

Multitasking and Career Skill Requirements: Implications for Career Technical Education

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Abstract

Multitasking, or engaging in multiple tasks simultaneously, is becoming more and more common in the contemporary work environment. However, multitasking activities are regarded as necessary skills by some employers but as distraction, fragmentation, or lack of efficiency by others. The purpose of this study is to investigate which occupations demand multitasking skills and which do not. It is hoped that such investigation will provide insights for career and technical educators while they help their students to be aware of their future career requirements and to acquire skills that are in line with their future professions.

Keywords: Career and technical education, career clusters, multitasking, polychronicity, monochronicity, time, new media and technology

Introduction

Multitasking is a human behavior that allows people to handle multiple tasks simultaneously or alternate multiple task switches (Baddeley, 1996; Gopher, Armony, & Greenspan, 2000; Lee & Taatgen, 2002; Meyer & Kieras, 1997; Roger & Monsell, 1995). Multitasking has been around for as long as humans have had competing needs, for instance, doing housework while watching a baby.

Time and productivity pressures in the modern workplace lead many individuals to think that if they can do several things at once, they can be more efficient and complete more tasks in less time. There are reasons why multitasking is expected in many occupations. The pace of life has sped up. People have more opportunities and higher expectations. Everything is expected in an instant – fast food, fast travel, instant information and instant communication. Yet, tasks take time and we only have 24 hours in a day, which is where multitasking enters the equation.

It is not uncommon to see multitasking at a workplace, for example, a receptionist talking on the phone while making notes and reviewing a computer screen. Multitasking is also expected at some jobs. For instance, some tasks that an administrative assistant performs require waiting time. During the waiting time, the administrative assistant can do other things such as word processing, filing, or answering the phone (Erickson, 2005). In the process, some tasks may take place simultaneously. Yet, multitasking is not always a desired skill. For instance, one would not expect a surgeon to multitask while performing a transplant.

The purpose of this study, therefore, was to investigate which careers demand multitasking skills and which do not. This investigation will help career and technical educators to incorporate appropriate opportunities in their curricula so that their students will be prepared to demonstrate the skills required of the jobs for which they apply. Students must learn about job requirements, understand how requirements have changed over time, and predict future trends and daunting tasks (Barton, 2006).

Literature Review

Career and Technical Education

Historically, the purpose of education has been to prepare the next generation for work, family, and citizenship. In this ever-changing world, the role of education is constantly being re-evaluated. Concern over America's global economic status is driving this re-evaluation. Career and technical education (CTE) produces gains in academic achievement and earnings, and represents a significant contribution to the education of America's youth and adults in preparation of a skilled workforce for the future (Association for Career and Technical Education, 2006).

First introduced in 1970, career clusters were developed by federal and state agencies and career guidance organizations to promote career awareness (Ruffing, 2006). A "career cluster" is a grouping of occupations and broad industries based on commonalities. Ruffing (2006) stated that the clusters were viewed as a whole new approach to preparing individuals for the workforce. With this structure, schools can better assure that each student has the opportunity to explore options, set goals, and prepare for meaningful work in the new century. In the 1990s, the U. S. Department of Education re-introduced career clusters to help transition "vocational education" to "career and technical education". This transition was more than a name change. The career cluster approach is a promising solution. It represented a fundamental shift in philosophy from CTE being for those who were not going to college to a system that prepares students for both employment and postsecondary education in the dynamic world economy (States' Career clusters Initiative, n. d.).

Sixteen clusters were established at the national level by the States' Career Clusters Initiative and are recognizable across the country in middle schools, high schools, community and technical colleges, and the workforce. They are: 1) Agriculture, Food & Natural Resources; 2) Architecture and Construction; 3) Arts, A/V Technology & Communications; 4) Business Management & Administration; 5) Education & Training; 6) Finance; 7) Government & Public Administration; 8) Health Science; 9) Hospitality & Tourism; 10) Human Services; 11) Information Technology; 12) Law, Public Safety, Corrections & Security; 13) Manufacturing; 14) Marketing; 15) Science, Technology,

Engineering & Mathematics; and 16) Transportation, Distribution & Logistics.

