Education for Students' Futures

The Problem Is Not the Mobile Phone

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Educators are complaining about surreptitious and even overt use of mobile phone texting during class. The premise of this paper is that mobile phone texting is not the problem; it is merely a symptom of a lack of highly engaging instructional strategies. In the absence of highly engaging external stimuli, students turn to alternative sources of stimulation: External (texting) or Internal (mind-wandering). Both of these alternative activities engage the social cognition network, the default network of the brain. By adopting highly interactive, engaging instructional strategies, we treat the disease, not the symptom. In the process we create greater liking for class, content, and teacher, and support proven acceleration of achievement.

Here we explore: 1) How traditional instructional strategies fail to provide engaging external stimuli; 2) How non-engaging instructional strategies that fail to activate the social cognition network predictably lead to texting and mind-wandering; and 3) How texting and mind-wandering can be radically reduced or eliminated by adopting alternative instructional strategies that provide high levels of stimulation and activation of the social cognition network.

Traditional Instructional Strategies Lack Sufficient Stimulation to Prevent Texting and Mind-Wandering

I have now done workshops in 35 countries and have toured classrooms in those countries. In each country the dominant instructional strategy is Whole-Class Question-Answer (WCQA). During a lecture or presentation, in an attempt to produce active engagement the teacher stops presenting and asks the class a question. Students who feel they would like to answer raise their hands. The teacher then calls on one student to answer. After the student answers, the teacher responds to the answer, offering an acknowledgement, praise, an augmentation, or a correction.

This traditional instructional strategy sequence is bankrupt with regard to producing active engagement among students. The maths of it reveals WCQA is exquisitely designed to produce disengagement. For example, in a

class of only thirty students, if the teacher did no talking at all and wanted to give each student a minute to verbalize their thoughts, calling on students one at a time would take thirty minutes. In fact, during WCQA the teacher talks about half the time, first asking the question and then responding to the answer. Thus it takes about two minutes to allow one minute of active engagement per student. This means that during WCQA, if students in a class of thirty participate about equally, the maximum each student can talk is about one minute per hour. In fact, however, many students choose not to raise their hands so their active participation is zero minutes an hour! In larger lectures or if the lecturer chooses not to ask the class questions, the active

engagement of students is far less than one minute per hour. Behavioural engineers could not design greater disengagement!

The lack of active engagement during instruction is particularly problematic because students have become accustomed to a very high level of stimulation. They have become accustomed to a steady diet of multimodal input including MTV, DVDs, YouTube, video games, and the Internet. The pace of stimulation has increased exponentially. To view, literally view, how the pace of stimulation has multiplied, simply watch a movie made thirty years ago. Everything moves slowly. We become bored, anticipating action that does not happen. So too is it with today's youth in a lecture. They are bored, having become accustomed to fast moving multi-media stimulation. Whereas yesterday's instructor could hold the attention of students with straight instructor talk (because that was the most stimulating game in town), today's instructors rarely can. Finding teacher talk boring, students seek alternative stimulation via texting and mind-wandering.

Texting and Mind-Wandering Result from Non-engaging Instruction

The predictable results of non-engaging instruction are texting and mind-wandering. To understand why this is so, we need to take a detour to understand the social cognition network in the brain, and to overview the research on mind-wandering.

The Brain's Social Cognition Network

Our brains have distinct neural tracks dedicated to figuring out the minds of others.

Contrary to what was believed for decades, new research demonstrates that brain structures involved in working memory and non-social reasoning are not involved in social cognition or *mentalising*. Mentalising is figuring out what someone else is thinking, feeling, or intending. The structures in the brain that are responsible for mentalising are part of the social cognition network located mostly in the medial (midline) regions of the brain in contrast to the working memory and fluid intelligence structures which are located in the lateral (outer) surface of the brain. We have an entirely independent social cognition brain network![1]

In other words, the neuroimaging findings are telling us something we could probably never have learned by just thinking about the inner workings of our minds: although social and non-social thinking feel like the same kind of process, evolution created two distinct systems to handle them.[2]

That this social cognition network is located in a deeper part of the brain indicates it evolved earlier. We are fundamentally social beings.

