

International Perspectives on  
Early Childhood Education and Development 10

Marilyn Fleer  
Avis Ridgway *Editors*

# Visual Methodologies and Digital Tools for Researching with Young Children

Transforming Visuality

 Springer

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# International Perspectives on Early Childhood Education and Development

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Volume 10

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Marilyn Flear • Avis Ridgway  
Editors

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Transforming Visuality

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*Editors*

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**Part I**  
**Post-developmental Methodologies**  
**for Researching with Young Children**



# Chapter 1

## A Digital Turn: Post-developmental Methodologies for Researching with Young Children

Marilyn Fleer

### Introduction

Niels Bohr (1885–1962) won the Nobel Prize for Physics in 1922. As a Danish physicist and pioneer in quantum physics, he was and still is viewed as a highly esteemed researcher. Interestingly, Bohr (1950) made the claim that there are huge limitations with the scientific method and its reliance on causal relations, arguing for a more holistic rather than reductionist view when undertaking research. He discussed the idea of complementarity, where he sought to remind the science community that ‘it must never be forgotten that we ourselves are both actors and spectators in the drama of existence’ (Bohr 1950: 51) and that complementarity ‘aims at an appropriate dialectic expression for the actual conditions of analysis and synthesis in atomic physics’ (Bohr 1950: 54). Fox Keller (1983) in looking at the life work of Barbara McClintock, noble laureate, stated that science is not as precise as one imagines. Instead ‘new theories (or arguments) are rarely, if ever, constructed by way of clear-cut steps of induction, deduction, and verification (or falsification). But rather scientists work with intuition, aesthetics and a philosophical commitment’ (p. 145). McClintock herself said she worked with the so-called scientific methods but only ‘*after* you know’ (Fox Keller 1983: 203) the answer to your research question.

McClintock developed an approach to studying the genetics of corn that came to be known as developing a ‘oneness of things’ which pushed against the research traditions of her time: ‘Basically, everything is one. There is no way in which you draw a line between things, what we [normally] do is to make these subdivisions, but they’re not real’ (Fox Keller 1983: 204). The methodological genius of her research was in creating ‘a oneness’ through bringing together all biological forms into a dynamic connectivity – the cell, the organism and the ecosystem. To do this,

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she metaphorically stepped into her microscope to study what initially appeared as disorder stating that ‘the more I worked with them the bigger and bigger [they] got, and when I was really working with them I wasn’t outside, I was down there. I was part of the system. I was right down there with them and everything got big. I even was able to see the internal parts of the chromosomes-actually everything was there. It surprised me because I actually felt as if I were right down there and these were my friends’ (Fox Keller 1983: 117).

In examining the methodological comments of these two well-known scholars of science research, we find that they (1) created a sense of the oneness with what is being studied; (2) gave a holistic or ‘a oneness’ view of research, rather than reducing and studying all the elements into separate categories; and (3) studied the connectivity of the system giving new insights, and only then did they test these through the scientific method.

In this book we draw upon these methodological insights but in the context of researching with children. We specifically seek to theorise how digital visual technologies support the idea of taking a holistic and connected view of research, where the subject under study remains part of a dynamic ecosystem of interactions. We draw upon a range of post-developmental (Blaise 2010) concepts, taken from cultural-historical theory (Hedegaard and Fleer 2008; Veresov, Chap. 8, this volume) and critical theory (e.g. Agbenyega, Chap. 9, this volume) to present a fresh new look at research in early childhood education and development.

Concepts that are introduced in this book have been generated through studies where digital visual tools for researching with children have been the focus. In this first chapter, a theoretical analysis of the key concepts that are later extrapolated in subsequent chapters in this book is given. This theoretical chapter concludes with a statement on the need for the concepts of *ethical validity*, *cultural validity* and *tool validity* when using digital visual tools for researching with children in the early childhood period.

## **Post-developmental Methodologies for Undertaking Research Using Digital Visual Tools**

Evelyn Fox Keller wrote back in 1983 that ‘Scientists make up many communities, and these communities vary by subject, by methodology, by place, and by degree of influence. Science is a polyphonic chorus. The voices in that chorus are never equal, but what one hears as a dominant motif depends very much on where one stands’ (p. 174). This statement about science can be applied directly to research with young children. That is, in the field of early childhood education and development, we find a polyphonic chorus of methodological voices. Claims are made in support of how to gain ‘the truth’ in research as well as the opposite view about ‘how the truth does not exist’. The opposition to truth has also been heard within science, as noted by Barbara McClintock, when she said the scientific method ‘gives us relationships which are useful, valid, and technically marvelous; however, they are not a truth’ (Fox Keller 1983: 201).

