

Effects of Time Metrics on Student Learning

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Abstract

Educational reform thinking is plagued with contradictions. Scheduling, the structure of the school day, the length of school year and pedagogic practices in general, although moderately successful, are frequently defined by mantras and rationales out of step with current research or anchored on educational myth. This duality of educational practices is often similarly and vehemently supported by academia and practice. This creates a nebulous and needlessly complex roadmap for reform. Administrators are encouraged to identify the needs of their school communities and implement practices that best fit their unique identity keeping in mind the human element and the nature of change. Consideration for a fluid and agile mindset that is growth focused is suggested for negotiating change.

Key Words

reform, purpose of education, scheduling, circadian rhythms, school day and year, change

Herbert Simon in his seminal work “the proverbs of administration” published in 1946 discusses at length the merits (or lack of) of classical organizational theory. Simon, the *enfant terrible* of the neo classicists, challenged the accepted dogma at the time and defined a body of knowledge that has affected organized institutions since. Notwithstanding his insightful deconstruction of administration, perhaps the most significant element of his dissertation is his choice of words for the title of his salvo across the bow of administrative dogma: *proverbs of administration*.

Proverbs are metaphoric, formulaic language, fixed in form, attitudinal in meaning and subject to context in their interpretation. As such, Simon astutely observed, they naturally occur in contradictory pairs.

Educational reform, a stereotype of institutionalization, is rife with proverbial advice. Not surprisingly, educational thought seems to be at the mercy of such paradigms. Practices deemed *Avant-garde* and innovative naturally lose their legitimacy with new research and understanding.

However, despite the debunking of the mythology surrounding such practices, some of the more charismatic methodologies persist and slowly become engrained in the fabric of education despite their inefficiency and the harm they cause. Examples of this dissonance are abundant. Of significance are those defined by the metrics of time: the anachronism of the school year, school scheduling choices, the absurdity of early starting times, and the misconceptions of longer school days. These structural and pedagogic follies can be remedied.

The purpose of this article is to provide a summary of the current research in regard to the most egregious practices currently in use and advocate for systemic change to address

the inequalities that are fostered by the current educational horizon.

The Proverbs of Education

The charm and allure of an educational panacea is understandable given the political and societal pressure placed upon educators. Common sense intimates that each silver bullet ought to be measured and critically evaluated before being fired at an ever-shifting target. Unfortunately, that cannot always be the case. Michael Fullan in his book, *Motion Leadership in Action*, borrows from the work of Tom Peters and Robert Waterman in advocating for the exact opposite. He encourages dynamic change with less, not more, consideration for rigid evaluation (Fullan, 2010).

The expression “Ready, Fire, Aim” figures prominently in the early chapters of the book. This phrase, popularized by Peters and Waterman, and later adopted by Michael Masterson in corporate thinking, implies that change is urgent and as such cannot afford to account for every contingency before implementation. The source of information most valued to affect success is intrinsic to the process and as such, feedback (or feedforward) is most significant at the source.

Change takes place when practices are implemented, and feedback during the process of execution affects direction. The goal is met with constant adjustments to the original plan, which, by definition, is a blueprint of the final strategy. No one plan can be replicated since each is contingent on the circumstances of the problem at hand and is affected, in turn, by external agents that may be unpredictable or unforeseeable.

This ideology indirectly echoes Herbert Simon’s argument for Bounded Rationality. The necessity for omniscience in decision making is an unattainable fabrication (Puranam, Stieglitz, Osman & Pillutla, 2015;

Stiggebout, Pieterse, and De Haes, 2015; Van Knippenberg, Dahlander, Haas, and George, 2015) Thus the alternative, Bounded Rationality, suggests that decisions are made with the best information available at the time taking into consideration the limitations of the selective pressures affecting the outcome of the decision.

This convoluted logic makes sense when considering the burdens under which government agencies must operate and the diverse, and often opposing, needs that they must meet. Ironically, this is one such proverb in education. So, how do we reconcile the need for profound reflection with immediate action in discerning educational reform? The answer lies in an examination of the fundamental purpose of education.