Within each career cluster, there are about seven career pathways. As a framework for grouping occupations according to common knowledge and skills, career clusters serve as an organizer for instruction. Sequences of courses can move learners through a progression of knowledge and skills, leading to attainment of durable, portable competency. Aligning instruction to the career cluster knowledge and skills creates a fundamentally different type of instruction where academic and technical instruction are blended and transitions among learner levels are seamless (Ruffing, 2006).

The New CTE Students and the Workforce: Digital Natives and Multitaskers?

Technology, mobility, and global economics have forced a paradigm shift for the workplace. The future of education and effective preparation for the next generation of the global workforce are shaped not only by technological changes but also by sociological changes. An understanding of the learning styles, habits, attitudes, and expectations of students of the 21st century is critical.

Today's students, particularly those who were born after the 1990s, have been labeled as "Generation Z," "Net Generation," "digital natives" or "Millennials" (Howe & Strauss, 2000; Oblinger & Oblinger, 2005; Prensky, 2001; Tabscott, 1998). They are not only growing up in a very different time, but are discussed by many scholars as having different characteristics, values, and priorities than students from prior generations because they are the most digitally connected generation in history. From infancy, these children grow up in an environment surrounded by and using graphical web browsers, laptops, cell phones, text messaging, broadband, wireless, and video games (Geck, 2006). They live in a world enveloped by communications technologies; the internet and cell phones have become a central force that fuels the rhythm of daily life (Lenhart & Madden, 2005). They are the next generation of workers to be prepared for the global workforce.

Kaiser Family Foundation reported that 8 – 18 year olds in the U.S. spent 7.38 hours on media daily, and that these young people packed a total of 10 hours and 45 minutes worth of content media into 7.38 hours of media use (Rideout, Foehr, & Roberts, 2010). These learners will more likely than any previous generations to

bring their media multitasking habits to other environments such as schools and workplaces. The media-multitasking behaviors have captured the attention of both popular media and scholarly communities, with some people excited about possible new cognitive abilities and social skills (e.g., Prensky, 2001), while others are concerned about the possible lack of focus or attention (e.g., Jackson, 2008) that young people are developing in their immersed technology activities.

One speculation of today's multitasking lifestyles is that multitasking leaves no time for reflection, thought, or creativity (Jackson, 2008). Jackson (2008) warned that attention, the key to recapturing our ability to connect, reflect, and relax, is missing in our new world. Some other scholars, however, are more optimistic about the skills that the younger generation may have developed with digital technologies. Prensky (2001), for instance, stated that the younger generations are operating at faster speeds and this ability has moved into a generation at large at an early age. Further, they are more comfortable with multitasking and random access to information; they are driven by graphics, fun, fantasy and quick payoff; and are active and well-connected. Howe and Strauss (2000) offered a positive view of this new generation as optimistic, team-oriented achievers who are talented with technology, and claim that they will be America's next "great generation." Raines (2003) states that the assets of Generation Z in the learning environment are their focus on goal orientation, positive attitude, technical savvy, confidence and willingness to collaborate with others. Their communication style is positive, respectful, motivational, goal-oriented, and electronic. Their learning needs include technology, structure, experiential activities, and entertainment and excitement.

The changes in the young generation present opportunities as well as challenges for teaching and learning. Some of the challenges for teachers include: how to speed up learning processes while keeping sight of quality and goals, how to increase textual literacy, depth of information and logical thinking, how to create experiences that allow students to think and link in non-sequential ways yet still communicate sequential ideas and logical thinking, how to take advantage of parallel processing, and how to search for new ways to combine fantasy and reality to help younger generations learn.

Educating the next generation may prove to be a challenge, but it is important to focus on what they need in a learning environment

and what the actual world of work will be like once they enter it. The following reflection from a current teacher seems pertinent to the controversial topic of multitasking:

If I were being honest, I'd have to plead guilty to that charge. And, in some ways, I even brag about it. I can check the roll, get the class started, sign re-admit passes and answer a call from guidance, without turning my back—all at the same time!! And I don't think I am unique in having this "talent." The students see this and it sets the pace for the class. Interruptions are just the norm in our lives and in schools...As an adult, I certainly am no way near as "plugged in" as my students, but I often talk on the phone while doing other tasks—particularly when I am at home. So, I don't think that multitasking is strictly a teenage activity. (Teacher Leaders Network, 2008)