A post-developmental perspective as first mooted by Blaise (2010) for the field of early childhood education generally is a useful way of thinking about research. Inspired by this conceptualisation, the term is adopted and expanded directly in relation to research methodologies where digital visual tools are used. Usually the term postpositivist is applied to name the movement away from quantitative research and to qualitative research. However, the term postpositivist is too generic to capture the uniqueness of researching in the field of early childhood education because studying young children in the birth-to-five period is hard to do in educational research. The complexity of generating data with infants, toddlers and preschool participants is well recognised. That is, young children cannot read to fill in a survey, have limited language development and therefore it is difficult to respond to formal interviews, and have no sense of the need to stay for a ‘testing process or procedure’ and will therefore not necessarily stay seated for long periods to respond to set tasks organised by researchers (see Fleer, Chap. 2, this volume). What is required is a sense of a holistic research context for studying with children, where ethical and cultural validity is the norm.

### *Ethical Validity of the Data*

Post-developmental research as theorised here specifically positions itself outside of the traditional child study paradigm where the researcher is viewed as being removed from the context (see all chapters on the role of the researcher). Rather, in post-developmental methodologies, the researcher takes an active role in the study context, not as someone who plays with children (anthropological or ethnographic view), or as someone who observes objectively (like a fly on the wall), but rather as holding the role of ‘the researcher’ with a specific position and task in the context. Sorensen (Chap. 11, this volume) makes the case that this means that the researchers take an ethically informed position, because they can help a child and still engage with a child, not ignoring the child, and therefore not being disrespectful to the child as a person, and through this ethical interaction gain more authentic data. She shows in her study that the *role of researcher* is a concept that is understood by children. She gives the example of a child who in physical activity seriously falls when playing outdoors and who asks the researcher if she caught this on her video camera. When the child discovered that the researcher had put down the camera in order to help her, the child offered to recreate the accident, so that the integrity of the study situation could be maintained (i.e. the research was about the studying physical sport in preschools).

We also see important elements of validity in the work of Quinones (Chap. 7, this volume), where she shows the different roles that a researcher can take when researching with children. She discusses the concept of the affective positioning of the researcher. She introduces nuanced positions that are emotionally charged to explain how researchers act when interacting with children during research. She has theorised a number of positions, including the researcher as a teacher,

as a friend, one who is in the context of space, time and emotions and as a visual-emotional partner.

The role of the researcher has not been theorised in these ways before. In a developmental research tradition, the role of the researcher has been to be objective and invisible because the researcher might contaminate the data. In using a post-developmental research methodology, as is shown in this book, it becomes important to tease out a range of ways that the researcher is positioned, because the role they take gives different possibilities for building a respectful and genuine interaction between the child and the researcher, thus enhancing the validity of the data. This can be thought about as an *ethical interaction* because in a post-developmental research methodology the researcher is not distant and unnatural but rather has a specific role that is taken and linked explicitly to the data that is generated.

Data gathered about or with young children is framed in relation to what role the researcher was taking at the time when the data were gathered, thus increasing the validity of the data generated and determining a higher level of what I term as the *ethical validity of the data*. A search of this term suggests that it has been used (see Edwards et al. 2008) but in relation to what I would consider to be *cultural validity* (discussed further below). *Ethical validity of the data* as it is discussed in this chapter refers to the *relationship and interaction* between the researcher and the child. Here the actual position that the researcher takes when interacting in the research context is coded with the data and is discussed in relation to the findings. The digital visual data is deemed *ethically valid* because the researcher takes a respectful and engaging position with the child in the research context. The position the researcher takes is considered when the data is analysed. This gives a more authentic and holistic approach to researching with very young children.

