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REVIEW OF EDUCATIONAL RESEARCH 2013 83: 236 originally published online 4 March 2013

DOI: 10.3102/0034654313478492

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What is This?

Changing Conceptions of Time: Implications for Educational Research and Practice

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The construct of time influences student learning in and out of school and consequently pervades educational discourse. Yet the integration of information and communication technologies into contemporary society is changing how people perceive and experience time. Traditional theoretical and methodological approaches to time research no longer capture the nuances of digital, temporal realities. This article offers a theoretical analysis of three temporal perspectives: (a) clock time, measured in objective, linear units; (b) socially constructed time, experienced subjectively according to social and cultural context; and (c) virtual time, a new category that synthesizes emergent temporal theory in the digital age. Implications for educational research and practice are discussed. The authors initiate discourse around new theoretical approaches to educational time research in an era characterized by great sociocultural and temporal transformations.

KEYWORDS: time theory, time and education, technology and education.

Vladimir:
That passed the time.
Estragon:
It would have passed in any case.
Vladimir:
Yes, but not so rapidly.
Samuel Beckett (1954), *Waiting for Godot*

The rapid integration of information and communication technology (ICT) into all facets of contemporary society is changing the way people make sense of time. Because the construct of time permeates all aspects of daily life, how individuals and societies utilize, perceive, negotiate, and experience the passing of time has been a subject of inquiry across academic disciplines. Investigating time use has been particularly pertinent in educational research because time represents a crucial input into the learning process. As the world becomes increasingly digital, educational scholars confront the challenges of studying temporal realities and

implications in a new cultural context. Examining the relationship between time and academic achievement requires an analysis of emerging temporal theory.

Time research is a challenging endeavor because what exactly constitutes the construct of time is subject to interpretation (Birth, 2004). Throughout history, changing social, cultural, and institutional contexts have generated different ways of conceptualizing time. Two dominant temporal theories have emerged. On the one hand, time is viewed as a universal, measurable construct dictated by the clock and the Western calendar. This paradigm, which we refer to as *clock time*, subscribes to a linear, objective characterization of time, aligning with positivist assumptions and scientific inquiry. On the other hand, people may not interpret time in uniform ways, and perceptions of time are not static; what time is and how it is experienced depends on the “basic sociocultural processes through which temporality is constructed” (Munn, 1992, p. 92). We term this second paradigm *socially constructed time*. These two theoretical perspectives have served as the foundation for most time research.

The early 21st century, however, is in the midst of significant sociocultural changes triggered by the proliferation of information and communication technology (Castells, 2000). As emergent technologies become integrated into numerous aspects of daily life, the ways in which people in Western societies experience and make sense of time are being transformed (Castells, 2000; Hassan, 2003; Wajcman, 2008). Traditional theoretical and methodological approaches to time research no longer capture the nuances of digital, temporal realities. The ICT revolution thus complicates the study of time in general and in education in particular. To highlight the need for educational researchers to understand and address these temporal changes, we offer examples of the ways in which time affects teaching and learning and has implications for educational opportunity and equity.

The notion of time pervades educational discourse. Researchers have examined instructional time and time on task, exploring how time spent engaged in learning activities affects students’ progress (Clark & Linn, 2003). How long students spend reading or writing throughout the school day, for instance, has implications for their overall academic progress (Langer, 2001). School leaders wrestle with how to best allocate their teachers’ time given both instructional and administrative demands (Darling-Hammond, 1997). Indeed, because scheduling creates both possibilities and limitations, teachers’ work is fundamentally shaped by and interpreted through the dimension of time (Hargreaves, 1990). How people spend their discretionary time also enhances or limits their success in education or the workplace (Becker, 1965). For students, “the non-school hours (evenings, weekends, summers) can be times of opportunity, risk, or stagnation” (Pittman, Irby, Tolman, Yohalem, & Ferber, 2003, p. 26). Students can theoretically improve their achievement by using their time in academically meaningful ways (Carbonaro, 2005). For instance, scholars have explored the effects of homework (Ulrich, 2007; Witkow, 2009) or involvement in extracurricular activities (Price, Wight, Hunt, & Bianchi, 2009) on academic achievement. Time allocation research therefore helps to explain and facilitate positive educational outcomes.

Because time is a principal input into the educational process, how time is used has ramifications for equity and access. Scholars have shown that acquiring advanced academic skills in K–12 settings requires providing students with ample time to practice (Fisher & Frey, 2008). However, schools vary in their capacity to

provide students with quality learning time. For instance, low-income students attending underresourced schools are more likely than their higher-income counterparts to experience class time that is devoted to test preparation or disrupted by discipline problems and disjointed scheduling (Balfanz, Legters, West, & Weber, 2007; B. Smith, 2000). Differential instructional time results in inequitable access to rigorous academic preparation. More generally, the allocation of time in schools is not neutral, but rather micropolitical: “Time distributions also reflect dominant configurations of power and status within schools and school systems” (Hargreaves, 1990, p. 306). How time is organized in schools reflects which academic subjects are privileged and which students are prioritized and embodies the temporal values of the dominant class—potentially placing marginalized youth at a disadvantage. In addition, students do not have equal opportunities to participate in activities outside of school that enhance their learning in school (Price et al., 2009). Higher-income students, who often have greater access to extracurricular programming, may acquire more practice with structuring time to complete required tasks.

Students’ time allocations become particularly critical at the postsecondary level. Because college involves fewer hours of structured class time, students’ academic success depends on their ability to use time effectively (Kitsantas, Winsler, & Huie, 2008). Yet recent higher education scholarship has suggested that college students allot more time to leisure activities and less time to studying, raising concerns about the value of a college degree (Arum & Roksa, 2011). Utilizing effective time management has been identified as one of the largest obstacles facing first-generation college students (Hurtado, Carter, & Spuler, 1996; Kuh, 2001). Time research in education can therefore facilitate the development of strategies that assist students in maximizing their achievement and enhance access to higher education (Kuh, 2001).

The construct of time is central to the ways in which researchers understand educational inputs and outcomes, policymakers conceive of schooling, administrators make decisions, educators design their instruction, and students acquire skills and knowledge. Understanding how time is perceived and experienced is thus a necessary prerequisite to constructing policies and pedagogical practices that increase educational opportunity. For this reason, the unique temporal landscape generated by ICT warrants attention and investigation. As time acquires new meanings within a new sociocultural context, the temporal dimensions of the educational process shift. Traditional assumptions about how time affects achievement may no longer be relevant. Accordingly, despite acquiescence around the importance of exploring the relationship between time and student learning, educational researchers lack a coherent temporal framework to guide inquiry during a moment of significant temporal transformations.

Our purpose here is to offer an overview of the literature on temporal theories and their applications in educational research to initiate discourse around how scholars might account for time in the digital era. The review proceeds in two sections, outlining first the theoretical foundations of time inquiry and then the applications of these frameworks in the context of education. We begin by examining the historical evolution of clock time and socially constructed time, followed by their contemporary applications and limitations. We then turn to emergent theory that aims to account for the temporal disorder caused by the rapid growth and

spread of information and communication technology. We synthesize this nascent literature within a third theoretical category, which we shall call *virtual time*.

The second half of the analysis explores these three theoretical frameworks in the context of educational research. Ultimately, we suggest that while the theoretical implications of ICT on time are not yet fleshed out and warrant further exploration, what is clear is that society is in a new era. Today's students encounter a world characterized by competing temporal meanings and demands, where time is governed by the clock and disrupted by the capacities of digital media. Innovative approaches to conceptualizing and studying time are needed to prepare students to successfully navigate this multifaceted temporal landscape. We close with a discussion and directions for future research.

Theoretical Perspectives on Time

This section outlines the historical development, applications, and limitations of the three temporal paradigms: clock time, socially constructed time, and virtual time. Before we proceed, we briefly discuss our approach to reviewing the literature.

Framing the Study

The literature featured here encompasses theoretical and empirical work from a range of disciplines, including sociology, anthropology, economics, computers and technology, and education. Within education, we examined time use research specifically, as well as scholarship on college access and diverse student populations. The literature and data were retrieved using library hand searches and the following search engines: ERIC, Google Scholar, and ProQuest. In obtaining information on the historical evolution of different temporal theoretical perspectives, we did not include a specific date range so as to gain a sense of how temporal theory evolved over time. Search terms to obtain literature on time included variations of the following: *time theory*, *scientific time*, *clock time*, *social time theory*, *anthropological or sociological time*, *perceptions of time*, *time sense*, *technology and time*, *digital time*, and *network time*. When articles and scholars appeared repeatedly cited in the literature, the search engine Web of Knowledge was used to identify other studies citing those influential sources. The literature that we uncovered predominantly fit into three themes, which we used to create our categories of time theory: clock time, socially constructed time, and virtual time.

In exploring the application of these theories in the field of educational research, we employed the following search terms: *time and education*, *out of school time use*, *time management*, *time use and academic achievement*, *students' time allocations*, *homework/study time*, *technology use and academic achievement*, and variations of these phrases. Initially, we limited our search to literature published after 2002, but incorporated relevant articles published prior to that year when they appeared frequently in works cited lists. We primarily included articles that discussed the relationship between students' time use or time sense and academic achievement. In addition, we include some references that discuss the culture of schools or the workplace, which pertain to the category of socially constructed time. Ultimately, 140 sources were included in the review, 59 of which were specific to time theory. In what follows, we provide an overview of each theoretical category of time research.

