generation surrounded with electronic screens. In our research, 96.7% families have mobile phones, 75.2% have tablets and 95.2% have computers. With age, time spent on those electronic devices gradually grows, while time spent on television and books decreases after its peak at 9-10 years old. The same trend can be seen in their media preference: computers and mobile phones gain continuous popularity when they grow up but fewer kids like television or books at the same time. With increasing age, more children own their mobile phones, increasing in number from 38.6% in 9~10 year-olds to 77.8% in 13~14-yearolds.

Chatting generation: millennials are a generation that uses SNS such as QQ and WeChat at a young age. QQ is so popular among them that 13~14-year-old kids like it (47.3%) even more than face-to-face communication (43.1%). Data shows that almost half (49.5%) 9~10-year-old children have their QQ accounts, which grows into 91.8% in 13~14-year-old children. They are active in participating in various QQ groups (50%) and game alliances (31.4%) and making friends, even with some strangers they met online (13.6%). Notably, 57.2% of 13~14-year-old children acknowledged that they had made friends with strangers online. Some of them even meet them offline without telling their parents.

Gaming generation: millennials are a generation good at playing e-games. 50.5% of the children state that playing games is their main purpose for using digital media. Playing games is a major part of their online life. They play games before entering school and are active in joining and setting up game alliances. We found that games are so much their important consumption that 12.1% would ask their parents to support them financially. Moreover, they show strong autonomy in choosing and downloading online games (50.1%). To study gaming strategy and find partners, 49.2% 13~14-year-old children have joined various alliances in online game communities.

Searching generation: millennials are a generation growing up with Baidu[2]. They are accustomed to scanning and searching for information online. 21.4% 13~14-year-old children state that they would turn to the Internet when encountering problems. With the improvement of traditional literacy, they rely more on the Internet to search for and gain information. Official accounts in WeChat (19.3%) and influential information sources from diverse fields in social media (16.8%) are also their important ways to get information.

Sharing generation: millennials are a generation that loves sharing and expression. 41.2% of the children state that they often publish messages online. They like taking photos with mobile devices (31.9%), and sharing pictures, articles and clips on social media (41.2%) and 13% of them have followers on social-media platform. As the most popular online public platform for sharing and expression, Weibo gains gradual popularity among them with increasing age. They create we-media in Weibo or Meipai at an ever-younger age: 28.6% of 13~14-year-old children state that they have followers in their we-media.

5.2   Millennials' growth path in the digital age

According to our framework, we examined children's media access and usage (width, depth, and attitude), self-development ability (entertainment, communication, learning and expression), anti-risk ability(safety, healthy activity, civilized behavior) through various questions. In the wake of the questionnaire, observation and interview, we have located several "key indicators" in every category that changes most significantly in children's growth.

We selected 3~6 year-olds, 8~9 year olds, 13~14 year olds as the representative age stages because of their evident changes in key indicators.

1)   Media access and usage: width, depth and attitude

Three representative media and applications are selected to indicate the breadth of children's media access and usage: mobile phone ownership, QQ ownership, and following a WeChat official account. We can find obvious jumps of three indicators in three age groups, from 2.4% to 77.8% for mobile ownership, 22.5% to 91.8% of QQ ownership and from 6.8% to 33.5% of following a WeChat Official Account. In the 13~14-year-old age group, the difference between children and adults in mobile phone, QQ and WeChat use almost disappears.

Besides, during our research, we find that the time and frequency that children spent on different media is a critical indicator of the depth of their media access and usage. Therefore, we investigated the time that children spent on different media, which, as shown in Figure 3, reveals that films and books both witness a decline after peaking at 9-10 years old and TV experiences consistently decrease with age.

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[2] The largest search engine in China

However, time spent on digital devices rises more than twice from children 3-6 years old to 13-14 years old, and 60.2% of children aged 13 to14 are using electronic devices for more than an hour during weekends. This contradiction vividly presents millennials' growth path in the digital age in how they abandon traditional media and turn to new media.