### ***Holistic View of Researching with Young Children***

All the chapters of this book go beyond a reductionist view of studying children, as subjects to be carved up into developmental periods – as has been the norm in the child study movement that underpins the foundations of early childhood education. In this book Fleer (Chap. 2, this volume) shows how digital video observations can be examined iteratively and gives the example of studying a child who is learning to walk, where the physical activity is examined in the context of how the child feels about her achievements and what motives exist for her learning to walk. She shows how a much more holistic study of a child learning to walk can be obtained. Walking is not viewed as a physical activity but also as an emotional and cognitive exchange between the child, the family and the researcher. That is, a post-developmental approach to researching with children would conceptualise learning to walk as also an emotional and cognitive activity not just a physical action. This view of research is in direct opposition to the traditional approach to studying and reporting on research in relation to the domains of physical, social-emotional, cognitive and language development. Here only parts of the child are studied when this latter conceptualisation is taken.

Veresov (Chap. 8, this volume) in critiquing traditional quantitative research makes the case for conceptualising the development of the child as a qualitative and transformative change – not as a child to be carved up once development has already taken place (i.e. at the end of the process, as the fruits of development). Development can be researched through the experimental-genetic method originally outlined by Vygotsky, where the buds of development (not the fruit) are the focus, where the relations between the ideal and the real forms of development are included in the study and where the idea of a dramatic event is foregrounded as the central catalyst for development. According to Veresov, researching with children entails these principles and provides a foundation for studying development in motion and not retrospectively. This approach to researching with children is very different to the traditional child study movement that historically underpinned the nature of studying children's development in early childhood education.

### *Tool Validity in Researching with Young Children*

A post-developmental view of research is also captured in the chapter by Agbenyega (Chap. 9, this volume) where Bourdieu's concepts of habitus, field and forms of capital are used to study children in Africa. Agbenyega demonstrates how the analytical tools used in critical theory for researching with children should also be applied directly to the researcher – their role, their tools and their fieldwork and the forms of engagement they have with the children, families and communities where they are researching. In studying children's perceptions of the disciplinary techniques used in families and the early years of school, Agbenyega argues that 'video is an option but it wouldn't work for me in this situation because the teacher and parents may alter their real punitive practices thereby defeating the purpose of the study; therefore I opted to use drawing' (Chap. 9, this volume). Casting the critical lens back onto the researcher and what tools they employ to gather data represents an important dimension of researching with young children. That is, for valid data to be generated when studying sensitive issues such as discipline, careful thought must be given to what kinds of visual tools will generate the most authentic data. Being mindful of what the tools will afford in relation to not just the research question but the specific context being researched represents a form of *tool validity in researching with young children*.

Tool validity was also the subject of analysis by Sumsion, Bradley, Stratigos and Elwick (Chap. 10, this volume). In their work critical reflexivity was central for determining how they could understand infants' perspectives in research. Their innovative approach of using *baby cam* for participatory research involved connecting a lightweight video camera to a headband and strapping it to an infant's head in order to capture the visual field of the infant, where the infant's intentions could be determined in relation to another video camera which captured the context that the infant and carer were jointly participating in. Conceptualising the infant's perspective through examining their gaze was possible through the use of digital visual tools. In this instance the tool afforded the best option for authentic data gathering. Once again, thought is directed to tool validity in researching with infants.

In considering the choices made by researchers in relation to tool use for gaining authentic data, it is possible to see how *tool validity* is important when researching with young children. We see a further example of this in the work of Monk (Chap. 5, this volume) where she chose to use visual tools but in relation to giving the tool to her participant families for capturing what mattered to them. In studying intergenerational learning and development in families, Monk used digital images to bring all members of the extended families together in order to create opportunities for dialogue around the images. Through this she positioned the family members as coresearchers, arguing that the families were the only ones that could accurately interpret the digital photographic images, where the dialogue acted as the source, and photographs as the site, of data generation. Through this conceptualisation of the tool, she was able to more authentically document beliefs, values and practices associated with child-rearing across generations. Here tool validity was conceptualised in relation to what it afforded as a tool for coresearching with the families of young children.

Ethical validity and tool validity in the context of a holistic framework for research is presented in this book as central principles of post-developmental methodologies for researching with young children in early childhood settings. We use this term post-developmental methodologies explicitly because the field of early childhood education in most European heritage communities has been *mind-locked* into a developmental view. This latter perspective of child development has guided and reinforced a view of the child as being reduced into pieces – social-emotional, cognitive, language and physical development. Like shadows from the past, developmental theory lives with us in the present. This period in our research history can be conceptualised as a *developmental methodology*. Post-developmental methodologies better capture the uniqueness of the research undertaken now in early childhood education. Post-developmental methodologies is a more accurate term for our field than the term postpositivist because it recognises the *developmental past that has enslaved our thinking about research*. It is a past that we work against each time we prepare and present our work in early childhood education publications. Each of the chapters in this book exemplifies and theorises the principles of post-developmental methodologies, making visible a new way forward with digital visual tools.