Research on Multitasking

Research on multitasking has a long history. Different terms, such as *polychronicity* (Hall, 1959), *dual tasking* (Logan & Gordon, 2001), *task switching* (Monsell, 2003), *multitasking* (Meyer & Kieras, 1997), and *media layering or multitasking* (Rideout, Foehr, & Roberts, 2010) have been used in different disciplines including anthropology, human performance and organizational management, cognitive psychology, neuroscience, information science, human-computer interaction, and communication and media studies. Accordingly, research has been conducted to determine workforce productivity and to use multitasking scenarios as a personnel selection tool (e.g., Stankov, Fogarty, & Watt, 1989), to investigate the executive control processes and neuroanatomical correlates of multitasking (e.g., Baddeley, 1996; Burgess, Veitch, de Lacy Costello, & Shallice, 2000; Rubinstein, Meyer, & Evans, 2001), and to examine information processing (e.g., Spink, Ozmutlu, & Ozmutlu, 2002; Spink & Park, 2005).

Studies focusing on executive control and cognitive processes correlates of multitasking show that our ability in multitasking is rather limited, if not impossible (Broadbent, 1958; Fisch, 2000; Lang, 2001); that multitasking over different types of tasks reduces productivity (Just et al, 2001; Rubinstein, Meyer & Evans, 2001), and that our ability to perform concurrent mental operations is limited by the capacity of the brain's central mechanism (Schweickert & Boggs, 1984). Scholars believe that switching

between tasks wastes precious time because the brain is compelled to restart and refocus (Meyer & Kieras, 1997). According to Meyer and Kieras (1997), each time one has this alternation, there is a period in which one will make no progress on either task. The result is that it takes longer to finish any one chore, and that people do not do their task nearly as well as they would, if they had given their full attention to the task at hand. A recent study by Ophir, Nass, and Wagner (2009) reported that heavy media multitaskers (HMMs) performed worse on task switching than light media multitaskers (LMMs), likely due to HMMs' reduced ability to filter out interference from irrelevant stimuli and representations in memory.

Research examining multitasking performance as an aspect of job performance has focused on cultural beliefs of time and individual characteristics and behaviors (Delbridge, 2000; Ishizaka, Marshall, & Conte, 2001). Hall (1959) introduced the concept of polychronicity based on how cultures perceived time. According to Hall, monochronic cultures view time as a linear concept and as such people prefer to complete one task at a time. In contrast, polychronic cultures view time as cyclical and as such people prefer to engage in more than one task simultaneously. Bluedorn (2001) defined polychronicity as the "extent to which people prefer to engage in two or more tasks or events simultaneously and believe that their preference is the correct way to do things" (p. 119).

Some researchers have tried to link multitasking performance to personality traits. These studies have produced different results. Bluedorn (2002) summarized earlier research and stated that "polychronic people appear to have more of the following: extraversion (extroversion), favorable inclination toward change, tolerance of ambiguity, formal education, striving for achievement, impatience and irritability, and frequency of lateness and absenteeism. Those same people appear to have less of the following: conscientiousness or stress (only in some jobs). However, Konig, Buhner, and Murling (2005) found that there were no significant relations between polychronicity and extraversion, nor were they predictors of multitasking performance. Instead, attention, fluid intelligence (the ability to reason and to solve novel problems), and working memory (the system of the brain that permits the storage and processing of information needed in the execution of tasks) were the most important predictors of multitasking performance. Goonetilleke and Luximon (2010) found that there

were significant differences in the performance and strategy between monochronic and polychronic individuals in the selective attention test. Monochronic individuals focused their attention on the primary task and achieved higher performance. Polychronic individuals had somewhat better total performance in more than one task under time-constrained conditions. Ishizaka, Marshall and Conte (2010) concluded from their study that employees high in list making should be given prioritized work schedules and tasks and that employees high in achievement strivings may be assigned to a work environment where prioritization of multiple tasks is appropriate as compared to a situation where employees are required to be flexible in deciding which task to focus on from time to time.