Clock Time

From this perspective, time is divided into measurable, linear units through clocks and calendars (James & Mills, 2005). Based in an objectivist, positivist worldview (Grandy, 1973), clock time has become dominant in Western culture and increasingly standardized globally (Zerubavel, 1982).

Historical Development

The evolution of clock time moved through two major phases: the introduction of modern scientific thought and the growth of capitalism.

Modern science. The roots of clock time theory can be traced to the 18th century and the birth of modern science. Prior to this time period, the Catholic Church was the dominant influence in Europe, conceptualizing time based on biblical chronology and the belief that time “accomplished” or brought about events (Fabian, 1983, p. 11). Sweeping social changes took place across Europe in the 1700s, facilitating the emergence of modern scientific theory. Modern science asserted the capacity for humans to acquire knowledge and facts through observation, challenging the dominance of Christian religious ideology (Fabian, 1983). The Scientific Revolution, European Enlightenment, and Age of Exploration fueled increased investment in exploration and scientific experimentation, resulting in what Fabian (1983) termed the “secularization of time” (p. 10). Secular time is characterized by two assumptions: first that time is immanent and coextensive with the world and second that relationships between parts of the world can be understood temporally. Charles Darwin’s theory of evolution then established the notion of geological time, further undermining the authority of the Church and strengthening the legitimacy of scientific perspectives (Fuller, 1971).

The work of Isaac Newton also contributed to the foundations of clock time by advancing scientific theory. Newton posited a model of linear and absolute time, portraying time as a universal, unchanging variable (Levine, 2003). In other words, time exists separately from human consciousness and passes uniformly independent of people’s daily experiences or interpretations. His theory thus aligned with positivist claims of neutrality and detachment in academic inquiry (Fabian, 1983). As Levine (2003) asserted, Newtonian views of time undergird much research in the sciences by supporting five key principles of positivism: (a) objectivity, in which time is seen as an invisible medium; (b) continuity, in which continuous time allows the study of change; (c) linearity, in which events take place on a linear timeline, enabling the study of cause and effect; (d) universality, in which laws and principles can be discovered; and (e) reductivity, in which examining a single unit of time affords understanding of an entire process. Within this paradigm, researchers strive to examine and understand human behavior according to a universal, standardized notion of time. Newton’s theory of linear time continues to dominate research in the sciences and economics (Levine, 2003).

Capitalism. After the emergence of modern science presented a secularized view of time, the growth of industry and capitalism in the 19th century ingrained clock time into mainstream life in Western societies. E. P. Thompson (1965) argued that the rise of industrialization altered people’s temporal awareness by standardizing

clock time. Thompson distinguished between task-oriented and clock-oriented societies. Individuals in task-oriented societies disregard clock time because they associate time with “observed necessities,” such as fishing or farming (Thompson, 1965, p. 60). Task-oriented cultures thus perceive less distinction between work and other aspects of daily life. In contrast, clock-oriented societies create a clear division between time owed to the employer and leisure time; time becomes commoditized (Gershuny & Sullivan, 1998). Fueled by the invention of clocks and the rise of the factory system, clock time facilitated the synchronization of labor, enhanced temporal awareness, and emphasized punctuality and precision (Thompson, 1965). Schools reinforced new conceptions of time by inculcating students with time thrift and time discipline. The Protestant Church encouraged work ethic from a moral standpoint, strengthening the association between time and money. “In mature capitalist society,” Thompson asserted, “all time must be consumed, marketed, put to *use*; it is offensive for the labour force merely to ‘pass the time’” (p. 91). Standardized clock time thus helped to create structure and efficiency in a capitalist economy (Heintz, 2005). Mumford (1934) maintained that the clock is the most important machine of the industrial age, a mode of time-keeping that “dissociated time from human events” (p. 15).

Contemporary Applications

Rooted in scientific theory and reinforced by industrial capitalism, clock time is commonly applied today through the lens of economic scarcity.

Economics. Economists note that each day is limited to 24 hours and characterize time as a scarce resource (Becker, 1965). Gary Becker (1965) first introduced the notion of time as a resource in his article, “A Theory of the Allocation of Time.” He equated families with firms, who have a limited number of resources to allocate such that they maximize their productivity. Time is one such resource and thus an input into the consumption process (Becker, 1965). According to this perspective, individuals choose to spend their time in ways that enable them to maximize their satisfaction. Gross (1984) endorsed this perspective, suggesting that people must choose among alternatives, such as working, sleeping, or playing, because they cannot complete two activities simultaneously. Economists therefore adopt a view of time as linear, continuous, and uniform (Usunier & Valette-Florence, 2007), requiring individuals to make time allocation choices based on a fixed number of hours in the day.

Clock time constitutes the dominant temporal perspective in Western, developed nations (Usunier & Valette-Florence, 2007). As Hallowell (1937) wrote, “When one thinks of time, not as a sequence of experiences, but as a collection of hours, minutes and seconds, the habits of adding time and saving time come into existence . . . time, in short, became reified” (p. 649). Simply put, time is money (Gross, 1984), requiring people to construct their daily activities and goals within a static framework. The commoditization of time in Western thought is so prevalent that it emerges in linguistic phraseology; time is spent, saved, wasted, invested, divided, managed, budgeted, shared, and used up (Birth, 2004; Gross, 1984; Lakoff & Johnson, 1980). People who prioritize and allocate appropriate amounts of time to complete business and educational objectives are lauded for using time

wisely. Gross (1984) pointed out that the current interest in time allocation research likely stemmed from the capitalist mode of production and economic commoditization of time. Most time allocation studies have relied on scientific theory and quantitative methods, employing the tools of Western time measurement to study human behavior.

Limitations

Scholars have highlighted ideological and theoretical limitations of the clock time paradigm (Aminzade, 1992; Birth, 2004; Fabian, 1983; Munn, 1992).

Ideological. Ideological concerns point out that clock time aligns people with a particular world order by creating structures that dictate work and leisure. Because clock time is embodied in daily activities and experience, “people are ongoingly articulated through this temporalization into a wider politico-cosmic order, a world time of particular values and powers” (Munn, 1992, p. 111). Philosophers such as Karl Marx (1877) and Max Weber (1876) viewed clock time as a vehicle for social control through the regulation of work schedules. Marx discussed the role that time plays in the oppression of workers in his writings on industrial capitalism. He distinguished between two types of time, concrete time, in which time is devoted to the creation of commodities, and abstract time, in which time itself becomes the commodity and has exchange value (Heydebrand, 2003). According to capitalist rules of production, a firm regulates the time of its workers to maximize production (Segre, 2000). Employers control the division between concrete and abstract time, thus maintaining unequal capitalist class distinctions. Weber also expressed concern for the institutional regulation of time in modern societies (Segre, 2000), asserting that capitalist firms regulate and stabilize the pace and timing of daily work. Other research has focused on the colonization of the Americas, which utilized Western temporal practices to force the assimilation of Native Americans (Pickering, 2004). For instance, the U.S. government organized reservations and schools to imbue Native American peoples with clock time discipline and thus accelerate their integration into the American labor force so that they might assume, presumably, productive lives.

Theoretical. Other critics of clock time underscore theoretical shortcomings, suggesting that studies based on time measurement rely on three false assumptions. The first assumption is that clock time is a universal construct to which all peoples and cultures subscribe. This assumption “is evident in the writings of economists who conceptualize time in social settings as information costs” (Aminzade, 1992, p. 471). However, the orientation toward clock time and the accompanying characterization of time as a scarce resource are historically and culturally specific beliefs. As Fabian (1983) asserted, when anthropologists view their research subjects from the perspective of Western notions of clock time, they create further distance between the researcher and the Other and reinforce imperialistic attitudes. Framing time as a commodity is a cultural construction (Birth, 2004), and different cultures both across and within societies construct their own notions of time.

The second assumption of the clock time paradigm is that people are willing and able to allocate their time according to the economic principle of scarcity

(Aminzade, 1992). In other words, this view assumes that people can and will conceptualize their time use decisions within an economic framework, considering trade-offs and aiming to maximize their productivity. Yet many people do not think about time in this way or cannot exercise autonomy over their time allocations due to social and economic obligations; contrary to Becker's (1965) premise, not all individuals calculate the monetary value of their time (Aminzade, 1992). Moreover, some research suggests that people who subscribe to the proverb "time is money," conceptualizing time in terms of its cash value, are likely to prioritize work and deemphasize leisure, volunteering, and social relationships (DeVoe & Pfeffer, 2007a, 2007b). In this sense, viewing time solely as a scarce resource may not support positive or meaningful outcomes in all aspects of a person's daily life.

The third assumption inherent in clock time is that quantifying time allocations provides adequate understanding of an individual's relationship with time (Aminzade, 1992). For example, time diary studies rest on the supposition that greater time spent in a particular activity represents the relative significance of that activity to the actor. Yet the amount of time devoted to an activity does not necessarily indicate its importance, because a host of factors and responsibilities influence people's time use choices (Birth, 2004). Hence, clock time research assumes universal acceptance of clock time and capitalist philosophy, disregarding subjective temporal values, experiences, and perceptions.