### ***Dialectical Frameworks for Undertaking Research Using Digital Visual Tools***

In post-developmental methodologies for studying with children, a dialectical model is adopted, where no one part of the system is studied independently of the whole system of interactions. Dialectical logic is used by the authors of the chapters in this book. Dialectics is understood in the Hegelian sense as both elucidating contradictions and concretely resolving them. Rather than dualisms, such as universal and particular, dialectical logic seeks to bring together binary opposites as a synthesis,

where both the general and the particular are both-at-once the same thing – as resolving contradictions. For instance, dualisms are evident in research when researchers conceptualise their research as either to ‘generalise across populations’ or as a particular ‘case study’. Cartesian logic (mind-body split – as dualism) would support this separation as a dualism that cannot be reconciled together. However, dialectical logic would seek to conceptualise the contradiction of the *general* and the *particular* together as a synthesis. For example, it is not possible to think about a *particular* case of a child, unless one also thinks about the child in relation to *general* childhood or humanity. A child is only conceptualised as a child if we know about a grown-up child – an adult. The *particular* child is part of a *general* population of people with all their complexity. We see an example of dialectical logic in the writings of Ridgway (Chap. 4, this volume) where the historical is conceptualised as part of the present context. She introduces the term past-present dialectic to name this movement. Through the use of digital visual tools for documenting and analysing how past practices manifest themselves in the present context, Ridgway was able to make visible how the fishing history of a preschool community she studied shaped the current practices of the children in an early childhood centre. It was through synthesising images of the past with the digital images of present that practices could be understood.

The concept of synthesis is also evident in Monk’s chapter when family members bring past photographic images of everyday life across three generations together with recent digitally captured images by the researcher and the families of everyday life, where contradictions are made visible and taken-for-granted practices become understood as value positions for child-rearing. It is not just the past-present dialectic of preschool practices or intergenerational child-rearing practices that become better understood when dialectical logic is used for researching with children but broader understandings of culture and community are also realised.

### ***Cultural Validity of Data When Researching with Children***

Researching everyday life using digital video tools is exemplified across chapters and across cultures, for instance, poor families in Australia (Chaps. 2, 4, 5 and 10, this volume), Chinese-Australian families maintaining their heritage language (Chap. 3, this volume), rural families in Cambodia (Chap. 6, this volume), rural family in Mexico (Chap. 7, this volume), urban schools in Ghana (Chap. 9, this volume) and sports preschools in Denmark (Chap. 10, this volume). Pennay (Chap. 6, this volume) explicitly transcends the insider-outsider dualism in research by adopting an interactive-dialectical methodology (Hedegaard and Fleer 2008) where she examines motives and demands in relation to children’s intentions in a rural Cambodian community. Pennay examines ‘at once’ the perspectives of the adults and the perspectives of the children during everyday activities in the morning, at school and in the evening. She draws out the dialectical relationship between the

translator and the researcher, as an important form of conceptualising the research process in order to *ensure cultural validity of the data*. Here she notes rapport, respect, reliability and reflexivity for achieving this. It is through these principles that a holistic view of the research context is formed.

Li (Chap. 3, this volume) in specifically drawing upon and expanding Hedegaard and Fleer's (2008) model of a wholeness approach to data generation shows how to build cultural validity. Through spiralling the analysis of visual data from a common-sense interpretation, a situated-practice interpretation and a thematic interpretation, it becomes possible to visit the data iteratively and to better understand the perspectives of children, parents and the researcher within the research context of the family. She names this final iteration as the *spiral of synthesis analysis* of family practices. Here the researcher is someone who is both within the cultural community (insider) and outside of the family as a visitor (outsider). This is not a boundary, but a dialectic. Li states that her visual analysis seeks to dialectically frame simple and complicated, individual and collective, and researcher and researched, where all perspectives are examined at the one time, leading to greater understandings of cultural practices. Cultural validity of the data is increased through the process of a spiral analysis.

## Conclusion

In this chapter it has been argued that a post-positivist view of research does not accurately reflect the history and development of research in early childhood education. Our research history can be termed as a *developmental research methodology*, and that which has followed can be conceptualised as part of what I have termed in this chapter as *post-developmental research methodologies*. This book fits within the latter.