The Purpose of Education

There is a need for meaningful reform, reconceptualization, and a focused strategy that is integrated and comprehensive when surveying the educational skyline. The purpose of school has evolved in complexity since the arguments put forth by the early Greek philosophers, Aristotle and Plato, to include realms of responsibility not envisioned by the most ambitious modern thinkers like John Dewey, George Counts and Mortimer Adler. What started out as simply the education of children to read for the purposes of spiritual salvation, quickly evolved into teaching pragmatism, citizenship, employability, and personal development. The multi-dimensionality of education (or its proverbial nature) is clearly evident in its origin.

While Dewey suggested that education is meant to prepare individuals to be rational and immediate (a perspective that is self-centered and exclusive), Counts advocated for the exact opposite, suggesting that education ought to prepare the individual for their assimilation into society (Stemler, 2016). Their

perspectives are predictably vague in their discussion of details, perhaps recognizing that the purpose of education shifts over time and is subject to historical context. To reconcile their dissenting opinions, Adler drew from both Dewey and Counts in synthesizing his version of education. The purpose, according to Adler, was to develop citizenship, personal growth, and employability—a dual purpose of individual and social growth (Adler, 1988).

This ideology seemed sufficient for a generation but was found lacking just before the turn of the century. DeMarras and LeCompte, not content with the scope defined by Adler, further distinguished the purpose of schooling into specific realms of knowledge: intellectual, political, economic, and social (Stemler, 2016). This approach, although more comprehensive, still lacked differentiation.

At the turn of the century, as society embraced technology and globalization, suddenly, the teaching of fundamental skills was not enough. Nationalism was replaced by a flat world, and tribalism was buried by multiculturalism. This necessitated a new approach that was more inclusive and cognizant of a shifting reality, a new philosophy for the new millennia.

Enter the proponents of education for the 21st century, the latest think tank attempting to conceptualize educational purpose. This loose assortment of educational thinkers and government sponsored bodies chronicled a laundry list of skills and abilities that were thought to be essential for success in a global society (Sullivan and Downey, 2015; Greenstein, 2012; Wolters, 2010). This “new vision” was in response to perceived deficiencies and poor showings in educational world rankings. They include among others, content knowledge, learning and innovation skills, information and technology, and life and most importantly, career skills (flexibility and

adaptability, initiative and self-direction, social and cross cultural skills, productivity and accountability, leadership and responsibility) Although clearly relevant, few would disagree that this litany of purpose is too large to be managed effectively and efficiently. No one disagrees with the importance of these skills; however, schools in their present form are not equipped nor able to provide the services required for an inclusive education of this magnitude.

It is evident that the intellectual progression of education has outpaced the infrastructure that houses it. This co-evolution, once synchronous, has devolved into a survival of the fittest. The majority of schools in America are no longer enlightened, relevant, or even current with the needs of the communities they serve.

A great divide has emerged between elementary knowledge and the world at large. The competitive edge granted by educated societies is no longer a safe investment in the global market. This seemingly hopeless statement is circular and self-defeating yet significant when one considers the dissonance in pedagogic practices.

Carnegie vs. Copernican scheduling

As a researcher, it never ceases to surprise me how much at odds we are as educators in what constitutes best practice. Granted, a concept of this caliber is difficult to define and quantify. But, by definition, best practice refers to a singularity, one approach that is superior to all others in attaining the perceived goal. Thus, there ought to be no competing strategies if the circumstances and the selective pressures are identical. In the proverb of scheduling, the Carnegie and the Copernican system originate from the same principle of effective instructional time. However, although they share a common philosophical origin, they end up at completely different destinations.

Joseph Carroll, in his articles on evaluating the Copernican system, lavishly praises the merits of the abbreviated system quoting improvements in almost all significant categories of success (Carroll 1994, 1990). However, notwithstanding the apparent superiority of the Copernican system, research by the Washington School Research Centre equally championed the Carnegie system echoing the success claimed by Carroll in his measurements. Their study highlighted the benefits of greater exposure to courses, achievement, and retention.