Multitasking has been mentioned as a potentially useful time-management strategy by some authors (e.g., Britton & Tesser, 1991). Job analysis data from the Occupational Information Network shows that being able to multitask is important for many jobs such as school bus drivers and fire fighting and prevention supervisors. Furthermore, interruptions, which require at least some multitasking to be handled, are common of many jobs including managers, physicians, administrative assistants, and small office workers (Fleishman, Costanza, & Marshall-Mies, 1999). Given its commonality in many jobs, multitasking has, not surprisingly, attracted interest of basic and applied research. The rapid development and convergence of new media and technologies have only helped facilitate such activities and habits (Lin, 2009).

Although research has so far presented different and sometimes controversial results regarding factors, abilities, and benefits of multitasking, the issue of multitasking is an important one in the workplace because it influences the effectiveness and appropriateness of the behavior in the workplace. For instance, if a multitasking behavior is seen as positive and encouraged or required in a workplace, then a person who prefers to multitask and is capable of multitasking may feel a better fit in the organization. The person will feel more efficient and productive in such an environment. Or otherwise, it may create a conflict if an organization requires that the employees work in a more monochronic manner. The multitaskers then may be led to feel that they are disorganized, fragmented, and less productive. Therefore, it is important to examine the requirements and values different organizations have regarding multitasking.

The Study: Purpose and Data Collection

The purpose of this study was to investigate to what extent multitasking is a required skill in today’s job market, and to analyze how requirements differ among the different career clusters. An exploratory study was designed using Monster.com, a highly popular job search engine.

Keyword search was used as the primary data collection method to find jobs related to each of the career clusters designated by the States’ Career Cluster Initiative (n.d.) Within each cluster, several career pathways were used as keywords during the search. Table 1 captures the keywords used when job titles were being searched within each career cluster.

Table 1
Career Cluster and Keyword for Job Titles Within Each Career Cluster

Career Cluster	Career pathway keywords used for searching job titles within each cluster
Agriculture, Food & Natural Resources	Environmental Engineer, Forest and Conservation Worker, First line supervisor of farming, fishing and forestry workers Animal Breeder
Architecture and Construction	Tile and Marble Setter Electrician Installation, Maintenance, and Repair Worker-helper Security and Fire Alarm Systems Installer Cost Estimator
Arts, A/V Tech and Comm	Audio Visual Collection Specialist Public Relations Specialist Audio and Video Equipment Technician Editor Librarian
Business, Mgmt & Admin	Compensation, Benefits and Job Analysis Specialist Training and Development Specialist Public Relations Manager Employment, recruitment, and Placement Specialist Administrative Services Manager

Education and Training	Postsecondary Law Teacher Fitness trainer and aerobics instructor Postsecondary Library Science Teacher Special education teacher, pre K - elementary Art, drama and music teacher, postsecondary
Finance	Personal Finance Advisor, Economist, Loan Counselor, Tax Preparer, Financial Analyst
Govt. & Public Admin	Medical and Public health Social Worker Social and Community Service Manager Arbitrator, Mediator, Conciliator Court, Municipal and License Clerk Animal Control Worker
Health Science	Medical Records and Health Information Technician Respiratory Therapy Technician Medical and Health Services Manager Speech-Language Pathologist Nuclear Medicine Technologist
Hospitality and Tourism	Host/Hostess, Restaurant, Lounge, and Coffee Shop Food Preparation Worker Amusement and Recreation Attendant Coach and Scout, Customer Service Representative
Human Services	Personal and Home care Aide Marriage and Family Therapist Medical and Public Health Social Worker Personal Financial Advisor Residential Advisor
Information Technology	Computer Software Engineer, Systems Software Computer Science Teacher, Postsecondary Network and Computer Systems Administrator Computer and Information Systems Manager Security and Fire Alarm Systems Installer
Law, Public Safety, Corrections & Security	Correctional officer, Firefighter, Crossing guard, Arbitrator, Mediator, Conciliator Police and Sheriff's Patrol Officer
Manufacturing	Environmental Engineer Manufactured Building and Mobile Home Installer Painting, Coating and Decorating Worker General and Operations Manager Welder, Cutter, Solderer, and Brazer