In summary, the clock time paradigm reflects a scientific, objective view of the world, characterizing time as a separate, measurable construct. Clock time research aims to explain behaviors and choices relative to quantifiable time allocations, based on the notion that time is a valuable and limited resource for human productivity. At the same time, this perspective disregards the existence of diverse temporal interpretations. Efforts to uncover subjective experiences of time emerge from social construction theory, discussed in the subsequent section.

Socially Constructed Time

To offer an alternative to the clock time paradigm, researchers primarily in the fields of sociology and anthropology have promoted a social constructionist framework. This view challenges the assumption that singular truths and realities exist, emphasizing the "fragmented, effervescent quality of experienced time, which defies sequence and cannot be measured" (Gershuny & Sullivan, 1998, p. 70). Time is a social construction and varies according to sociocultural context (Adams, 1988; Usunier & Valette-Florence, 2007).

Historical Development

The conceptualization of time as a social construct emerged at the beginning of the 20th century during a critical turning point in anthropological and sociological research. Western scholars seeking to understand other cultures began to realize that diverse societies construct reality—and in turn, time—differently. We discuss the contributions from anthropology and sociology in the subsections that follow.

Anthropology. Anthropologists such as Malinowski (1927), Evans-Pritchard (1939), and Geertz (1973) were instrumental in exposing diverse perceptions of time. Malinowski identified three temporal constructs among the Trobriand Islanders of Northwest Melanesia: astronomical, meteorological, and cultural.

Evans-Pritchard found that the Nuer understand time as a motion or process, characterized by work and social activities. Because the Nuer language does not have an equivalent word for time, “they cannot . . . speak of time as though it were something actual, which passes, can be wasted, can be saved, and so forth” (Evans-Pritchard, 1939, p. 208). Similarly, Geertz encountered a unique time consciousness through his study of culture in Bali. He identified a sense of detemporalization relative to the Western calendar, in which the use of different stages and cycles signifies a nondurational notion of time. These studies revealed that time is not universally and objectively defined. Rather, temporal constructions emerge from particular sociocultural contexts.

Varying interpretations of time also surfaced in research on indigenous peoples. Scholars have found that Native Americans possess a different time sense (Hallowell, 1937; Pickering, 2004). Among the Lakota people, for example, “time was never a specific minute, but rather spaces of time, like early morning, just afternoon, or just before midnight” (Pickering, 2004, p. 92). Hallowell (1937) asserted that entering the temporal reality of the Saukteaux Indian tribe demonstrates the “relativity and provinciality of western time concepts” (p. 651); different time orientations are functions of cultural experience rather than reflections of primitive or backwards mentalities. Additionally, the Aboriginal conceptualization of time has been a focus of many scholars (Dean, 1996; Stanner, 1956; TenHousen, 1999). Coined by anthropologist Frank Gillen, *dreamtime* refers to the primordial time in Aboriginal mythology, when the ancestral spirits formed the existing world with fixed structures and moral codes (Dean, 1996). Because these structures are eternal and unchanging, “man, society, and nature and past, present, and future are at one together within a unitary system” (Stanner, 1956, p. 54). The resulting time sense is patterned-cyclical—discontinuous, event oriented, and experienced as a long duration instead of a series of moments (TenHousen, 1999).

Contemporary research on African societies also reveals that time is “radically contextual” (Reichardt, 2000, p. 470). People living in subsistence economies, small villages, or tribal units do not require an abstract system of time measurement because they can coordinate events and networks through face-to-face interactions. Africans in these societies characterize time according to activities, rituals, natural cycles, and spiritual beliefs; time is not viewed as something humans control, but rather “a dimension of the surrounding world” (Reichardt, 2000, p. 470). In addition, transmitting knowledge through oral storytelling allows Africans to experience time collectively rather than individually. Referencing the work of John Mbiti, Reichardt (2000) explained that traditional African cultures do not conceive of the future. Because time is not an abstract, quantitative concept, it is defined and produced through experience, which makes it real. Consequently, the linear pattern of clock time, organized into past, present, and future, represents a culturally specific means of temporal sense-making.

Finally, two influential works that explored the construct of time in anthropology warrant mention (Fabian, 1983; Gell, 1992). In *Of Time and the Other: How Anthropology Makes Its Object*, Fabian (1983) portrayed time as “a carrier of significance, a form through which we define the content of relations between the Self and the Other” (p. ix). He criticized the tendency for anthropologists to depict their research subjects in a time separate from their own and disregard the sharing of time, which he terms “denial of coevalness.” Fabian recommended that researchers

confront diverse temporal realities, both distinct and shared, throughout the research process. Gell (1992) contrasted two categories of time in his book, *The Anthropology of Time: Cultural Constructions of Temporal Maps and Images*. The world operates according to real time, or B-series time, which represents the unchanging temporal relationships between events. However, people's awareness of time is confined to A-series, or human perceptions of past, present, and future. Individuals can only understand time according to their personal experiences and expectations, which mediate their interactions with real time. Gell thus suggested that even within an objective temporal pattern, conceptions of time are "culturally constructed and ultimately individually perceived" (Hodges, 2008, p. 404).

Sociology. Recognition that time varies according to sociocultural context has also appeared in the work of sociologists. Though not a social constructionist, Emile Durkheim posited that time is a social phenomenon, contextualized within human activity and experience (Bergmann, 1992; Nowotny, 1992). He speculated the existence of social time, or time that is constituted by the collective rhythms, representations, and categories of social life (Munn, 1992; Nowotny, 1992). Rather than an abstract, homogenous entity, time represents a qualitatively varied, heterogeneous, and ambiguous process marked by social experiences within a particular group or society (Munn, 1992). Social activities and the relations between those activities connote the process of time.

Building from Durkheim's work, other scholars legitimized time as a sociological subject of study (Sorokin & Merton, 1937). Sorokin and Merton (1937) differentiated between the quantitatively homogenous nature of scientific, linear time and the qualitatively heterogeneous nature of social time. Consequently, specific temporal frameworks may better complement certain academic disciplines (Sorokin, 1943). Sorokin (1943) argued that physical, mathematical, and economic interpretations of time do not suit the social sciences. Rather, research in the social science requires conceptualizing time based on sociocultural reference points that can account for differences in culture and the experience of time. Subjective time perceptions assign meaning to specific activities within a society, which then influence individual and collective behaviors (Mosakowski & Earley, 2000). Individuals' temporal experiences thus cannot be reduced to universal, measurable generalizations.

The conception of time as a social construction also surfaced in John Hassard's (1990) *The Sociology of Time*. Hassard rejected the existence of a singular, objective time sense, suggesting that people arrange time according to a broader societal framework. Western cultures have implemented the clock as a means for coordinating events in modern, capitalist society, which he termed the linear-quantitative tradition and which resulted in temporal commodification. Yet as modern society changes, how people experience time is continuously reconstructed (Hassard, 1990). In his later work, Hassard (2002) problematized the tendency of organization researchers to adopt a linear-quantitative temporal perspective and deemphasize the significance of qualitative temporal interpretations.

Recent scholarship has also explored the relationship between structure and agency in the context of temporal constructions (Giddens, 1984). Building on "an ontology of time-space as constitutive of social practice," Giddens (1984, p. 3)

developed a theory of structuration whereby social systems are produced and reproduced through social interactions. Within this framework, collective human experience shapes temporal structure, yet this structure also constrains human agency by perpetuating existing patterns of social organization in daily life. Giddens's analysis thus revealed the increasingly complex role of time in modern society, as people both create and are limited by temporal structures.

Contemporary Applications

Scholars have pointed out that different temporal constructions do not exist only among different societies, but also within the same society (Bergmann, 1992; Gershuny & Sullivan, 1998). People construct meanings of time that most comfortably align with their self-identities and social experiences (Heintz, 2005). Therefore, although linear clock time is the dominant temporal paradigm in the United States, individuals may develop distinct time orientations and temporal values.

Time orientation. Studies in the field of sociology have investigated variations in temporal identities, suggesting that people orient themselves differently to the past, present, or future (Bergmann, 1992). Hornick and Zakay (1996) defined time orientation as "the relative dominance of past, present or future in a person's thoughts" (p. 385). A future time perspective refers to the extent to which people are motivated to engage in present activities that will produce particular future outcomes (McInerney, 2004). Briley (2009) explored the future time orientations of people from the United States and East Asia, finding that East Asians are more likely to explain present happenings by considering past and future trends. Americans, by contrast, tend to focus on the present and attribute occurrences to actions of individuals. One study found that time orientation can be individualistic or collective, active or passive, and varies among different racial and socioeconomic groups in the United States (Coser & Coser, 1963). Coser and Coser (1963) posited that these orientations are shaped by various external factors, such as position in the social structure and feeling of social power. While the notion of present or future time orientations in part aligns with the assumptions of clock time, how individuals conceive of the future in relation to the present varies and may not necessarily be linear.

Scholars have pointed out that temporal orientation is shaped by numerous cultural, social, and individual factors (Jonas & Huguet, 2008; Koriat & Fischhoff, 1974). Koriat and Fischhoff (1974) revealed the role of temporal landmarks in shaping individuals' temporal perceptions through a study conducted in Israel. The researchers conducted a series of daily phone calls to university students, asking them to name the day of the week and tracking the response time. Their results indicated that as time from the Sabbath (on Saturday) increased, response time also increased but that closer to the Sabbath, students identified the day of the week faster. In other words, days that carry more cultural meaning—such as the Sabbath for people in the Jewish faith—are likely to serve as temporal anchors that orient individuals toward time in particular ways. Jonas and Huguet (2008) replicated these findings using an exam date among students and the world soccer championships among soccer fans, leading them to suggest that "our internal clock [could be] a 'social clock,' at least in part" (p. 363).