Media preference is investigated by posing two questions: what is your favorite media? What's your favorite way to contact others? The data shows that except newspapers, traditional media such as TV and books are losing popularity when millennials grow up, while new media such as computers and mobile phones enjoy a noticeable increase especially after children reach 9-10 years old. 45.4% of 9-10 year-olds children love using the computer to communicate and mobiles even reached 57.4%. The same trend can be seen from the shift in millennials' favorite way to contact others, though in total majority of the cases millennials prefer face-to-face interaction; the preference shrinks as they grow older. QQ, the instant messaging application, on the other hand, increases almost six times and even exceeds face-to-face interactions in 13-14 year-olds to reach 47.3%. Digital media has become the major way for millennials to get in contact with others.

2) Self-development ability

Gaming is the top activity for children to do with digital media in our study, which, nonetheless, has been neglected by most researchers in China. We contend that the ability to play games is crucial in their development. Thus we explore what they play and the depth of their entertainment behavior, including the population that play massively multiplayer online games (MMOG), who invest money in online games, and who choose and install e-games by themselves in different age groups. As illustrated in Figure 6, the ability to play games has consistently improved with age. 73.4% of 13-14 year-olds choose and install e-games by themselves; 18% could invest money in computer games, and 25.8% are playing MMOGs. Those data shows the high level of millennials' autonomy and proficiency in entertainment. Online games, on the other hand, have become part of their daily consumption.

What's more, we have'found that online communication has expanded children's choice to interact with others. QQ (56.9%) are more popular than WeChat (20.6%) in older millennials. 91.8% of 13-14 year-olds joined QQ groups, and more than half of them (57.2%) have online friends; one in ten (10.1%) have added strangers online. Meanwhile, in the world of online games, where communication is crucial for collaboration, 49.2% of children aged 13 to14 joined game alliances.

New media creates new ways and content to learn as well. In this category, we examine how children's behavior to get information with electronic devices (scan/search for information, read e-books and subscribe to official accounts in WeChat), which have seen significant growth with age, reached 49.4% for 13-14

year-olds. Besides, the Internet has gradually become their important tool to do self-learning and critical thinking, which are crucial for their development, especially in the digital age. Meanwhile, millennials have learned to use the Internet to search for accurate information, Upon hearing news of an earthquake, the percentage of checking news from websites to verify the accuracy of the information rises from 16.3% of 7-8 year-olds to 47.7% of 13-14 year-olds.

Most importantly, the Internet has liberated children's right to expression, which transforms them from passive content consumers to active communicators and creators. With digital media, they can create we-media to express themselves and participate in society, which is a distinctive ability compared to former generations. For them, rational participation and reasonable expression online is the first step to become a qualified citizen and contribute to a civil society. What we can see in the data is that millennials have learned to express themselves at young ages. 18.6% of the children 3-6 years old have posted messages/images/videos/audios online. Besides, the ratio of children who own followers in their we-media has jumped more than ten times from those 3~6 years old (2.4%) to those 13~14 years old (28.6%). Weibo as a public online platform has emerged in millennials' life as they are older as well, while 12.4% of the 13-14-year-old children use Weibo on their mobile phone.