Social Cognition Is the Brain's Default Mode

The social cognition network is the brain's default network. When we are given IQ-type test questions or try to estimate how far our car can travel on the gas remaining in the tank, our working memory and fluid intelligence go to work, shutting down the social cognition network. Brain scans reveal that as soon as we have completed those tasks, our brains re-activate the social cognition network.[3, 4]

The default network quiets down when we perform a specific task, such as calculating a math problem in math class or studying ancient Greek pottery in history class. But when the mind's chores are done, it returns to Old Faithful—the default mode. In other words, the brain's free time is devoted to thinking socially.[5]

That the social cognition network is our default network means we are primed to look for thoughts, feelings, and intentions in others. We even extend this proclivity to impute feelings and intentions to objects. For example, when shown a motion picture of triangles, a circle, and an open box with the geometric figures moving, normal children and adults attribute feelings and intentions to the objects, "the big triangle is a bully that is picking on the small triangle and circle, who are running scared but then…."[6] Autistic children, who have a deficit in social cognition, describe the same objects and movements objectively. They do not impute feelings or intentions to inanimate objects: "the big triangle went into the rectangle. There were a small triangle and a circle. The big triangle went out. The shapes bounce off each other…."[7] Our normal default mode is to look for thoughts, feelings and intentions of others, and even attribute them to inanimate objects! Our default mode of cognition is social cognition. We are social creatures.

Social and non-social reasoning are carried out by different brain structures. Thinking about the academic content is carried out in an entirely different place in the brain than thinking about a girl's potential response to a request for a date! When subjects read sentences that do not involve figuring out what someone is thinking, feeling, or intending, the lateral prefrontal regions of the brain associated with language, working memory, and fluid intelligence become engaged. In contrast, across a number of studies, when subjects read sentences that involve mentalising, thinking about the thinking of others, their social cognition network goes into action. The regions involved with working memory and fluid intelligence are quiet. The social cognition network consists of four structures: The dorsomedial prefrontal cortex (DMPFC), the tempo-parietal junction (TPJ), the posterior cingulate, and the temporal poles.

These two distinct networks of brain structures actually work antagonistically.[8] Thinking about non-social, task-related content shuts down thinking about the thoughts, feelings, and intentions of others, and mentalising shuts down thinking about non-social tasks. We have a social IQ and a task IQ, but we can't operate both at once!

The implication: We have a social brain distinct from our non-social brain! Knowing what others are thinking is so important that our brains dedicate special, independent circuits for that purpose.

Texting and Mind-Wandering

In the absence of compelling external content, the brain naturally turns to social cognition. Texting is a social activity. So too is mind-wandering: During mind-wandering we activate the social cognition network–our thoughts turn to understanding the thoughts, feelings, and intentions of others. Thus, both texting and mind-wandering are a predictable response to the non-engaging format of WCQA. Given the lack of engaging external stimuli, the brain gravitates toward social cognition.

Pervasiveness of Mind-Wandering

Mind-wandering is variously referred to as "stimulus-independent thought (SIT),"[9] "task unrelated images and thoughts (TUIT),"[10] "task unrelated thought (TUT),"[11] "attention lapses,"[12] "zone outs,"[13] "daydreaming,"[14]

"decoupling of attention from the external environment,"[15] and "Mind-Wandering."[16]

Numerous studies document the pervasiveness of mind-wandering:

- Among 2,250 adults randomly sampled during the day via an iPhone application, mind-wandering (attention to non-task-related thoughts) occurred a remarkable 46.9% of the time![17]

- The iPhone application revealed mind-wandering occurs in all but one waking activity at least 30% of the time or more. The one exception: making love!

- A bell was sounded to sample mind-wandering during college classes and the researchers found minds wandering 54% of the time![18]

- Spontaneous mind-wandering occurs more often among college students with a childhood history of ADHD.[19]

- In a major review of mind-wandering research, the authors concluded, "mind-wandering may be one of the most ubiquitous and pervasive of all cognitive phenomena."[20] Their review of different approaches to measuring mind-wandering revealed mind-wandering occurs across a diverse variety of tasks between 15% and 50% of a person's time.