Temporal values. Sociocultural context also shapes temporal perceptions by promoting certain values. Chadwick and Valenzuela (2008) pointed out that “Americans work an average of 350 hours more per year than do people in countries like Britain, France, Sweden, Germany and Norway, and . . . the lesser developed countries of the world” (p. 11), leading to a greater emphasis on punctuality and paid time in the United States. People’s relationships with time thus reflect particular priorities. For example, the strong link between quantity of hours worked and perceived worker productivity reflects the belief that time is money; greater time quantity is associated with greater worth. In contrast, research suggests that in most African, Middle Eastern, and South and Central American cultures, people place more importance on the quality of activities and relationships than on the hours and minutes devoted to them (Manrai & Manrai, 1995; R. T. Carter, Yeh, & Mazzula, 2007; Rust et al., 2006).

Research investigating temporal values among different cultures has distinguished between those that place high or low value on social interactions (Hall, 1960; Manrai & Manrai, 1995). Low-context cultures, dominant in Europe and the United States, place less importance on the context of social interactions (Hall, 1960). These cultures emphasize scheduling and punctuality and tend to be monochronic, in which people complete activities one at a time. Cultures of South America, Japan, Asia, and the Middle East are considered high context and place high importance on social transactions. High-context cultures tend to be polychronic, performing numerous activities at once and integrating work and leisure. Polychronic individuals prioritize adequate completion of the task at hand, focusing on the immediate circumstances and necessities rather than maintaining a schedule. Social relationships take precedence in high-context cultures, and promptness is considered impolite and hasty (R. T. Carter et al., 2007). For instance, if an individual is going to an appointment and runs into a family member or friend on the way, he or she is likely to stop and engage in conversation out of social obligation; “in many cultures, valuing people is far more important than valuing punctuality or tasks accomplished per unit time” (Rust et al., 2006, p. 34). Hall (1984) highlighted the tendency for organizations to embody a monochronic time sense, which can alienate individuals who work more effectively within a more fluid temporal structure.

Divergent temporal values also stem from unique historical experiences (Reichardt, 2000). Reichardt (2000) situated the time sense of African Americans in a historical discussion of imperialism, slavery, and segregation. Notably, colonial powers imposed Western timekeeping on non-Western societies as a means of establishing control. Slavery led to the emergence of what Hanchard (1999) called racial time, or unequal temporal access to institutions, resources, and knowledge caused by power distinctions between dominant and nondominant groups. For instance, because they were bought and sold at the will of White slave owners, slaves had no control over their movement or schedules. Segregation laws continued to restrict the temporal autonomy of Black people, who received public services “only after those same services were provided for whites” (Reichardt, 2000, p. 475). African American culture thus formed in response to years of subjugation and oppression, which denied Blacks temporal independence. As such, Black and White cultural expressions embody distinct forms of temporal organization (Reichardt, 2000). James Snead suggested that jazz music reflects a collective and

dialogic sense of time (as cited in Reichardt, 2000); the nonlinear and repetitive temporal structure of jazz invites participation, improvisation, and interaction.

In these ways, cultural and historical contexts contribute to the development of numerous temporal orientations and values among people living within the same society.

Limitations

Although socially constructed time offers tools for understanding subjective and diverse temporal experiences that clock time cannot capture, this approach also has limitations. Theories of time as a social construction are subject to the standard criticisms of social constructionism as a whole. Subjective perceptions of time are open to interpretation and, consequently, unable to be objectively measured or generalized (Gross, 1984).

Social constructionism. Socially constructed time has been criticized within a larger critique of cultural relativism (Bloch, 1977). Using models from linguistics and cognitive anthropology, Bloch (1977) rejected the existence of diverse, subjective realities, asserting instead the existence of a universal, linear representation of time. He drew a connection between language and temporal understandings: "The logic of languages implies a notion of temporality and sequence and so if all syntax is based on the same logic, all speakers must at a fundamental level apprehend time in the same way" (Bloch, 1977, p. 283). He refuted Geertz's (1973) assertion that the Balinese possess a unique time sense, maintaining that their perceptions of time in mundane contexts are "based on cognitive universals" (Bloch, 1977, p. 285). One criticism of socially constructed time, therefore, stems from the belief that even when cultures embrace different temporal meanings, the passing of time remains universal, objective, and continuous.

Many skeptics of socially constructed time have insisted that human behavior can be universally understood through the clock time paradigm (Gross, 1984). Underscoring the benefits of time allocation studies, Gross (1984) maintained, "all overt behavior—that which has an observable environmental effect—can be located within the framework of unitized time measured in seconds, hours, days, years" (p. 520). While he acknowledged the importance of attitudes, symbols, values, and representations, Gross suggested that socially constructed time theory overemphasizes these units of analysis. Social researchers who focus merely on subjective experiences of time produce biased research; "studies of time allocation in anthropology generally reflect the strong idiographic bias of the discipline" (Gross, 1984, p. 524). Gross thus posited that the linear time framework does not undermine individuals' subjective temporal symbols and experiences, but rather helps to maintain objectivity. Indeed, a common criticism of research that views time as a social construction is the presence of bias.

False dichotomy. Other scholars have maintained that the dichotomy between clock time and socially constructed time is inherently flawed because these perspectives are not diametrically opposed (Gershuny & Sullivan, 1998). Similar to Gross (1984), Gershuny and Sullivan (1998) refuted the assumption that only the socially constructed framework can accurately capture human temporal experiences.

Contrary to the claims made by many social theorists, clock time is not a tool of capitalism, but rather “a feature of any complex, large-scale, technological society” (Gershuny & Sullivan, 1998, p. 70). Though Gershuny and Sullivan did not depict problems inherent in the social construction paradigm, they suggested that social theorists’ criticisms of clock time are exaggerated and counterproductive. They advocated instead for research into time allocation that acknowledges the value in each perspective.

In summary, while clock time focuses on time quantity, socially constructed time explores temporal diversity, quality, and meaning. These frameworks have supported extant time research. We turn now to a discussion of emergent theory on time in a digital world.

Virtual Time

The rise of information and communication technology over the past two decades has changed the landscape of contemporary society. According to Christo Sims, 89% of households now have Internet access in the home (Ito et al., 2010). New forms of ICT, including cell phones, instant messaging, MySpace, Facebook, and YouTube, have become widespread, particularly among young people. New technologies enhance the speed at which people can complete tasks or connect with one another, enabling instant access to media, world events, and social connections. However, theorists have also suggested that by facilitating engagement in activities and relationships at any time and in any order, ICTs undermine the linear sequence of the clock (Castells, 2000; Hassan, 2003). We ask, then, is it not possible that technological transformations are more than simply a speeding up of daily life but rather are changing how society thinks about, constructs, and experiences time? We draw from emergent temporal theory to explore this proposition within the category of virtual time, highlighting the increasing acceleration and disorder of temporal realities as well as the potential for human agency to shape the impact of technology on time.

Historical Development

Technological innovation is not a new phenomenon; people have always invented tools to facilitate tasks. Scholars have long acknowledged that emergent technologies alter societal perceptions of time (Gross, 1984; Nowotny, 1992; Thompson, 1965). Inventions such as the steam engine, telegraph, and television, for example, led to changes in organizational structures and people’s daily lives (Hassan, 2003). Yet these technologies took decades to spread across the globe and transform cultures and societies. Even the integration of the clock as the primary mode of timekeeping occurred gradually. Although theorists have noted the quickening pace of life since the writings of Marx and Weber, they only vaguely attributed this phenomenon to technology and modernity (Hassan, 2003). By contrast, the ICT revolution has directly spawned swift and widespread changes around the globe, causing spatial and temporal reorganization (Hassan, 2003; Jones, 1995; Lenz & Nobis, 2007).

Temporal disruptions. Manuel Castells (2000), a prominent scholar of sociology, presented a theory of “timeless time” in his analysis of modern society in the

digital era. In his book, *The Rise of the Network Society*, Castells argued that social, technological, economic, and cultural transformations have led to the rise of a new type of society—a network society. He suggested that the ICT revolution represents a departure from past technological innovations not only because technology is introduced, integrated, and advanced at an unprecedented rate, but also because people's relationship to technology has changed. Individuals now become not only users, but also doers and creators through engaging with ICT. The generation of knowledge and information through innovation thus becomes cyclical: "The feedback loop between introducing new technology, using it, and developing it into new realms becomes faster under the new technological paradigm" (Castells, 2000, p. 31). Because culture transpires and evolves through the interaction of symbols and relationships, and the nature of these interactions has changed, the influx of ICTs consequents cultural changes as well.