5.3   Triple jumps in millennials' growth

This research has illustrated a close relationship between millennials' growth and new media. At different ages, millennials behave differently in media access and media usage. Through significance analysis with key indicators, we have found that the ages of 3-6 years, 9-10 years, and 13-14 years are three key stages which show most evident change (we pay attention to the ratios of 30%, 50% and 80%, which means the corresponding behavior has become significant, rather significant and popular in millennials) in millennials' growth in digital world.
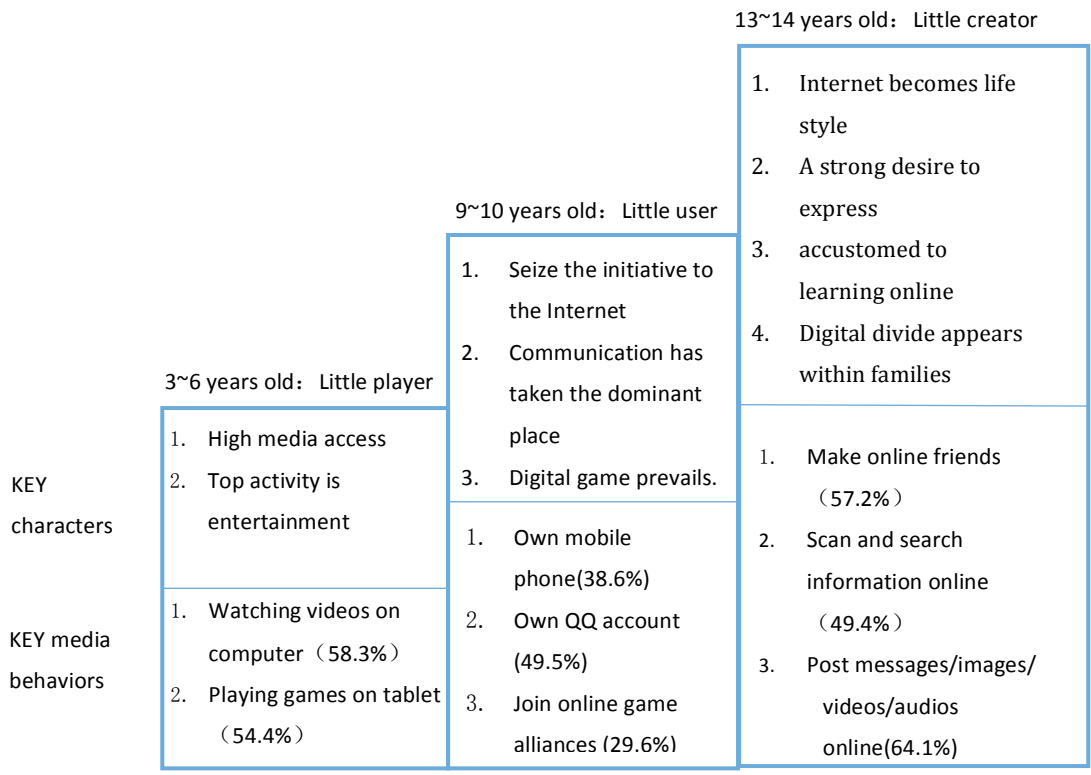
3~6 years old：Little player

KEY characters

1. High media access
2. Top activity is entertainment

KEY media behaviors

1. Watching videos on computer（58.3%）
2. Playing games on tablet（54.4%）

9~10 years old：Little user

1. Seize the initiative to the Internet
2. Communication has taken the dominant place
3. Digital game prevails.

1. Own mobile phone(38.6%)
2. Own QQ account (49.5%)
3. Join online game alliances (29.6%)

13~14 years old：Little creator

1. Internet becomes life style
2. A strong desire to express
3. accustomed to learning online
4. Digital divide appears within families

1. Make online friends （57.2%）
2. Scan and search information online （49.4%）
3. Post messages/images/ videos/audios online(64.1%)

Figure 2: Triple jumps in millennials' growth

Dimension		Key indicators	Age		
			3~6 years old	9~10 years old	13~14 years old
Media access and usage	width	Own mobile phone	4.2%	38.6%	77.8%
		Own QQ accounts	22.5%	49.5%	91.8%
		Subscribe to official accounts in WeChat	6.8%	14.5%	33.5%
	depth	Spent more than one hour in digital media on　weekend	25.6%	28.7%	60.2%
	attitude	Regard mobile phone as the favorite media	26.8%	27.9%	57.4%
		Regard QQ as the favorite way to communicate	7.5%	14.5%	47.3%
Self-development ability	entertainment	Watch video clips on digital media	51.7%	42.2%	51.3%
		Listening to music on digital media	26.2%	36.7%	59.7%
		Playing MMOGs on digital media	1.5%	9.1%	25.8%
	communicatio	Join QQ group	8.8%	44.7%	90.0%

n	Join online game alliances	9.3%	29.6%	47.3%
	Make friends online	4.9%	23.1%	57.2%
learning	Turn to Internet when encountering problems	3.2%	9.9%	21.4%
	Read e-books	3.6%	8.8%	21.9%
	Scan/Search information online	4.9%	29.3%	49.4%
expression	Use Weibo with mobile phone	0.7%	2.7%	12.4%
	Post messages/images/videos/audios online	18.6%	35.8%	64.1%
	Have followers in social media	2.4%	9.3%	28.6%

Table 2: The key indicators in millennials' digital growth

1）3~6 year-olds：Little players

Children are accessing various media at very young ages. 89.8% of those 3~6 years old have read books; 91.7% have seen television; 55.7% have gone to the cinema monthly. The percentage of children accessing new media is even higher: 91.8% for mobile phones and 83.4% for computers. And the time they spend on them is increasing too. More than half (53.4%) of children aged at 3~6 spend over thirty minutes on new media on weekends.