A comprehensive literary review of the topic would probably show the exact same paradigm. Support for each model would be equally as convincing and probably as truthful. John Hattie in his research measuring effect size, suggest that scheduling, either Copernican or Carnegian, is insignificant in affecting student learning (effect size .09) (Hattie, 2008) As it is often the case, the positive outcomes of either system are contextual to a combination of other interventions and school characteristics.

Early starting time and circadian rhythm of teenagers

The design of schools given the current demographic needs is inherently flawed. When schools were first built in the early 1800's, there was no blueprint to guide the establishment of these new "unknown" entities. The only compass available at the time was the church (for curriculum and instruction) and the factories mushrooming in the cities (for design and operation). Schools became, for a lack of a better alternative, mini factories tasked with fabricating individuals ready to serve church and god. That model, rigid and inflexible, has persisted through time and still defines today's modern schools. Schedules, timetables, school bells, and the length of the school day are all relics of the industrial revolution.

Research by Zerbibi and Merrow (2017), Tonetti, Adan, Di Milia, Randler, & Natale, (2015) and previously by Hagenauer, Perryman, Lee and Carskadon (2009) has shown that adolescents have a delayed circadian cycle. They are physiologically incapable of falling asleep early or wake up to be in time for the early start of school. In essence the teenage brain, high school teenagers in particular, “wake up” approximately two hours after school starts. So, why do we continue to start school two hours before they wake up?

A report conducted by Brian Jacob and Jonah Rockoff in the Hamilton Project in 2011, and replicated by the Hanover Research Group (2013) highlighted the many benefits of a late starting time which included improvements in alertness, mood and physical health (as cited in Dewald, Meijer, Ooart, Kerkhof, and Bogels, 2011). Furthermore, late starting times allow longer sleep periods which greatly improved learning retention and cognitive functioning (Boergers, Gable and Owens, 2014)

Notwithstanding the compelling biological evidence to support a late start to the day, the economic pressures that most families must contend with make early starts a necessity as the school day must correspond to the start of their workday. Furthermore, elementary schools, traditionally and unofficially tasked with the raising of young children, must be available to receive their charges when their parents drop them off before heading off to work.

Length of school day

Brain research by multiple authors suggest the teenage brain to be plastic and malleable (Dahl and Suleiman, 2017; Fuhrmann, Knoll and Blakemore, 2015; Blakemore and Choudhury, 2006). The development of synaptic connections and new neural pathways continues well into young adulthood

contradicting outdated research that suggested an end to brain growth after puberty (Dahl and Suleiman, 2017). This suggests that the development of executive function and higher-level thinking has not attained maturity in high school. This new research challenges education in its present state as it creates conflict between nature and nurture.

Schools in their present form place a significant mental burden on students. The length of the school day may create a cognitive deficit that often impairs decision making and learning (Sievertsen, Gino and Piovesan, 2016; Matos, Gaspar, Tome and Paiva, 2016). Thus, to expect the teenage brain to fit a restricted model better suited for mature brains would be counter intuitive. Given the cognitive demands of everyday activities, the teenage brain is apt to exhibit signs of mental fatigue when forced to meet schedules and timelines that are designed to suit adulthood.

The cost of a lengthier day is not simply sleepy students; it may have a much more significant negative impact on learning. Categorical work by Sievertsen, Gino and Piovesan (2016), Marcora, Staiano, and Manning (2009) and Boksem, Meijan and Lorist (2006, 2005) suggested that fatigue results in a decrease in attention, listless behaviour and poor performance in simple cognitive and physical tasks. Similarly, Kaplan (2001, 1995) and more recently Shochat, Cohen-Zion, and Tzischinsky (2014) observed that mental fatigue in teenagers resulted in increased aggressive behavior, restlessness, and violent outbursts.