Specifically, new technological and cultural forces alter socially constructed meanings of space and time (Castells, 2000). As Castells (2000) wrote, "the transformation of time under the new information technology paradigm, as shaped by social practices, is one of the foundations of the new society we have entered" (p. 460). The quickening of daily life is a central aspect of the digital era. Modern technology provides "unprecedented temporal immediacy to social events and cultural expressions" (p. 491). People now learn of events as they are happening and engage in real-time dialogue through computer-mediated technology. At the same time, ICTs provide access to information, expression, and interpretation according to the desires of the consumer and decisions of the producer, independent of an organized or linear sequence. Time in this network society consequently becomes eternal, removed from its chronological placement, and ephemeral, ordered and experienced depending on the social context and purpose under which it is sought. Because users choose when they view or interact with media, the timing of events becomes synchronous, blending past, present, and future.

Castells (2000) thus posited the emergence of a new temporal construct: timeless time. He characterized timeless time as a "systemic perturbation in the sequential order of phenomena performed in [a particular] context" due to the compression of time by ICTs (Castells, 2000, p. 494). Although timeless time is in many ways a new social construction, it differs from extant temporal depictions in anthropological and sociological literature; while diverse forms of time reckoning and meaning-making have always existed, none has challenged or reversed the domination of clock time. By contrast, Castells argued, timeless time inherently disrupts the linear sequence of the clock. As a result, "the network society represents a qualitative change in the human experience" (Castells, 2000, p. 508).

The temporal disorder caused by digital technology was further developed in Hassan's (2003) construct of "network time." Like Castells (2000), Hassan acknowledged increasing temporal acceleration; the ICT revolution "has [compressed] the meter of the clock and [accelerated] the time standard of modernity" (p. 234). Yet Hassan also argued that by creating a digital network, ICTs have generated a new form of time that, in contrast to the clock, is "emptied and de-temporalized" (p. 253). Hassan termed this new temporality *network time*, in which time is no longer governed by linear, measurable units but rather by the capacities of the digital world. ICTs invite people to experience time virtually, in which access to information and social relationships is infinite and temporally unrestricted. This new temporality speeds up the pace

of daily life, but also blurs and largely displaces traditional temporal relationships between work, home, and leisure.

Human agency. While ICTs compress and disrupt the linear flow of time, scholars have acknowledged that digital technologies allow people to control time in new ways (Castells, 2000; Hassan, 2003; Wajcman, 2008). In her article, "Life in the Fast Lane? Towards a Sociology of Technology and Time," Wajcman (2008) promoted a perspective on technology and time that underscores human agency. New technologies influence social interactions, activities, and practices, but "the relationship between technology and time [is] one of mutual shaping" (Wajcman, 2008, p. 66). Castells (2000) also referred to greater human capacity to control time. In the business world, for instance, time is still viewed as a resource, but the clock no longer serves as a point of reference: "time is managed as a resource, not under the linear, chronological manner of mass production, but as a differential factor with reference to the temporality of other firms, networks, processes, or products" (Castells, 2000, p. 468). Essentially, individuals and firms have the capacity to manipulate time within a digital context; time becomes processed.

As such, humans are not necessarily victims to the acceleration and disorder of linear time caused by new technologies (Wajcman, 2008). Instead, "if ICTs themselves are conceived of as culturally and socially situated artifacts and systems, then there is nothing inevitable about the way they evolve and are used" (Wajcman, 2008, p. 67). People assign meaning to technologies when they adapt and use them in particular ways, thus shaping their temporal experiences. New technologies may be merely reconfiguring the way people experience time, and people exercise agency in this process.

Contemporary Applications

The integration of ICTs into modern life suggests three new temporal developments: blurred boundaries, temporal flexibility, and multitasking.

Blurred boundaries. One important lesson from evolving theories on time and technology is that the borders between spaces are becoming increasingly blurred. Due to the rise of ICT, "the clock no longer serves as a major instrument for the synchronization of joint activities in time and space" (Thulin & Vilhelmson, 2007, p. 246). People can now complete tasks from anywhere, so long as they have a digital device that permits online access. In the business world, capital flows across financial markets 24 hours a day in real time (Castells, 2000). Traditional associations of particular time frames with particular spaces are therefore weakening. "The socio-cultural temporal rhythms that evolved over the last 200 years, such as weekends, nine-to-five workdays, family time, prescribed holiday times, and so on are becoming a thing of the past" (Hassan, 2003, p. 236). Wajcman (2008) addressed this phenomenon as well, suggesting that as ICT use becomes widespread, "the spatial, organizational, and even psychological border between time at home and time at work will lose its salience" (p. 69).

Temporal flexibility. ICTs influence the way people experience time in their daily lives by enabling more temporal flexibility and control. Scheduling, coordinating,

and organizing of activities and events have become more malleable (Traxler, 2010). Mobile phones and the Internet allow social contact and tasks to take place outside the constraints of time and place (Thulin & Vilhelmson, 2007; Traxler, 2010). Some scholars have referred to the “softening” of time and schedules due to reliance on cell phone texts or calls to coordinate changes (Bittman, Brown, & Wajcman, 2009; Grinter, Palen, & Eldridge, 2006; Ling, 2004). Cell phones enable people to “constantly negotiate and renegotiate agreements for meetings and joint activities as plans change” (Thulin & Vilhelmson, 2008, p. 142). In essence, time has become more personalized.

Multitasking. Computer and mobile technology has also facilitated greater levels of multitasking (Arum & Roksa, 2011; Foehr, 2006; Ito et al., 2010; Kenyon, 2008; Vergeer & Pelzer, 2009). Although multitasking is not a new phenomenon, ICTs enable it to occur at a faster, even instantaneous, pace. New technology and its effects on multitasking have changed dramatically even within the past 20 years. When the Internet first emerged, people had to log online from a computer at home or work, and their interactions with these technologies were bound in a particular place. In contrast, new mobile technology allows people to be online all the time; our ability to instantly complete tasks, obtain information, and maintain social connections regardless of time and place has become largely taken for granted. Numerous activities can now be completed simultaneously through ICTs, such as working and socializing (Kenyon, 2008). One study indicated that people “add” 7 hours to each day through media multitasking (Kenyon & Lyons, 2007). Easier multitasking has implications for how people spend time. Traditional time allocation research methods, such as time diaries, can no longer capture the range of activities that people can complete instantaneously through ICT use.

Limitations

The limitations of this new paradigm stem from its relative infancy—scholars are still exploring the implications of the temporal transformations generated by the ICT revolution. Notably, the emergence of virtual time has differential effects for different groups and individuals (Green, 2002). Although technology potentially affords people more temporal autonomy and flexibility, an individual’s capacity to control time is always mediated by his or her social context. For example, Horning, Ahrens, and Gerhard (1999) explored the impact of personal computers on individuals’ time practices. They identified three temporal orientations of people who use technology: “surfers,” who use ICT functionally to save time; “skeptics,” who limit usage of ICT due to perceived time pressures; and “gamblers,” who increase time flexibility through ICT multitasking. These findings indicate that people may adapt technology into their lives in different ways, complicating the potential for making generalizations about people’s technology use. Moreover, despite increasing levels of ICT use, a digital divide remains between those who have the means to benefit from new technologies and those who do not (Madigan & Goodfellow, 2005).

In summary, we are positing that the emergence of ICT has generated a new temporal paradigm. In some respects, virtual time represents an extension of socially constructed time, as people’s use of ICT shapes new temporal experiences.

Yet these temporal experiences are more varied, complex, and fast paced than those originally conceptualized by social constructionists. Meanwhile, virtual time appears to directly contradict the assumptions inherent in clock time; although ICTs largely liberate people from linear temporal organization, societal structures and organizations remain bound by clock time. Traditional temporal theories and methodological approaches are no longer adequate to understand time in people's daily lives. What follows is a consideration of these three paradigms in the field of education.

Theories of Time in Educational Research

The following subsections explore the unique contributions and limitations of clock time and socially constructed time in educational contexts. We then examine potential implications of virtual time on educational inquiry, highlighting questions that remain.

Education and Clock Time

Most educational research on time subscribes to the clock time paradigm and has made significant contributions to our understanding of the relationship between time use and academic outcomes. Many researchers have adopted the view of time as a limited resource that is fundamental to the learning process, seeking to associate particular time allocations with achievement variations.

Applications

Clock time research in education falls into three categories: time allocation in school, time allocation out of school, and time with technology.

Time allocation in school. Time research in school contexts generally focuses on instructional time. *Instructional time* is a broad term, encompassing numerous ways to engage students' time during class (Berliner, 1990). For example, allocated time refers to the amount of time mandated for instruction by state- or district-level policy. How much total time is allocated as well as how schools organize that time within daily schedules can impact student learning (Clark & Linn, 2003). The amount of minutes and hours students are exposed to direct instruction is often used to evaluate student achievement outcomes (Berliner, 1990; Clark & Linn, 2003). Instructional time can also refer to engaged time, or the time students spend listening to their teacher deliver a lesson. Time on task represents another temporal construct that supports analysis of educational progress (Stallings, 1980). This concept refers to the amount of time students spend actively participating in an academic task, such as writing an essay or working in groups. Although researchers have emphasized the importance of quality teaching and meaningful learning activities (Berliner, 1990; Langer, 2001; Stallings, 1980), the quantity of time allotted to particular instructional goals often serves as a variable for analyzing achievement outcomes.