Entertainment including playing games and watching television dominates 3~6 year-old children's digital life, which all exceeds 45% on mobile phones, tabletsand computers. Besides, they begin to use other online applications such as WeChat and QQ. It is noteworthy that 21.2% of 3~6 year-old children have used WeChat by mobile phone and 18.6% have published message on social media.

2）9~10 year-olds: Little users

In this stage, children's digital life starts to be diversified when entertainment, communication, learning and expression behavior extend at the same time. And they have shown a higher independence when they have their own mobile phone. Data reveals the ages of 9~10 years is the peak stage that most children begin to own their first mobile phone, accounting for 38.7%. 44.7% choose and install digital games by themselves.

Communication has taken a dominant place in this age bracket. Almost half (49.5%) of the children have owned QQ, increasing fivefold compared with those 3~6 years old. 44.7% have joined QQ groups; 23.1% have their online friends; and 29.6% have joined game alliances in online games.

3）13~14 year-olds：Little creators

13~14-year-old children have shown higher independence in media usage. With the development of communication skills, they grow from content consumers to

content creators and communicators. Most importantly, their digital literacy has exceeded their parents', which means a digital gap within families appears in   this period.

Besides, digital media has become an inseparable part of their daily life. 60.2% of the children use digital media for over an hour on weekends. 91.8% have QQ; 81.8% have their social media accounts. 90% have joined more than one QQ group and 57.2% have made online friends. The mobile phone becomes their favorite medium in this stage, accounting for 57.4%, followed by books (49%) and computers (45.4%).

5.4   Natives VS immigrants : digital gap in family

As digital natives, millennials are supposed to have a gap with their digital immigrant parents. By comparing the key indicator and related indicator of children and parents (see from Figure 3 to Figure 5; the percentage is calculated in the following steps: add up the key indicators in four categories to yield an average ratio in the group of children and of parents separately, then divide the children's ratio by the parents' ratio), we have found that children grow much faster than their parents in the digital world. Moreover, our research reveals that it is at the age of 13-14 years that the digital gap between millennials and their parents begins to emerge, especially in the communicating and expressing activities. Besides, we have examined "self-efficacy" of Internet knowledge, which indicates that with increasing age both children and their parents consider that "children know more Internet knowledge than parents", and more parents hold this opinion than children.
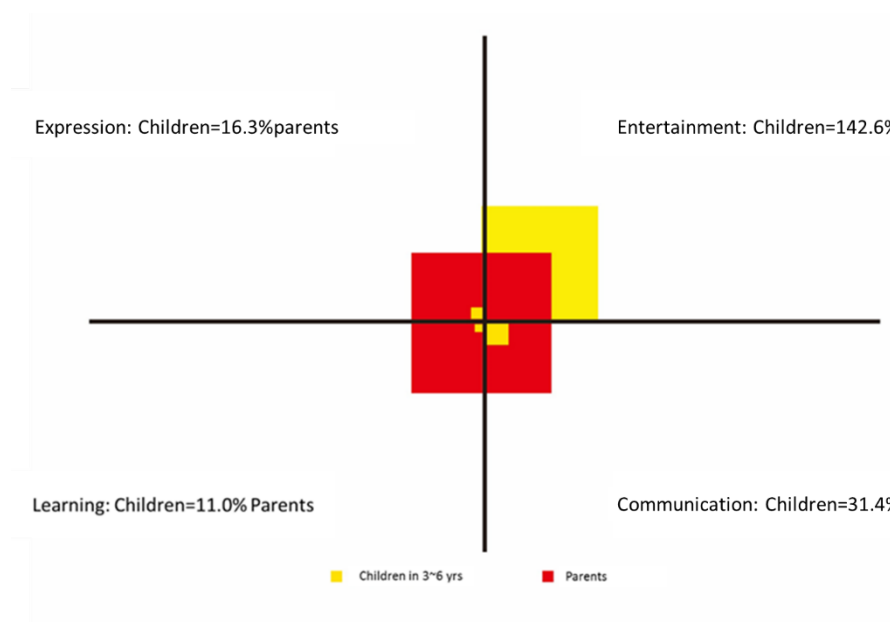