Marketing and Sales	Public Relations Specialist Advertising and Promotions Manager Customer Service Representative Demonstrators and Product Promoters Marketing Manager
Science, Technology, Engineering & Mathematics	Environmental Science and Protection Technician Medical Scientist except Epidemiologist Atmospheric and Space Scientist Biochemist and Biophysicist Physicist
Transportation, Distribution and Logistics	School Bus Driver Flight Attendant Aircraft Mechanic and Service Technician Taxi driver and chauffeur Automotive Service Technician and Mechanic

The data was collected in the following steps: First, a broad-based search on Monster.com was conducted. Each job title was typed in the keyword search. Following that, the “search job title only” box was clicked so that the search could be narrowed and only hits representative of a particular job would show up. The number of total vacancies was recorded. Second, each job posting was examined. The job descriptions, including essential functions and responsibilities, requirements, qualifications, skills, and knowledge section were read to ensure that each job posting fit the criteria of each particular cluster. In this process, if the total number of jobs was a hundred or less, every job description was read. If the number of jobs exceeded a hundred, then approximately one-hundred job descriptions were randomly selected and read. The jobs with descriptions unrelated to the title or cluster were excluded in the reporting, but the total job vacancies from keyword searches and the job descriptions that were read and met the career cluster definition were recorded. Last, the term multitasking, and related terms such as the ability to handle multiple tasks, juggle multiple demands, and so forth were noted to determine if the job required multitasking skills. The number of jobs including these terms in their descriptions was collected and recorded.

Results and Discussions

Table 2 presents the numbers of job vacancies, jobs that met the Career Cluster definitions and jobs that require multitasking skills. It's clear from Table 2 that the job requirements for multitasking skills are quite different. Some job clusters such as "Business, Management and Administration," "Finance," and "Human Services" seemed to demand multitasking skills while other job clusters such as "Architecture and Construction," "Information Technology," "Law, Public Safety, Corrections and Security," and "Transportation, Distribution and Logistics" had very little mentioning of any multitasking skills required.

The authors further examined the specific jobs within the clusters that demanded multitasking skills. These clusters included "Business, Management, and Administration," "Finance," and "Human Services." "Government and Public Administration" was not included because there were only three jobs, although all three job descriptions included multitasking skills. Table 3 provides the examples from the three clusters.

Within each clusters there were differences in multitasking skill requirements as well. For instance, within the "Business, Management, and Administration" cluster, 68.42% (13 out of 19) of the job descriptions seeking compensation, benefits and job analysis specialists mentioned multitasking skills while only 28% (6 out of 21) job descriptions seeking employment, recruitment, and placement specialists indicated requirements for multitasking skills. Within "Finance" cluster, 70.73% (87 out of 123) job descriptions seeking personal finance advisors asked for multitasking skills while only 19.23% (5 out of 26) job descriptions for tax preparers mentioned multitasking skills.

One might speculate that one reason a financial advisor is expected to have multitasking skills is that the financial advisor needs to check various resources while listening to his or her client in order to provide the best advice to help his or her client's personal financial situations. Although it is beyond the scope of this paper, it is clear that much research is needed to understand empirically the reasons behind various levels of requirements for multitasking skills in different jobs.

Table 2
Numbers of Job Vacancies, of Jobs that Met Career Cluster Definitions, and of Jobs that Require Multitasking Skills

Career Cluster	Total Vacancies	Numbers of jobs meeting the Career Cluster definition	Numbers of jobs requiring multitasking skills	Percentage of jobs requiring multitasking skills
Agriculture, Food & Natural Resources	207	80	30	37.50%
Architecture and Construction	1382	156	21	13.46%
Arts, A/V Tech and Communication	260	167	63	37.72%
Business, Mgmt & Admin	102	68	36	52.94%
Education and Training	42	42	10	23.81%
Finance	4541	473	224	47.36%
Govt. & Public Admin	3	3	2	66.67%
Health Science	249	120	26	21.67%
Hospitality and Tourism	1083	440	143	32.50%
Human Services	3172	211	87	41.23%
Information Technology	59	59	10	16.95%
Law, Public Safety, Corrections & Security	24	21	3	14.29%
Manufacturing	1710	423	88	20.80%
Marketing and Sales	1587	700	228	32.57%
Science, Technology, Engineering & Mathematics	71	71	20	28.17%
Transportation, Distribution and Logistics	150	81	3	3.70%