Time allocation out of school. The clock time framework has also been adopted to investigate the relationship between students' out of school time use and academic progress. Scholars have noted the importance of time spent engaging in academically

meaningful activities outside the classroom (Astin, 1999; Kuh, 2001; Witkow, 2009). Devoting time to studying and homework has been associated with higher academic outcomes (Brint & Cantwell, 2010; Pascarella & Terenzini, 2005; Stinebrickner & Stinebrickner, 2008; Witkow, 2009). As such, this literature emphasizes the need for developing students' time management skills, or the techniques a person adopts to monitor, regulate, or structure time (Claessens, van Eerde, Rutte, & Roe, 2007). Effective time management skills coupled with less time spent in passive leisure are significant predictors of GPA (George, Dixon, Stansal, Gelb, & Pheri, 2008).

Scholars have also evaluated how time allocated to nonacademic activities influences achievement. For example, involvement in structured extracurricular programs is associated with better school performance and positive youth development (Choy, Horn, Nunez, & Chen, 2000; Jordan & Nettles, 1999; Mahoney & Stattin, 2000), although scholars have found that underrepresented youth have fewer opportunities to participate (Price et al., 2009; Shann, 2001). Research has also analyzed the effects of employment on achievement, emphasizing the number of hours worked. Moderate work intensity, characterized as fewer than 20 hours per week, is generally associated with positive academic outcomes (Bachman, Staff, O'Malley, Schulenberg, & Freedman-Doan, 2011; Monahan, Lee, & Steinberg, 2011). In contrast, working 20 hours per week or more constitutes intensive working and likely diminishes academic success (Apel, Bushway, Paternoster, Brame, & Sweeten, 2008; Bachman & Schulenberg, 1993).

Time with technology. More recently, research has investigated the quantities of time that students spend engaging with new technologies. Accounting for the use of ICTs such as cell phones, Internet, and social networking sites, students appear to spend "nearly half a day engaging in some type of technology use" (Witt, Massman, & Jackson, 2011, p. 763). However, findings are inconsistent regarding the effects of technology use on academic achievement. While some researchers have underscored the potential for ICTs to benefit students academically and socially (Junco & Cotton, 2011), others have identified detrimental outcomes, such as higher distractibility (Jackson, 2008) and decreased academic engagement (Willoughby, 2008). The lack of consensus regarding the impact of ICT use speaks to both the relatively recent development of these technologies as well as the need for better theoretical and methodological approaches to studying their utilization.

Within the clock time paradigm, therefore, time allocations are seen as trade-offs that affect learning. For instance, teachers are expected to implement effective classroom management skills to maximize students' time on task. A student who chooses to participate in an extracurricular activity may have less time to devote to studying but more time to hone talents and build supportive social networks. Students who spend afterschool time socializing with friends and neglecting homework are arguably "wasting" time that could otherwise be used to enhance their academic learning. Students that "manage" their time well are likely to achieve. This body of educational research thus relies on the assumptions of the clock time paradigm: (a) Time is a limited resource, and (b) particular time allocations influence subsequent outcomes.

Limitations

The limitations of clock time research in education stem from the weaknesses inherent to the paradigm, both ideological and theoretical. Ideologically, clock time reinforces the dominance of Western values over nondominant cultures. Theoretically, studies of time allocation within a clock time paradigm assume that quantities of time can explain educational outcomes, overlooking variance in temporal qualities and meanings.

Ideological. Theorists such as Marx and Weber asserted that the education system reinforces the coercive regulation of time in industrialized societies. Schooling structures require children to conform to strict schedules, promoting and rewarding a Westernized temporal awareness based on the clock (Thompson, 1965). This perspective is echoed in the work of more contemporary educational researchers, who have maintained that schools reinforce White, middle-class culture (Bourdieu, 1973; P. Carter, 2005). Students from nondominant racial, ethnic, or socioeconomic groups may struggle academically in part because their cultures do not align with the culture of the school (P. Carter, 2005). Specifically, their cultural interpretations of time may not conform to Western understandings of the clock, which propagate particular assumptions about what it means to “be on time” or “manage time” effectively. The clock time paradigm may consequently, though unintentionally, help to maintain unequal class structures and the dominance of the privileged class.

Theoretical. As discussed in the previous section, clock time as conceived by modern economists relies on three assumptions: (a) Linear time is universally accepted and understood, (b) people can and will view their time as a limited resource, and (c) quantities of time represent the relative importance of specific allocations (Aminzade, 1992). Regarding the first, students may develop different forms of time awareness that are culturally specific (Chadwick & Valenzuela, 2008). The second assumption that students will allocate their time based on the economic principle of scarcity denies the existence of contextual factors that impede the consideration of trade-offs. For example, students from low-income families often have more unstructured afterschool time than their socioeconomically advantaged peers because low-income parents have fewer resources and less access to high-quality programs (Price et al., 2009). Many disadvantaged youth consequently have little experience managing activities within a set schedule and thus may not consider their time use choices in relation to alternatives.

Finally, clock time falsely presumes that quantities of time allotted to a specific activity represent its relative significance to an individual. For instance, students who spend most of their out of school time in employment may be working out of necessity rather than preference (McNeal, 2011). Investigating the amount of time the students spend engaged in particular activities fails to uncover the motivations for certain time use choices, which have significant implications for achievement. Quantifying time allocations also cannot account for the quality of time that a student spends engaged in an activity. When a teacher allots 20 minutes of English class for independent reading, students will make use of that time differently, which creates variation in academic outcomes (Langer, 2001; Stallings, 1980). In

the context of out of school time, two students may spend one hour studying, but how they utilize that time varies and has implications for learning (Plant, Ericsson, Hill, & Asberg, 2005). Ulrich (2007), for example, found that homework effort and quality are associated with achievement rather than the quantity of time devoted to homework completion. Clock time research thus explains only one aspect of the nuanced relationship between time and academic achievement.

Clock time undergirds the majority of time research in education, enabling scholars to identify correlations between particular time allocations and educational outcomes, but also overlooking potential nuances in the reasons for and quality of time use choices.

Education and Socially Constructed Time

The social construction framework exposes culturally situated temporal values, perceptions, and behaviors and explores how temporal diversity shapes teaching and learning.

Applications

Research within the socially constructed time paradigm examines varying temporal interpretations among staff and students. This framework also encourages appreciation of temporal diversity and enables inquiry into time quality.

Temporal diversity among school staff. Research on time perception in school contexts reveals that temporal diversity exists among administrators, teachers, and students. Hargreaves (1990) employed a framework of multiple time dimensions to highlight distinctions in temporal sense-making between teachers and administrators. He suggested that elementary school teachers operate in a highly polychronic classroom context that requires juggling numerous curricular tasks and interpersonal relationships. In contrast, administrators exemplify a monochronic view of schooling, derived from capitalist concerns for worker productivity and reinforced by accountability pressures. Administrative policies strive to maximize achievement outcomes by controlling and compartmentalizing teachers' time. The monochronic goals of administrators thus counter the polychronic experiences of classroom teachers, complicating reform efforts.

Temporal diversity among students. Research that reflects a social constructionist view identifies differences in students' temporal perceptions, orientations, and values, which in turn shape their educational experiences in and out of the classroom. How students decide to engage with academic material, for instance, may be influenced largely by their perceptions of time. Based on series of interviews and analyses of students' journal entries, Case and Gunstone (2003) identified two dominant time perceptions among college students in a chemical engineering class: (a) Time is controllable, a resource they can manage and use, or (b) time is out of their control, a force with which they must compete. Participants did not fall neatly into one category but demonstrated both views at different moments throughout the semester. How students perceived time then informed their time allocations; students who felt in control of time were more likely to invest energy in understanding the content deeply, whereas students who felt out of control were more likely to focus

on completing small, easy tasks. Case and Gunstone concluded that learning environments with less time pressure may better support learning.

Research has also explored the relationship between time orientation and academic achievement (Lens, Simons, & Dewitte, 2002; Phan, 2009). Students who are future oriented tend to perceive their educational experiences as leading to beneficial future outcomes, such as college or specific career trajectories. Future orientation is associated with planning and self-regulation, higher achievement motivation, and better grades (Shell & Husman, 2001; Simmons, Vansteenkiste, Lens, & Lacante, 2004). While future time orientation may benefit students academically, students adapt different levels of awareness about the future and its relationship to the present. Acknowledging the existence of multiple time orientations facilitates research into the factors that assist students in planning for their academic futures.

Students' diverse temporal orientations are shaped by numerous factors, such as family, culture, and school. Ashbourne and Daly (2010) reported that adolescents navigate among school, work, social, and family demands when making decisions about how to spend time. As discussed in the previous section, research indicates that Native American, Latin American, and African cultures often possess a temporal sense characterized by task orientations and social obligations, focusing on the quality of what takes place in a given time rather than the quantity of minutes and hours (Chadwick & Venezuela, 2008; Manrai & Manrai, 1995; Pickering, 2004; Rust et al., 2006). McLaren (1986) explored the schooling experiences of low-income youth through the lens of monochronic and polychronic time perceptions. Working-class communities operate according to polychronic time, in which children undertake multiple activities and navigate an extensive set of interpersonal relationships simultaneously. As a result, many low-income students may feel excluded from or resistant to the monochronic structures of the school, where academic tasks are depersonalized and completed in a linear fashion (McLaren, 1986). Consequently, students may not exhibit the behaviors inherent in linear clock time, such as punctuality, scheduling, and future planning, because they interpret time differently.