Figure 3 The comparison of key indicators in digital growth between 3~6 year-old children and their parents
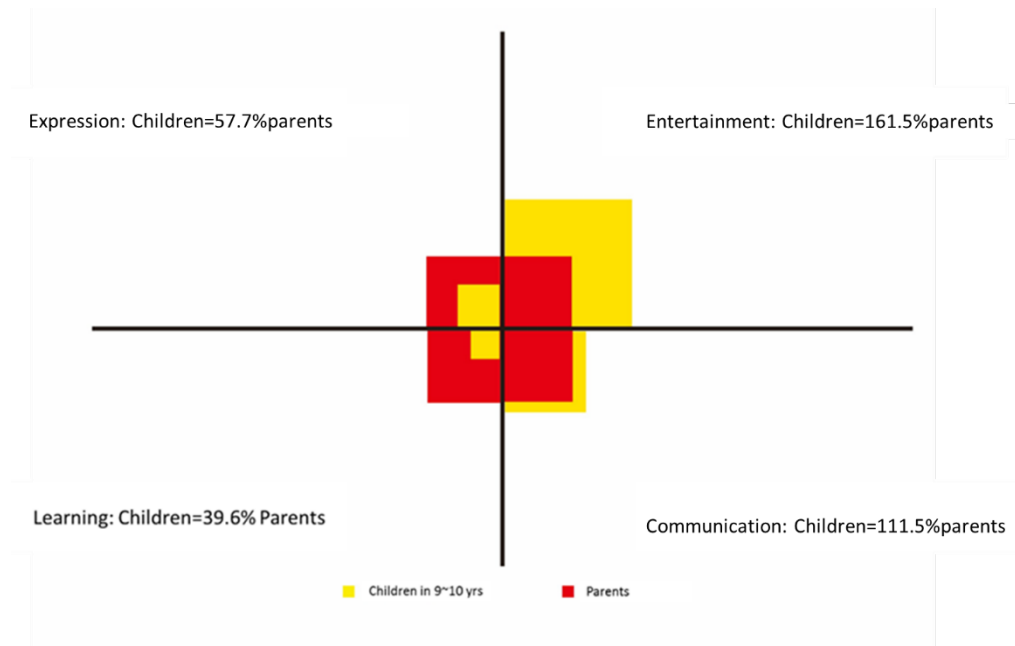
Figure 4: The comparison of key indicators in digital growth between 9~10 year-old children and their parents
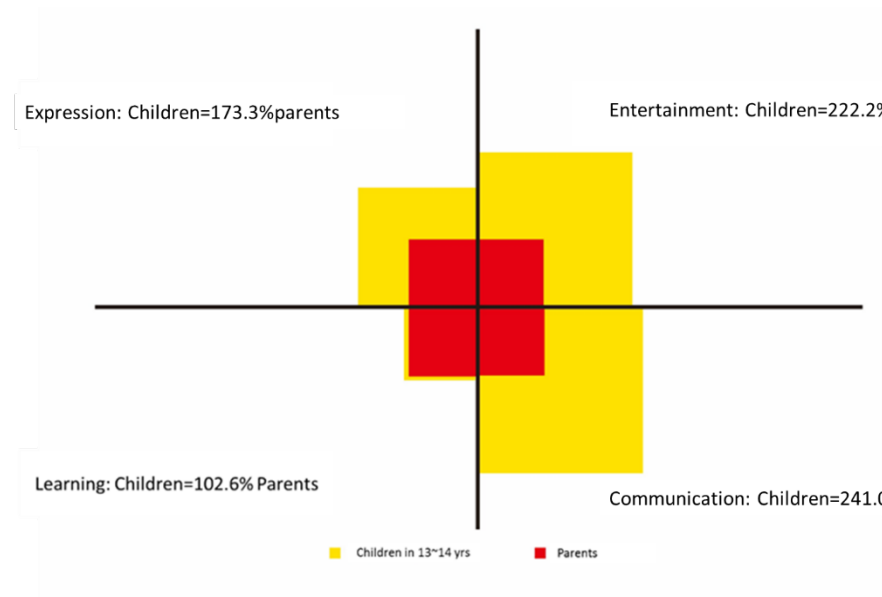