Using a clicker device to record mind-wandering during lectures, researchers found attention lapses to be early and frequent. They disconfirm the notion that minds only begin to wander after about 10 minutes into a presentation:

Contrary to common belief, the data in this study suggest that students do not pay attention continuously for 10–20 minutes during a lecture. Instead their attention alternates continuously between being engaged and non-engaged in ever-shortening cycles throughout a lecture segment.
...

Students report attention lapses as early as the first 30 seconds of a lecture, with the next lapse occurring approximately 4.5 minutes into a lecture and again at shorter and shorter cycles throughout the lecture segment.[21]

Additional research has disconfirmed the belief that attention declines only after ten to fifteen minutes into a lecture. Minds begin wandering right away![22]

Mind-Wandering Lowers Achievement

Mind-wandering impairs achievement:

- Mind-wandering is related to decreased note-taking and performance on course exams.[23]

- Participants whose minds wander more, fail to notice when the text they are reading has turned to gibberish and continue reading for a significant number of words before realizing what they are reading makes no sense![24]

- Mind-wandering occurs about 20-40% of the time during reading, and those whose minds are wandering are often unaware they are off topic—they lack meta-cognitive skills.[25]

- Reading comprehension is lower for those whose minds wander more.[26, 27]

Experimenters measured mind-wandering in a lecture to 334 undergraduate students taking an introduction to psychology course.[28] During the fifty-minute lecture a bell rang at 8, 15, 25, 34, and 40 minutes into the lecture. Students recorded if they were focused on the lecture or on unrelated thoughts or images. Mind-wandering was associated with lower performance on mid-term and final exams and overall course grades. It was also correlated with lower overall academic performance. To the extent the mind is wandering, the lecture is not understood or retained.[29]

The negative relationship between mind-wandering and test performance is strong. Experimenters tested mind-wandering and test performance in three one-hour lectures, each with different content. Individuals were probed at intervals during the lectures to report if their minds were wandering. After the lecture was over, those who self-reported mind-wandering on fewer than 50% of the probes correctly answered 77% of the questions on lecture content; those who reported mind-wandering on more than 50% of the probes correctly answered only 54% of the questions.[30]

An Antidote to Texting and Mind-Wandering: Engaging Instructional Strategies

An antidote to both texting and mind-wandering is the use of engaging, cooperative instructional strategies that meet the need for demanding external stimulation and engagement of the social cognition network. Here I will briefly describe two of many such strategies that can be used during any lecture or presentation: *Listen Right!* and *Numbered Heads Together*. Details of these strategies are presented in two books: *Kagan Cooperative Learning*,[31] and *Brain-Friendly Teaching*.[32] Steps of additional highly engaging, interactive instructional strategies are available in over 100 books published by Kagan Publishing.[33]

Listen Right!

In contrast to traditional lectures in which students take notes *while* the teacher is talking, *Listen Right!* separates listening and note-taking. Students have full, undivided attention to a chunk of the lecture and undivided attention to note-taking. They are not attempting to take notes *while* listening to the next bit of the lecture, which results in impoverished listening and impoverished note taking. The social cognition network is activated as students share their notes with others and improve them via the interaction. The steps of the strategy are as follows:

1. Teacher presents a chunk of content.

2. Teacher stops presenting.

3. Students take notes, without interacting with other students.

4. Students share their notes with a partner or within their team, augmenting if a partner has included something important they have missed.