Appreciating temporal diversity. Understanding time as a social and cultural construct disrupts deficit thinking that attributes low academic achievement to problems inherent in marginalized students and their parents (Valencia, 1997). For example, Lareau (2003) suggested that parents from diverse socioeconomic backgrounds often adopt different approaches to childrearing. Parents with greater financial means tend to demonstrate concerted cultivation, whereby they carefully schedule and manage their children's time. By contrast, parents from socioeconomically disadvantaged backgrounds tend to rely on natural growth, giving children more autonomy to develop and make time use choices without direct guidance (Lareau, 2003). From the deficit perspective, low-income parents who do not schedule their children's afterschool time may be portrayed as inadequate or uncaring about their students' academic progress. Socially constructed time challenges this sort of deficit thinking by acknowledging that time embodies different meanings and serves different purposes for different groups. Within this framework, particular temporal behaviors reflect particular values and strengths. For

example, parents may foster their children's sense of loyalty and responsibility to family and community networks, whereby students understand time as a medium for social connection rather than a resource for personal gain.

Investigating the diverse range of temporal values among students also enables researchers to highlight students' strengths—such as loyalty to social obligations and concern for task quality—and develop improved policies and pedagogical strategies. For instance, students who place high value on social relationships may be encouraged to advance academically through building meaningful relationships with adults in school (Noguera, 2008). Total time devoted to a particular activity may be less important to students' academic growth than the effort exerted to complete that activity. For instance, some high schools and districts have adopted proficiency-based teaching and learning approaches (D. Smith, 2012). These initiatives evaluate student learning based on mastery of content standards instead of traditional Carnegie units, which represent total seat time. Proficiency-based teaching removes temporal constraints on students' academic progress, affording learners more flexibility and autonomy. Recognizing that many time perceptions exist allows schools to better address students' academic needs.

Time quality. The social construction framework also provides a platform for understanding the quality of time students spend engaged in an activity, which has implications for their academic progress. A salient example of the significance of time quality emerges in the literature on homework. While research within the clock time paradigm focuses on the quantities of time students commit to studying, scholars have also emphasized the need for high-quality study time and an environment conducive to learning (Larson, 2001; Plant et al., 2005). Students' interactions with the teaching and learning environment are related to study behavior outside the classroom (Ning & Downing, 2010). If students are raised in a cultural context that emphasizes social relationships over Western time values, fostering high-quality relationships with family, friends, and teachers may facilitate learning. The social construction framework can examine how and why students spend time participating in a specific activity and facilitate the development of educational policies that encourage students to maximize their achievement.

Limitations

In educational research, socially constructed time has limitations because the broader societal context is characterized by particular temporal values. Although the tendency to characterize human experience relative to linear time privileges the dominant culture, American institutions and structures, as well as international business, trade, and government organizations, function according to the clock. As Reichardt (2000) wrote, "even while mechanical, rational time is constructed and culture-specific, the modern technical world would be inconceivable without it" (p. 472). Modernization and globalization are irreversible trends, linking time and money across the globe. People's welfare and future success, particularly in highly modernized countries, depend on their capacity to conform to the time practices dictated by the clock. As such, preparing students to compete and succeed in the workplace requires teaching them the assumptions of linear time. While social theory acknowledges that all temporal constructions are equally valid, limitations

of this framework in education stem from the need to prepare students for success in the real world.

Temporal socialization. Research suggests that educational institutions do not exist merely to impart academic curriculum, but rather to socialize and integrate students into society (Bowles & Gintis, 2002; Thompson, 1965). It is necessary to note that the latter aims have at times been applied unjustly, compelling the assimilation of nondominant cultures (Pickering, 2004; Reichardt, 2000). Still, acquiring skills and practices expected in the workforce is important for students to achieve social mobility through education. Bowles and Gintis (2002) developed the concept of schools as mechanisms for socialization, suggesting that cognitive growth plays only a small role in the attainment of economic success. Several noncognitive traits determine success in the labor market, including temporal orientation (Bowles & Gintis, 2002). Employers report that employees who possess future-oriented time awareness are more desirable because they perform well to guarantee continued employment. Workers are also expected to display punctuality and efficient time use, regardless of cultural background.

Schools embody the cultural and social practices of the dominant class and attempt to integrate students into mainstream society by “structuring social interactions and individual rewards to replicate the environment of the workplace” (Bowles & Gintis, 2002, p. 1). Students from diverse backgrounds often possess nonmainstream cultural traits and must decide whether to adopt or reject the dominant cultural practices (Bowles & Gintis, 2002; Carter, 2005). Young people who are motivated to achieve academically—and ultimately fare better in the workforce—find ways to appropriate aspects of the dominant culture that facilitate educational success. Certain temporal practices enable students to do better in school, such as arriving to class on time, submitting assignments when they are due, and productively using both in and out of school time to accomplish required tasks. Moreover, because students with future time perspective tend to perform higher than those without (Phan, 2009), students who maintain a present or nonlinear time sense may be at a disadvantage academically. As such, despite the importance of legitimizing and empowering diverse cultural practices, students’ capacity to conform to mainstream temporal values largely dictates their future success.

Educational equity. Equipping students to operate within a linear time framework thus has implications for educational equity. Many scholars have emphasized the need for students to utilize time management skills to maximize their learning and succeed academically, particularly in college (Bembnutty, 2009; Claessens et al., 2007; Kitsantas et al., 2008). Time management involves behaviors that derive from a linear time perspective: awareness of one’s time use, planning and prioritizing, goal setting, and minimizing distractions while performing academic tasks (Britton & Tesser, 1991; Claessens et al., 2007). Because effective time management is positively related to educational achievement (Bembnutty, 2009; Crede & Kuncel, 2008; George et al., 2008), students benefit from learning to schedule time quantitatively.

Unfortunately, many students do not realize how much time they should invest into the learning process: “The vast majority of students are entering trade schools,

community colleges, and universities without an understanding of the academic requirements or the personal commitment necessary to be successful” (Barnes & Slate, 2010). They struggle to effectively prioritize their time between studying, work, and socializing (Hanson, Drumheller, Mallard, McKee, & Schlegel, 2010). High school students often fail to practice essential academic skills such as time management and disciplined studying (Slate, Jones, & Dawson, 1993). For students whose temporal perceptions do not align with the dominant clock paradigm, honing these particular temporal skills may be even more difficult. One qualitative study found that successful management of resources, such as time, schedules, and finances, plays a vital role in facilitating adjustment to college for low-income, first-generation students (Hurtado et al., 1996). Increasing college access and social mobility thus depends in large part on developing students’ ability to conceptualize and manage time as a resource necessary for academic success.

In essence, limitations of socially constructed time arise when nondominant temporal orientations are situated within the broader context of American society. Efforts of time researchers to understand social and economic variations in temporal experience are both valuable and necessary in validating diverse interpretations of time. However, given that American institutions and structures privilege certain types of temporal knowledge, recognizing students’ unique time perspectives is insufficient. Educational time research can facilitate mobility by investigating ways to bridge students’ cultural knowledge and that of the school.

Education and Virtual Time

The ICT revolution has shaped the temporal realities of today’s students, who have grown up immersed in new forms of technology (Castells, 2000). Schools have also begun to utilize new forms of technology, altering traditional assumptions about time in educational contexts. Emergent theory on time in the digital age thus has substantial implications for educational researchers.

Applications

Extant research on ICT use among students and within schools is presented in three subsections: blurred boundaries, temporal flexibility, and multitasking.

Blurred boundaries. The softening of temporal and spatial borders resulting from digital technology affects not only the workplace (Hassan, 2003; Wajcman, 2008), but also education. For example, ICTs challenge the traditional distinction between students’ in school and out of school time. Mobile technology enables students to participate in leisure and social communication in classroom settings, activities that used to occur only at designated times during the school day or after school. ICTs also create opportunities for learning and communication outside the school building that were not available to the previous generation. Wajcman (2008) referred to the blurring of boundaries between absence and presence; students no longer have to physically be in a particular space to experience it because they can do so digitally. Students rarely endure periods of time that are isolated in a particular space, such as a classroom, or designated for a particular activity, such as studying for a test.

A prime example of the blurring of boundaries in the realm of education is the spread of online learning. According to Horn and Staker (2011), the number of

K–12 students enrolled in an online course rose from 45,000 in 2000 to more than 3 million in 2009. The proportion of students taking at least one postsecondary online course is also growing: 10% in 2003, 25% in 2008, 30% in 2009, and 50% predicted in 2014 (Christensen, Horn, Caldera, & Soares, 2011). Online learning assumes many forms, from classes that are taken entirely online—typically called distance learning because students’ geographical location is irrelevant—to blended models, in which students receive some instruction in the classroom and the rest on a digital forum. In this way, online programs directly supersede the traditional constraints of time and space; while ICT enables students to access academic information outside of school more generally, online education allows students to obtain certified credits without ever setting foot in a school building. Online instruction thus disassociates schooling from time spent in a traditional classroom, potentially increasing access (Christensen et al., 2011).