Notwithstanding this research, it should be noted that the length of the day is a relative term as the typical day is approximately 7 to 8 hours. Although this seems excessive, multiple breaks and other environmental stimuli contribute to a de-escalation of stressing factors, thus reducing mental fatigue in general

(Kaplan 2001, 1995). However, if one considers the vulnerability of the teenage brain and the escalated state at which teenagers often start the day, 7 hours of sustained mental alertness, despite the ameliorating factors outlined above, may be excessive (Kelley, Lockley, Foster and Kelley, 2015).

The merits of a longer day have been documented by various school districts and researchers (Rivkin and Schiman, (2015); Angrist, Cohodes, Dynarski, Pathak, and Walters, 2016). More learning time, a greater diversity of courses, and more opportunities for student engagement are some of the benefits touted by an extended school day.

However, these studies caution, that length of day may be secondary to quality of instruction and richness of programming in affecting learning outcomes.

More recently, research on chronotypes and optimal learning time suggests that not all students reach their ideal learning window during traditional schedules (Zerbini and Merrow, 2017; Van der Vinne, Zerbini, Siersema, Pieper, Merrow, Hut, and Kantermann, 2015; Wile and Shoupe, 2011). Some students are better suited for morning classes while others show increased learning in the afternoons. The practical application of the research suggests that an ideal school sensitive to learning chronotypes would offer the same classes at different times of the day to accommodate student needs (Zerbini and Merrow, 2017; Callan 1998). This perfect set up is neither farfetched nor unfeasible if schools are redesigned to offer either morning or afternoon classes where students would be expected to attend one or the other depending on their needs and learning styles.

The length of the day is a contributing factor to decreased cognitive abilities if devoid of stimuli and opportunities for mental

rejuvenation. Furthermore, schools ought to be redesigned to meet the learning chronotypes of students in a more effective and efficient manner. Although the length of the day is increased, less instruction should take place in a more effective and efficient manner with longer breaks for students and with greater mental stimulation and downtime.

Length of school year

The Center of Public Education, an American think tank funded by the National School Boards Association, raised an interesting point when it questioned then Secretary of Education Arne Duncan on his claims that American students need to spend more time in school to catch up to other world leaders in education. His assertion that American schools spend 25% less time in the classroom than China or India stirred controversy. Notwithstanding the inaccuracy of his statement, time in school cannot and should not be equated with learning. Longer tenures engaged in bad practices does not change outcomes, it exacerbates them.

According to the OECD, Finland, a world leader in educational achievement, requires students to attend 602 hours of instruction a year. Similarly, Sweden, another high achiever, requires 741 hours of instruction. The U.S. ranges from 700 (Vermont) to 1200 hours of required instruction (California). Ironically, there is an inverse correlation between the highest achieving states and the amount of time spent in school. Vermont is among the highest achievers in the US while California is among the poorest.

As indicated earlier, the length of the school year is tied to the agrarian systems that existed at the time of the universal inception of schooling as a formalized process in the western world. As indicated by Malcom Gladwell in his book *Outliers*, the agricultural system of western civilizations greatly affected many aspects of their present condition. A

dependence on the seasons for food production meant alternating periods of labor and exertion. This meant that child labor was needed for planting and harvesting during the summer and fall and thus time off from school. In China and South East Asia, a year-long agricultural economy meant no such reservations for schooling and predictably, the summer vacations are much shorter.

This seemingly simple fact has radical repercussions for learning as “summer loss,” a term coined to describe the reversal of learning that happens during summer holidays, can greatly impact on financially and socially deprived families (Tiruchittampalam, Nicholson, Levin, and Ferron, 2018; Rambo-Hernandez and McCoach, 2015). Work by Cooper (2003), and more recently, Rambo-Hernandez and McCoach (2015) suggested that the loss of learning can be equivalent to a full month of instruction in factual and procedural learning (math and language skills).