The concepts of *ethical validity*, *cultural validity* and *tool validity* have been introduced in this chapter in relation to using digital visual tools when researching with young children. These concepts are exemplified in the chapters that follow in this book where dialectical logic was predominantly used to capture *a holistic view of researching with young children*. Taken together, these concepts represent some of the unique features of what it means to use digital visual tools in generating data related to early childhood education and development. Whilst many have written about how to use digital visual tools, few have conceptualised these tools in relation to increasing ethical, cultural and tool validity for early childhood education research. The chapters that follow theorise digital visual tools in new ways, giving insights into researching with young children across cultures, generations and time periods. As a result, this book forges new pathways for post-developmental research.



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**Part II**  
**Cultural–Historical Conceptualisations**  
**of Digital Visual Tools**

# Chapter 2

## Beyond Developmental Geology: A Cultural-Historical Theorization of Digital Visual Technologies for Studying Young Children's Development

Marilyn Fleer

### Introduction

Back in 1966, Barker and Wright asked “How can the student of psychological ecology keep the situation natural and observe naturally occurring behavior when it is not natural for an observer to be present?” (p. 6). I would like to suggest that the question we now need to ask is: How can a researcher using cultural-historical theory keep the situation natural and use a digital video camera to observe naturally occurring behavior when it is not natural for the researcher to walk around holding a video camera? Using digital video tools might look easy, but without a theoretical gaze or without methodological confidence, all that will be gained is hours and hours of video data, without knowing what to do with it. Building a methodology for the use of digital visual technologies has become an important research need for the study of young children's development.

Much of the work that has been written in early childhood education around the use of digital visual tools has either focused on the technical dimensions of the resources, such as what they offer researchers and teachers (e.g., Fukkink et al. 2010; Theobald 2012), or as a description of approaches used in particular research studies (e.g., Hsueh and Tobin 2003). Very little theoretical work has been directed toward knowledge generation through digital visual tools for the study of young children's development across a range of cultural communities (Rose 2007). However, important work outside (Derry 2007) and related (Angelillo et al. 2007; Hedegaard and Fleer 2008; Tobin and Hsueh 2007) to the field of early childhood education provides insights into video pedagogy (Tocho 2007), study of infants (see Johansson and White 2011), video and phenomenology (Erickson 2007), peer learning (Hmelo-Silver et al. 2007), and informal learning environment, such as

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museums (Palmquist and Crowley 2007; vom Lehn and Heath 2007). Consequently, the field of early childhood education has had to mostly draw upon work outside of its area when conceptualizing digital visual research (Johansson 2011a) from a cultural-historical perspective. Significantly, a theoretical space has emerged where digital video tools need to be studied in relation to cultural-historical theory, the research problem, and the study methods. We urgently need to build a cultural-historical methodology for digital tools when researching children's development (e.g., Quinones and Fleer 2011; Vygotsky 1998).

In this chapter it will be argued that digital visual tools when conceptualized from a cultural-historical perspective and applied to the study of child development will allow researchers to document and analyze a child's intentions and engagement across a variety of activity settings. As children move between home, community, preschool, and school, different practice traditions create conflicts and demands that create different conditions for children's development which can be captured in motion using digital video observations (Fleer 2008a, b, c). How these shape children, and how children contribute to these demands, conflicts, and transitions, can be studied in new ways and theorized differently when using digital video tools conceptualized by cultural-historical theory.

In the first part of this chapter, it will be argued that standard approaches to making observations of children have been dominated by traditional views of development where progression is captured as a linear movement following maturational developmental norms constituted in Western middle class communities. It is well understood within the field of early childhood education that these child development theories are limiting and have been called into question. Digital video observations and simple computer video editing tools give the possibility for conceptualizing development differently. I theorize how this might be possible.

In the second part of the chapter, a theoretical discussion will ensue, framed as a methodological rationale focused specifically on the use of digital visual technologies for researching children's development. The social situation of development for Louise, an 18-month-old toddler (Fleer 2010), will be used to illustrate the different features of a cultural-historical methodology for the use of digital visual technologies for studying young children's development.