Temporal flexibility. ICTs also challenge traditional conceptions of time in education because they affect young people’s relationship to time overall. Greater temporal flexibility afforded by ICTs provides adolescents more control over their time (Stald, 2008). Cell phones, for instance, may reduce students’ feelings of stress, haste, and time pressure (Bittman et al., 2009; Ling, 2004). At the same time, many adolescents have become careless about timekeeping, tending toward more spontaneous and impulsive decision making (Lenz & Nobis, 2007). Thulin and Vilhelmson (2007, 2008) studied mobile phone use among teenagers, finding that many calls and messages pertained to delays. “It appears that one benefit of the mobile—that of never being left with no information—has made postponement more socially acceptable” (Thulin & Vilhelmson, 2007, p. 246). The meaning of “on time,” then, has seemingly shifted; some adolescents may consider themselves on time even if they arrive late, as long as they send a warning text message. In other words, by decreasing reliance on the clock for scheduling events and enabling greater temporal flexibility, ICTs create a context in which traditional Western time values, such as punctuality, are reinterpreted. Human behaviors change as a result, particularly among young people who have grown up in the digital era.

Temporal flexibility is further exemplified through online learning, which is designed to create more personalized learning experiences. Scholars have pointed out, however, that reaping the potential benefits of online education requires fundamentally changing traditional assumptions about time in education (Horn & Staker, 2011). Schools across K–12 and postsecondary settings have historically focused on inputs, such as time, which is “fixed by credit hour or semester” (Christensen et al., 2011, p. 43). Students are expected to attend a predetermined number of course hours to earn credits; time is fixed and learning is variable (Christensen et al., 2011). In contrast, online learning shifts to a “system where students progress based on their mastery of academic standards or competencies as opposed to seat time or the traditional school calendar” (Horn & Staker, 2011, p. 13). Online learning allows students to work and demonstrate proficiency at their pace; time is inherently variable and learning is constant (Christensen et al., 2011). Students who are able to master content and advance quickly may do so, while students who require more time to meet standards are not penalized. Teachers

also acquire more temporal flexibility as they adapt their pedagogical practices to online forums (Horn & Staker, 2011). Although online learning compels instructors to adjust how they allocate instructional time or plan content delivery, teachers may gain more autonomy to determine when and from where they fulfill professional responsibilities, such as delivering content or grading.

Multitasking. Media multitasking may be especially prominent among young people, who easily adapt to new technologies (Foehr, 2006). The highly digital environment enables both constant interruption from current tasks and the completion of many tasks simultaneously (Stald, 2008). Young people experience less “dead time,” when they cannot maintain contact with others (Bittman et al., 2009, p. 674). In his study of mobile phone usage among teenagers, Stald (2008) reported that 80% of respondents never turned off their phone, and 20% turned it off only in specific, necessary situations, such as sleeping, working, or viewing a movie. Ito et al. (2010) suggested that adolescents “are becoming particularly adept at maintaining a continuous presence in multiple social communication contexts” (p. 49). Most adolescents are “always available for communication, information, entertainment, or, in short, for other people” (Stald, 2008, p. 151). Consequently, today’s students are often uncomfortable with time spent waiting or doing nothing (Ito et al., 2010). Arum and Roksa (2011) pointed out that college students rarely walk around campuses without looking at their Blackberries or iPhones.

Constant multitasking via ICT changes the way students experience learning time. Twenty years ago a high school student would have to wait to speak with friends. Potential social distractions during class time were generally limited to writing and passing handwritten notes or starting a side conversation. While today’s students can still indulge these diversions, they also have instant and easy access to social communication through ICTs. Young people often use their mobile phones during class to communicate with peers via text or social networking sites, which can supplant academic tasks (Arum & Roksa, 2011) and create new obstacles for classroom teachers. Media multitasking similarly alters traditional conceptions of study time. Prior to the ICT revolution, studying typically meant sitting down with educational materials to complete class assignments. Students may have experienced interruptions such as chatting with a friend or watching television. However, the primary vehicle for learning—printed text—served only that single, academic purpose. Digital mediums allow students to carry out multiple activities simultaneously through search engines, social networking, and instant messaging. When students sit down at a computer to study, how they use that time and what distractions they indulge is no longer as clear or straightforward.

Limitations

As previously noted, the benefits and limitations of virtual time remain unclear because this theoretical category has yet to be fully developed. Further research is needed to better understand the impact of digital temporal transformations on educational processes. The uncertainty surrounding time, technology, and learning is further complicated by inequitable access to ICT and myriad forms of ICT engagement among users. As Green (2002) highlighted, social context largely influences one’s access to and comfort with technology use. This point is especially salient

with respect to students, especially those from disadvantaged backgrounds. Exercising temporal autonomy depends first on whether one has access to ICTs and second on whether one is aware of how to utilize ICTs productively.

Educational research within the three temporal frameworks, clock time, socially constructed time, and virtual time, underscores the fundamental role of time in teaching and learning. However, as ICT transforms cultural contexts and society enters a new era, the relationship between time and schooling becomes more nuanced, varied, and difficult to study. We close with a discussion, recommendations for future research, and a brief conclusion.

Discussion and Future Directions

The three perspectives on time theory that we have presented provide valuable insights concerning time in educational contexts. We have argued that the onset of virtual time signifies not only a speeding up of linear time, but also the emergence of a unique temporal paradigm. We do not suggest that virtual time renders useless the two established temporal frameworks, but rather that alone they are no longer sufficient.

Clock time offers an objective way to measure and analyze behaviors that affect the learning process. This paradigm reflects the dominant temporal model to which American institutions, businesses, and society at large are aligned. Consequently, clock time assumptions remain relevant to understanding modern society, even as they are challenged and obscured by ICT use. The socially constructed time framework facilitates greater educational equity and access by highlighting the culturally specific nature of temporal sense-making. Students adopt a wide range of time orientations according to cultural, social, economic, and technological influences. By acknowledging and validating diverse time perceptions among youth, socially constructed time has the potential of facilitating the development of educational policies and teaching strategies that help nonmainstream students to bridge their cultural understandings with those privileged in schools. Students from diverse backgrounds can learn to exhibit the particular temporal values and behaviors that support success in academia and the workplace.

However, the ICT revolution has ushered in a new temporal paradigm that requires first acknowledging temporal diversity and disorientation and second developing innovative approaches to time research. ICT use disrupts the linear sequence of the clock by affording individuals the capacity to engage information, tasks, and relationships at any time and in any order. Compiling a list of time allocations no longer paints a clear picture of what people do and experience from moment to moment. As virtual time blends temporal tenses within digital spaces, categories of time orientations that have formerly been taken for granted—past, present, and future—may require redefinition. Students growing up immersed in digital technology may think about punctuality, time management, and multitasking in ways that vastly differ from older generations. As opportunities for online education expand, academic institutions may move farther away from the notion of seat time. The Carnegie unit, which has previously facilitated both implicit and explicit generalizations about the relationship between time and student learning, may be losing salience. As such, time not only adopts new meanings for individuals, but also serves a different purpose in educational institutions and processes. Existing theoretical frameworks cannot adequately address the complexities of these shifting temporal realities.

Perhaps the most salient lesson to be learned from the literature on time in the digital age is also our greatest challenge: People now experience increasing tension between the linear structure of clock time and the absence of temporal structure created by ICTs. Today's students are developing and learning in a society characterized by temporal disorder. The meanings and experiences embodied in virtual time—such as the ability to control time and surmount boundaries of time and space—directly contradict the standard sequence of linear time. Despite this disturbance, however, clock time is deeply integrated into our societal institutions and thus likely to endure. As Hassan (2003) wrote, “the linear meter of the clock . . . is fundamentally embedded in culture and society, and it would be almost impossible to disentangle it from the complexities of everyday life” (p. 233). Achieving success in education and ultimately attaining social mobility depends on a student's ability to adapt to the demands of clock time. The result is the coexistence of opposing temporal paradigms, requiring today's young people to negotiate increasingly complex temporal terrain. Students from nondominant cultures confront particular challenges because they may be navigating among multiple temporal orientations, defined by their family's culture, the dominant culture, and the digital world. Equipping students to traverse these tensions effectively warrants further research.

Numerous avenues exist for future inquiry. Fundamentally, educational scholars need to better understand how students think about time and how ICT shapes their interpretation of linear clock time. The more flexible, personalized nature of virtual time has the potential of shaping achievement outcomes in ways that have yet to be clearly understood. New methods for time research that can more accurately measure how students engage with ICT and how engagement with ICT affects their time allocation are warranted. Research is needed to develop pedagogical strategies that (a) better meet the needs of students who are constantly connected and (b) explicitly teach students the linear temporal expectations of professional settings that remain despite the emergence of virtual time. Further investigation into the temporal implications of online learning would also be useful; time will remain essential to the learning process, but it remains unclear how. If seat time may no longer denote academic progress, researchers and policymakers will benefit from the development of different metrics for measuring student achievement and teacher effectiveness, as well as the role that time plays in these processes.

Conclusion

Over a half century ago Samuel Beckett's Vladimir and Estragon discussed how confusing time was in the groundbreaking *Waiting for Godot*. Beckett's work suggested that time was not simply one moment after another. In this text we have suggested that we may be at another such moment. The ICT revolution has ushered in a new sociocultural context and generated a new form of temporality, disrupting traditional conceptions of time. Existing temporal paradigms, clock time and socially constructed time, offer unique contributions but are no longer sufficient to understand the multifaceted realities of virtual time. New theoretical and methodological approaches are required to advance educational research on time in the digital era. While we have not offered prescriptions, we emphasize the need to pursue this line of inquiry to better facilitate students' academic success.

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