Figure 5: The comparison of key indicators in digital growth between 13~14 year-old children and their parents
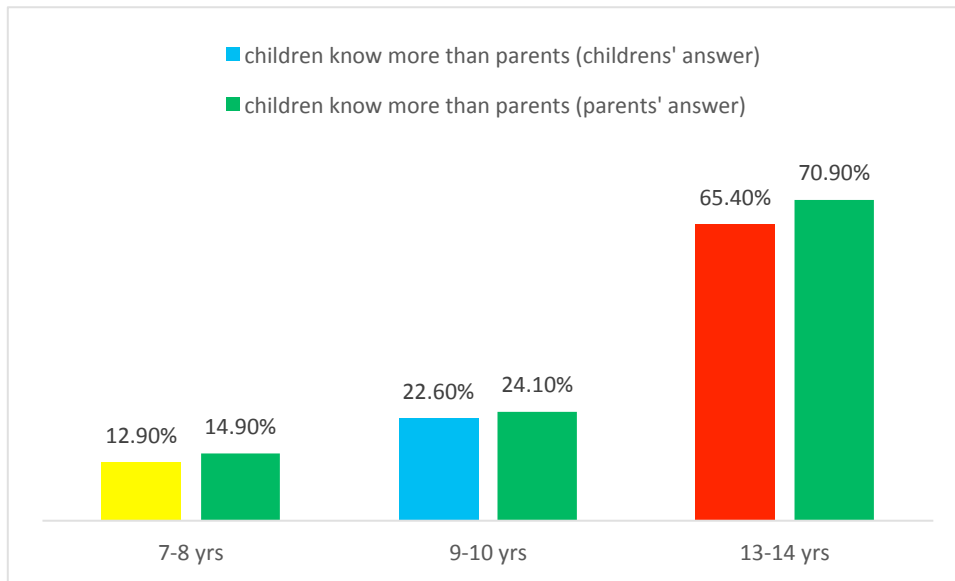
Figure 6: Who know more Internet knowledge in family?

5.5 Online risk and family education
5.5.1 Online risk

As illustrated above, the speed of children's digital growth is beyond our imagination. However, because of their immature mind and limited experience, children are quite vulnerable in the Internet world. In research, we have found that in China, children are potentially highly exposed to risks, which also potentially reflects their low ability to protect themselves from harm. Based on our study, the online risks children encounter are divided into three categories: insecurity, unhealthy activity and uncivilized behavior. Insecurity refers to unawareness of personal privacy, potential harmful online friendship, cyberbullying and fraud. Unhealthy activity refers to inappropriate information, excessive media usage and cyber-addiction. Uncivilized behavior refers to impolite, immoral or unlawful behavior when communicating or expressing online.

The data shows that self-reported online safety awareness of millennials is comparatively high. However, only 32.5% of the children would ask for parents' opinions before filling personal information online. The ratio of those doing so without their parent's consent rises from 2.9% for those 7-8 years old to 10% for those 13-14 years old. As for meeting online friends "offline," the ratio of those who would go without hesitation and those who would discuss it with peers rises with age, while the number of those who would consult their parents drops from 20.2% to 15.5% among children aged 13 to 14.

With age, more children have exposed themselves to inappropriate information. But fewer children would talk to their parents if they have come across uncomfortable information. Among those 13-14 years old, parental authority decreases to such a degree that only one in three kids would turn to family, while more kids prefer to talk

with peers (35.3%) and the population that choose to keep it secret are mounting too (27.9%). In face of risks, growing children choose to solve their problems by themselves rather than turn to their parents, which increases the potential risk at the same time.

What's more, cyber-bullying also becomes more common with increasing age. Among those 13-14 years old, almost one in five millennials (18.3%) have been bullied online while the ratio among those 3~6 years old is 2%. While most of the children have no idea about how to tackle the problem, as shown in the data, half of them choose to ignore it, and the population that choose to bully back rises twice from 9.7% among those 7-8 years old to 21.8% in those 13-14 years old.

5.5.2 Digital-literacy education

In face of online risks, parents expressed assorted worries. The top three are their effects on their children's studies (71.5%), their propensity of damaging eyesight (68.7%), and exposure to inappropriate information (66.1%). Also, parents are afraid of their children making friends with strangers who are treacherous (47.8%), of their being cheated (42.2%), taking away their time for rest (37.6%), and overspending money (13.4%).