This alarming statistic is worthy of consideration in changing the structure of our educational systems as schools were originally designed primarily to help those less affluent to exceed their current condition. Historical justification notwithstanding, the anachronistic nature of summer holidays, once useful, is now a deterrent to success. Its permanence has more to do with tradition than sound pedagogic reason. To this end, three suggestions are often cited to minimize learning loss and reduce the achievement gap that has plagued modern western educational systems: year-long schooling, summer school and/or shorter breaks (Cooper, 2003)

Studies conducted by Miller (2007), Chaplin & Capizzano (2006) and Cooper, B., Charlton, K., Valentine, J.C., & Muhlenbruck, L. (2000) unequivocally showed that students from poor families have equal achievement

during the school year and only lag behind after summer holidays.

This discrepancy is directly related to the lack of educational enrichment and engagement that characterizes summer holidays for less affluent families. In contrast, well off children with access to summer programs and opportunities for learning new skills and practicing existing knowledge maintained or increased their learning by the beginning of the school year.

It should be noted that opportunities for learning are not restricted to traditional schooling as Meyer, Princiotta and Lanahan (2004) identified physical activity, visits to zoos, libraries, museums, art galleries, camps, etc. as rich opportunities for learning. Predictably, 20% of children from less affluent families took part in these types of activities while 62% of affluent children reported being involved.

Research in support of longer school days is misleading. Although definitive gains can be achieved through longer school years, the key is not on the length of time, but the quality of instruction (Parinduri, 2014). Other previously thought unrelated factors may also play a significant effect on achievement. Aucejo and Romano (2016) observed that lengthening the school year by 10 days improved learning by an equivalent increase in grades of 1.7% while an equivalent decrease in absences during the year had a much greater significant change of 5.5%. Similarly, a study by Crede, Wirthwein, McElvany and Steinmayr (2015) looking at German adolescents, noted that parental education had a significant effect on their success and life satisfaction suggesting that attitude and predisposition may play a significant role in academic success regardless of the mechanics of the system.

Conclusion

The multiple moving parts that construct an educational system make it difficult to identify a keystone element. The structure of the school timetables, the length of the school day and school year, the starting times of the school day and many more insignificant minutiae may influence student achievement to a greater extent than previously thought (for a continuously growing list of effect size and school related interventions, see John Hattie's *Visible Learning*).

The quality of instruction cannot exceed the quality of the teacher in the classroom, and as such, regardless of the systemic changes that

improve learning, none will be greater than improving the quality and expertise of teachers. The school system is often tasked with a growing laundry list of impossible missions with no option for refusal. Some obstacles cannot be easily resolved without a sustained, multi-dimensional and widely inclusive approach that is costly, complex, and conditional on external factors outside the jurisdiction of the educational system. However, there are others that are simple. Time dependent considerations are fiscally prudent and have the potential to generate the greatest benefit, not just with student readiness, but also remunerations that perhaps far exceed the initial intended goal.

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Upcoming Themes and Topics of Interest

Below are themes and areas of interest for publication cycles.

1. Governance, Funding, and Control of Public Education
2. Federal Education Policy and the Future of Public Education
3. Federal, State, and Local Governmental Relationships
4. Teacher Quality (e.g. hiring, assessment, evaluation, development, and compensation of teachers)
5. School Administrator Quality (e.g. hiring, preparation, assessment, evaluation, development, and compensation of principals and other school administrators)
6. Data and Information Systems (for both summative and formative evaluative purposes)
7. Charter Schools and Other Alternatives to Public Schools
8. Turning Around Low-Performing Schools and Districts
9. Large Scale Assessment Policy and Programs
10. Curriculum and Instruction
11. School Reform Policies
12. Financial Issues

Submissions

Length of manuscripts should be as follows: Research and evidence-based practice articles between **2,800** and **4,800** words; commentaries between **1,600** and **3,800** words; book and media reviews between **400** and **800** words. Articles, commentaries, book and media reviews, citations and references are to follow the *Publication Manual of the American Psychological Association*, latest edition. Permission to use previously copyrighted materials is the responsibility of the author, not the *AASA Journal of Scholarship and Practice*.