## **Transcending Linearity and Capturing Change**

When research focuses on studying change of some kind, then it is important to make explicit how change is captured and analyzed. This is usually theorized as some form of "development over time." But one of the fundamental problems facing the field of early childhood education is the need for a new theory of child development to replace the exiting and heavily critiqued maturational theory of how children develop (e.g., Dahlberg et al. 1999). The latter theory affords the documentation of biologically determined developmental milestones that are used as the benchmark for analysis. So how can cultural-historical theory inform research into child's

development in ways which offer something new and help with gaining new understandings of children's development? For example, what would a cultural-historical study of a child learning to walk look like? Would a cultural-historical theory better inform our research practices than traditional maturational theory?

Temporality, rather than dynamic motion, is foregrounded in traditional thinking about development. Bringing together both development as change and development as an overarching theory of child development adds richness and context to a theoretical investigation of digital video technology as a methodological construct. This is particularly so for digital observations and analyses (see Lemke 2007), because as will be argued, *change does not need to be measured by time*.

Standard tools used for making observations of children within the field of early childhood education, such as paper and pencil, have been dominated by traditional views of development where progression is captured as a linear progression. Assumptions about children's development have mostly followed maturational developmental norms constituted in Western middle class communities (for a critique see Rogoff 2003). For instance, developmental milestones are often used as markers of "expected development over time," such as when a baby crawls at 6 months, walks at 12–14 months, and runs thereafter. Vygotsky (1997) argued that much of the research and theorization in traditional psychology sought to understand human development as a fused mix of biological and cultural development, where the biological developmental pathway is privileged because it is more visible. For example, when a child does not walk at an expected age, then this is viewed as a lack of developmental progression. Originally development was seen and researched in relation to growth and maturation. However, Vygotsky's thinking ran much deeper.

Unlike maturational theories of development, a cultural-historical conception of development is not linear. Vygotsky argued against a maturational or biologically driven view of development, stating that this theory only ever represented one side of development. He argued that although this theory acknowledges "the external influences on the biological plan (natural)," he stated that the biological plan does not go far enough because it does not show how "culture itself profoundly refines the natural state of behavior of the person and alters completely anew the whole course of his [sic] development" (Vygotsky 1997, p. 223). For instance, community beliefs about how babies are held ready to support communication or walking (e.g., see Nsamenang and Lamb 1998) determine the conditions for not only an infant's opportunities for social engagement and willingness to walk, but how they can physically respond or interact, completely changing the nature of what might be learned or developed. For example, in Cameroon babies are held outward facing the community, ready for social engagement, while in many European heritage communities, babies are held facing their caregiver, ready for one-to-one intimate communication.

Vygotsky (1997) articulated a theory that focused on a holistic model of development that included the dialectical relations between psychological, biological, and cultural dimensions as noted through motives, cognition, and the social situation of development (Bozhovich 2004, 2009; Kravtsova 2005). In a dialectical and

revolutionary view of child development as discussed by Vygotsky (1997), the child's relations to their environment are the central source of development. For example, when an infant is constantly held to keep it safe because it lives within a family where older siblings and pets move rapidly about (Fleer 2010), the opportunities to learn to walk are different to an infant who is placed on the floor with an expectation of moving about by themselves. In a cultural-historical reading of child development, walking is culturally defined and enacted and not just biologically determined. Video observations can capture the complexity of the dynamics that surround the material conditions and social expectations that make up the cultural nature of a child's development.

Vygotsky (1997) stated that "the process of cultural development itself must be understood as a change in the basic original structure and the development of new structures" where cultural development "represent a genetically more complex and higher form of behavior" (Vygotsky 1997, p. 83). When using video tools, "video re-presentations may never be raw data in the sense that we once understood that phrase..." raw data deines all that which is captured "from the moment the video camera is turned on" (Goldman 2007, p. 17), and re-presentations of how this raw data is worked in layers. For example, digital video observations of an infant learning to walk are better understood when data are layered to determine the relations between individual motives, family interactions and demands, societal expectations of when children are "expected to walk," and the material conditions available to the infant. The video data are saturated with interpretation across each of these layers, but these interpretations can only be understood in relation to each other. One level of analysis (i.e., at the individual child level) is given meaning by an analysis at another level (i.e., the community expectation of when children should walk).