For children, the home is the most common location for Internet use and their parents are their first guardian of security. However, though parents show great worries about the potential harm of online risks, most of them do not take action to instruct their children; they even set a bad example in using media and the Internet. Specifically speaking, in our research the lack of media-literacy education in family can be demonstrated in four areas:

1) Absence in children's online world

Most parents admit that they do not add their children as "friend" on social media platforms: 44.7% parents in QQ, 55.8% in WeChat, and 62.9% in Weibo refused to do so. Without a close relationship in the digital world, it is hard for parents to keep track of their children's Internet behavior and to help them to protect themselves from potential harm online. Moreover, parents' company while their children use the Internet is limited too. It shows that 55.2% of parents never play e-games with their children and 38.8% of parents and children never watch television together.

2) Failure to take effective action to ensure online safety

In our research, parents pay not much attention to online risks. 61.7% of the parents never screen applications on their children's mobile or tablet; 67.7% of them do not reach an agreement with children about playing time and content. Parents are the "gatekeeper" for their children. Good awareness and taking measures on cyber security would reduce their children's chance of being harmed by online risks.

3) Failure to set a good example in media usage

Data reveals that, in children's eyes, their parents are addicted to their mobile (72.9%) and show no interest in books (only 27.2% of the children think their parents' favorite mediuma is books). What their parents like most is chatting in WeChat (53.6%) and online shopping (48.0%). Parents' behavior exerts a crucial influence on their children's development, but nowadays most of them fail to become role models for their kids.

    4) Losing authority over children

With age, there is a decreasing trend that millennials turn to their parents in face of problems. Those who regard their mother as a recourse, for instance, have drastically shrunk from 65.1% to 20.4% while those who regard their peers and the Internet as fulfilling that role have jumped from 2.2% and 1.9% among those aged 3 to 6 to 27.6% and 18.4% among those aged 13 to 14. Based on the interview, the decline in parental authority is caused by two reasons: children's autonomy and ability to use digital media increase and parents pay no attention to the online risks that their children are facing and make no effort to curb them.

6 Conclusion and policy implication

After analyzing the data collected using the digital-literacy framework, we have reached several conclusions.

First is the vast diversity of ways children use new media. As we concluded above, children can be characterized as the touching generation, chatting generation, gaming generation, searching generation and sharing generation. At different ages, children's media use diversifies too. They grow from "little player" to "little creator", expanding their self-development in entertainment, communication, learning and expression.

Secondly, regardless of the rapid increase in children's expressing and communicating behavior, entertainment still prevails at all ages. Children place an enduring value on playing games, watching videos and listening to music. These activities attract them most and consume most of their time and money.

Moreover, more opportunity means more risk. Online risk faced by children is caused by the following reasons. First, children's awareness of protecting against risk is low and the ratio decreases with age. Also, the digital gap within families emerges at an ever-younger age. As shown in the data, amaong those 13~14 years old, their ability exceeds their parents' in all four categories, bearing out an astonishing gap between the two generations. Besides, as illustrated in the data, parents today have no idea where the online risk is and how to deal with it with their diminished authority. The lack of education raises the possibility of their children facing online risks.

Although it almost goes without saying that new media is ubiquitous in children's life, we need to take more measures to know more about this new generation.

Raising awareness. Children's digital-literacy education deserves national attention for the reason that improving the overall literacy of citizens in the digital age is closely related to national competitiveness and national cyber security. On the national level, long-term planning for children's digital literacy and related legislation and laws should be made. If possible, the government could appoint a specialized agency to design, organize and coordinate the education, propagation and promotion of children's digital literacy. Besides, digital-literacy education should be included in "civic education" or "ideological education" as a required course or selected course.

Conducting more local researches on "children and new media". The political system, culture and history have made China a unique education and media system. Therefore, more local research based on solid theoretical frameworks should be made to unveil scientific evidence for digital-literacy education that suits the local media environment and children's psychological development.

Improving the self-regulation system of mass media. The content media produce impacts children's mind and psychological health directly. As a result, the supervision and self-regulation of media systems are crucial for children's well-being and development. At the same time, more investment should be made in those media that serve children, and to build a friendly media environment for children.

Negotiating families, schools and society. Digital-literacy education is necessary for children as well as for adults, as part of lifelong learning. Children palaces, museums, libraries should work together to spread digital literacy in families, schools and communities and establish a healthy and civilized Internet society.

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