Cover page checklist:

1. title of the article:
identify if the submission is original research, evidence-based practice, commentary, or book review
2. contributor name(s)
3. terminal degree
4. academic rank
5. department
6. college or university
7. city, state
8. telephone and fax numbers
9. e-mail address
10. 120-word abstract that conforms to APA style
11. six to eight key words that reflect the essence of the submission
12. 40-word biographical sketch

Please do not submit page numbers in headers or footers. Rather than use footnotes, it is preferred authors embed footnote content in the body of the article. Articles are to be submitted to the editor by e-mail as an electronic attachment in Microsoft Word, Times New Roman, 12 Font. The editors have also determined to follow APA guidelines by adding two spaces after a period.

Acceptance Rates

The *AASA Journal of Scholarship and Practice* maintains of record of acceptance rates for each of the quarterly issues published annually. The percentage of acceptance rates since 2010 is as follows:

2012: 22%	2016: 19%
2013: 15%	2017: 20%
2014: 20%	2018: 19%
2015: 22%	2019: 19%

Book Review Guidelines

Book review guidelines should adhere to the author guidelines as found above. The format of the book review is to include the following:

- Full title of book
- Author
- Publisher, city, state, year, # of pages, price
- Name and affiliation of reviewer
- Contact information for reviewer: address, city, state, zip code, e-mail address, telephone and fax
- Reviewer biography
- Date of submission

Publication Timeline

Issue	Deadline to Submit Articles	Notification to Authors of Editorial Review Board Decisions	To AASA for Formatting and Editing	Issue Available on AASA website
Spring	October 1	January 1	February 15	April 1
Summer	February 1	April 1	May 15	July 1
Fall	May 1	July 1	August 15	October 1
Winter	August 1	October 1	November 15	January 15

Additional Information

Contributors will be notified of editorial board decisions within eight weeks of receipt of papers at the editorial office. Articles to be returned must be accompanied by a postage-paid, self-addressed envelope.

The *AASA Journal of Scholarship and Practice* reserves the right to make minor editorial changes without seeking approval from contributors.

Materials published in the *AASA Journal of Scholarship and Practice* do not constitute endorsement of the content or conclusions presented.

The Journal is listed in Cabell's Directory of Publishing Opportunities. Articles are also archived in the ERIC collection. The Journal is available on the Internet and considered an open access document.

Editor

Kenneth Mitchell, EdD

AASA Journal of Scholarship and Practice

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AASA Resources

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- ✓ For **Resources on COVID-19**, see <https://bit.ly/2xyrcQV>
- ✓ For information on AASA's **Community Emergency Management, School Safety and Crisis Planning** go to <https://bit.ly/2xyrcQV>
- ✓ **Resources for School Administrators** may be viewed at www.aasa.org/welcome/resources.aspx
- ✓ The **AASA's Leadership Network** drives superintendent success, innovation and growth, shaping the future of public education while preparing students for what's next. Passionate and committed, the Network connects educational leaders to the professional learning, leadership development, relationships and partnerships through a variety of ongoing academies, cohorts, consortiums, and programs needed to ensure a long career of impact. For additional information on leadership opportunities and options visit www.aasa.org/LeadershipNetwork or contact Mort Sherman at msherman@aasa.org or Valerie Truesdale at vtruesdale@aasa.org.
- ✓ For information on AASA's **Future-Focused Schools Collaborative** refer to www.aasa.org/AASACollaborative.aspx
- ✓ Learn about AASA's **books program** where new titles and special discounts are available to AASA members. The AASA publications catalog may be downloaded at www.aasa.org/books.aspx.
- ✓ **Virtual meetings** for Education Leaders may be found at www.aasa.org/AASA-LeadershipNetwork-webinars.aspx

Upcoming AASA Events

2020 Legislative Advocacy Virtual Online Conference, July 7-9, 2020. Registration is online at www.aasa.org/legconf.aspx

AASA 2021 National Conference on Education, Feb. 15-17, 2021 in New Orleans, La.