Vygotsky (1997) argued that maturational theories of development when used by educators position the person "to take slow, smooth steps" (p. 223) along a particular development trajectory, as an *evolutionary pathway* of child development. However, in Vygotsky's alternative theorization, he suggested that development could be captured through the metaphor of *skipping*, where development is nonlinear and revolutionary. For example, a dynamic form of analysis is needed when we see an infant who is positioned centrally within a family, always being held, placed into a high chair, or pram, for extended periods, and where siblings are constantly moving about the house circling the mother and infant, the high chair, or the pram, engaging with the baby and each other and the material environment. In this example, there is no need for the infant to walk and no motive for learning to walk. The infant does not develop walking in relation to an expected age, but rather in relation to the material conditions and social need for walking. Digital video tools capture this engagement and interaction and give a new approach for dynamic analysis of development. Goldman (2007) argued that "Video representations seem to be a different kind of re-presentation than textual representations. They display and illustrate a person's expression and experience in the context of a community as an event is taking place" (p. 16). Knowledge production about human development



Fig. 2.1 Screen dump capturing a child learning to walk

is viewed “as a series of dynamic and interactive events,” and this perspective “trumps the linear, causal, and internal explanation” (p. 22) and problematizes linearity (see Tobin 2007). The metaphor of *skipping* transcends linearity as measured by time, and video tools help realize this new dynamic way of thinking about capturing change.

Capturing change as *skipping* is central to Vygotsky’s (1997) dynamic methodology where child development is viewed as a dialectical process between the child and their social and material world as a form of cultural development. Vygotsky (1997) argued that “Culture is both a product of social life and of the social activity of man [sic] and for this reason, the very formulation of the problem of cultural development of behavior already leads us directly to the social plane of development” (Vygotsky 1997, p. 106). Important here for understanding skipping as a metaphor for cultural development is the concept of *social mediation*. Social mediation is the relations between the child and their material world, and mediation with all its complexity can be easily captured in digital visual form as a copy of social reality. An example of what this might look like when using simple technologies, such as iMovie on a Macintosh, is shown in the screen dump depicted in Fig. 2.1. Here the example of a child learning to walk is shown. An electronic copy of these social relations that become higher mental functions allows for the possibility of an iterative analysis

as conceptualized through the metaphor of *skipping*. In this theorization, it is important to acknowledge that Vygotsky had a specific scientific meaning for the term social because to do otherwise would be to risk reducing the interpretations of Vygotsky's theory to a superficial or everyday reading of this term:

The word "social," as applied to our subject, has a broad meaning. First of all, in the broadest sense, it means that everything cultural is social. ...Further, we could indicate the fact that the sign found outside the organism, like a tool, is separated from the individual and serves essentially as social organ or social means. (Vygotsky 1997, p. 106)

Hence, all "higher mental functions are the essence of internalized relations of a social order, a basis for the social structure of the individual. Their composition, genetic structure, method of action – in a word, their entire nature – is social; even in being transformed into mental processes, they remain quasisocial" (Vygotsky 1997, p. 106). Digital visual technologies capture the social order and structure of the individual in the process of its formation.

Digital video observations provide detailed accounts of how, in everyday life, cultural development is shaped by and shapes the social situations that the child finds themselves in. Digital video analysis allows these cultural interactions to be examined and reexamined, in ways which include the researcher and the researched, the material world, and the past events that are active in the moment. Categories are held visually together within a system of concepts and are not separated out. For instance, to examine the "demands" upon a child, one can also examine the "demands" and "expectations" that the child makes upon an adult. For example, when an infant who cannot yet walk wishes to be on a swing, the infant will make demands upon the adult to carry her to the swing and give support. The adult creates the conditions by providing the swing. But when the adult does not have time to support the infant to go on to the swing, this places demand upon the infant to try to stand in order to go onto the swing. This in turn may lead to the development of a motive to learn to walk (Fleer 2010). The complexity of this kind of analysis, common in cultural-historical research, can be understood when the techniques of digital analysis are considered.

In situ video observations gained through digital video recording, and the mirroring of this process later through digital video analysis, allow many possibilities for analysis which seek to keep data connected and not disembedded from context, activity, and the lived nature of everyday life where development occurs. In digital video work, the layers of analysis are iterative and present themselves within the mirror image of the real situation being researched (as shown in Fig. 2.1).

To document the cultural nature of development as *revolutionary rather than evolutionary* process requires tools, such as digital visual technologies, that will make visible the nature of the dynamic interaction conceptualized in the *skipping* metaphor. Vygotsky (1997) states that "It is obvious that the uniqueness of this process of changing behavior that we call cultural development requires very unique methods and ways of research" (Vygotsky 1997, p. 27). A cultural-historical conception of digital visual technologies for the study of child development gives this possibility.