Table 3
Job Clusters Requiring Multitasking Skills

Business, Mgmt & Admin				
Job Positions	Total Vacancies	# of jobs reviewed	# of jobs requiring multitasking skills	%
Compensation, Benefits and Job Analysis Specialist	35	19	13	68.42%
Training and Development Specialist	9	9	5	55.56%
Public Relations Manager	28	16	10	62.5%
Employment, recruitment, and Placement Specialist	27	21	6	28.57%
Administrative Services Manager	3	3	2	66.67%
Total	102	68	36	52.94%
Finance				
Job Positions	Total Vacancies	# of jobs reviewed	# of jobs requiring multitasking skills	%
Personal Finance Advisor	3000	123	87	70.73%
Economist	16	16	8	50%
Loan Counselor	13	13	9	69.23%
Tax Preparer	100	26	5	19.23%
Financial Analyst	1412	295	115	38.98%
Total	4541	473	224	47.36%
Human Services				
Job Positions	Total Vacancies	# of jobs reviewed	# of jobs requiring multitasking skills	%
Personal and Home care Aide	129	54	0	0
Marriage and Family Therapist	11	11	0	0
Medical and Public Health Social Worker	30	21	0	0
Personal Financial Advisor	3000	123	87	70.73%
Residential Advisor	2	2	0	0
Total	3172	211	87	41.23%

Limitation, Implication, and Conclusion

This current study is limited in the following ways: 1) the data used in the study is limited by the database of monster.com, although Monster.com is one of the most popular and extensive job search engines. Future study could expand data collection to include other job search engines and career resources. 2) Although all the sixteen career clusters and career pathways were covered in the study, data could vary if another round of search at a different time were conducted. This obviously could affect the results of the study. Future study could collect more extensive data over a period of time to represent a better picture of the job market and job descriptions. 3) Since this is one of the first studies to examine multitasking skills that may be required in various career clusters, little research evidence could be found to explain reasons behind the job requirement differences.

Limited as it is, the current study showed that some job clusters (e.g., “Business, Management and Administration,” “Finance,” “Government and Public Administration,” and “Human Services”) demanded multitasking skills more often than other clusters, such as “Architecture and Construction,” “Information Technology,” “Law, Public Safety, Corrections and Security,” and “Transportation, Distribution and Logistics.” In addition, within clusters, some career paths require more multitasking skills than others.

It is clear that not all jobs require the same set of skills. Students who are growing up with digital technologies may be forming different sets of habits and skills that are not necessarily expected or desired by the workforce. As mentioned earlier, some scholars are worried that multitasking leaves no time for reflection, a skill that is critical for problem-solving in all corners of life including workplace (Jackson, 2008). In fact, realizing the fact that employees can be more productive when they take time to think and reflect, some high-performing companies such as Google have built in time and space (e.g., workout facilities, café, snack rooms) for their employees to take time to relax and enjoy their time at work, rather than pushing them to spend every minute on their work (<http://www.google.com/intl/en/corporate/culture.html>).

On the other hand, it is also important to take advantage of the younger generation’s abilities and preferences in the process of helping them to develop their workforce skills. Studies have

suggested that practices and training increase brain processing speed, improve working memory, and improve our ability to multitask (Jaeggi, Buschkuhl, Jonides, & Perrig, 2008; Ruthruff, Van, Johnston, & Remington, 2006). Young people growing up with digital technologies may be developing different capabilities in organizing and processing information. With usage of electronic media devices rising rapidly along with the simultaneous use of those devices, educators will need to dramatically shift the strategies they use to communicate with this generation.

The findings of the study are important for the CTE teachers. With the knowledge, CTE teachers can help their students to be aware of different job requirements, and help them develop skills that are correspondent to the workforce. They can design curricula considering different requirements in job clusters. CTE teachers who are working in different cluster areas can identify and highlight examples of job duties, and bring discussions of multitasking skills into curricula when appropriate. They can also incorporate application activities into the curricula that would help to assess student capabilities for multitasking, as well as providing opportunities for students to increase their skill sets through practice.

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