5. Teacher announces key points.

6. Students celebrate if they recorded key points.

7. Teacher presents next chunk and process is repeated.

Numbered Heads Together

In contrast to working alone, *Numbered Heads Together* is designed to have students "put their heads together" to encourage, support, and tutor each other at points during a lecture or presentation, activating the social cognition network. The steps of the strategy are as follows:

1. Students in teams of four each have a number, 1 through 4.

2. Teacher asks a question or poses a problem and allows think time.

3. Students privately write an answer.

4. Students stand and share answers with teammates, discussing and teaching each other.

5. Students sit when everyone knows the answer or feels prepared to share their thoughts.

6. Teacher calls a number, 1 through 4.

7. Students with that number stand, shows their answers via a slate, response card, or some other way.

8. Classmates applaud those with the right answer or with a differentiated response.

Listen Right! and *Numbered Heads Together* both engage the social cognition network and both provide a high level of engaging stimulation. Students engaged in these and other highly engaging, interactive instructional strategies have little time or inclination to text or to mind-wander. Research confirms the impact of engaging instructional strategies. In a series of independent research studies conducted by a research team at State University of New York (SUNY) comparing *Numbered Heads Together* and WCQA, the average effect size favouring *Numbered Heads Together* was .89.[34] An effect size of .89 means a student scoring 50 using WCQA would score 81 had they been taught with *Numbered Heads Together!*

Rather than blaming mobile phones and texting for lack of student engagement, instructors using traditional lectures and WCQA would do well to take a hard look at the instructional strategies they are using. There are alternative proven, engaging instructional strategies that prevent texting and mind-wandering, and which enhance joy and success in teaching and learning.

References

[1] Lieberman, M.D. **Social. Why our brains are wired to connect**. New York, NY: Crown Publishing Group, 2013.

[2] Lieberman, M.D. Social. **Why our brains are wired to connect**. New York, NY: Crown Publishing Group, 2013, 117-118.

3 Harrision, B.J., Pujol, J., Lopez-Sola, M., Hernandez-Ribas, R., Deus, J., Ortiz, H., Soriano-Mas, C., Yücel, M., Pantelis, C., & Cardoner, N. Consistency and functional specialization in the default mode brain network. **Proceedings of the National Academy of Sciences**, 2008, 105(28), 9781-9786.

[4] Spreng, R.N., Mar, R.A., & Kim, A.S. The common neural basis of autobiographical memory, prospection, navigation, theory of mind, and the default mode: A quantitative meta-analysis. **Journal of Cognitive Neuroscience**, 2009, 21(3), 489-510.

[5] Lieberman, M.D. **Social. Why our brains are wired to connect**. New York, NY: Crown Publishing Group, 2013, 22.

[6] Heider, F., & Simmel, M. An experimental study of apparent behavior. **American Journal of Psychology**, 1944, 57(2), 243-259.

[7] Klin, A. Attributing social meaning to ambiguous visual stimuli in higher-functioning autism and Asperger syndrome: The Social attribution task. **Journal of Child Psychology and Psychiatry**, 2003, 41(7), 831-846.

[8] Van Overwalle, F. A dissociation between social mentalizing and general reasoning. **NeuroImage**, 2011, 54(2), 1589-1599.

[9] Mason, M.F., Norton, M.I., Van Horn, J.D., Wegner, D.M., Grafton, S.T., & Macrae, C.N. Wandering minds: The default network and stimulus-independent thought. **Science**, 2007, 315(5810), 393-395.

[10] Lindquist, S.I., & McLean, J.P. Daydreaming and its correlates in an educational environment. **Learning and Individual Differences**, 2011, 21(2), 158-167.

[11] McKiernan, K.A., D'Angelo, B.R., Kaufman, J.N., & Binder, J.R. Interrupting the "stream of consciousness": An fMRI investigation. **NeuroImage**, 2006, 29(4), 1185-1191.

[12] Bunce, D.M., Flens, E.A., & Neiles, K.Y. How long can students pay attention in class? A study of student attention decline using clickers. **Journal of Chemical Education**, 2011, 87(12), 1438-1443.

[13] Schooler, J.W. Re-representing consciousness: Dissociations between experience and meta-consciousness. **Trends in Cognitive Science**, 2002, 6(8), 339-344.

[14] Lindquist, S.I., & McLean, J.P. Daydreaming and its correlates in an educational environment. **Learning and Individual Differences**, 2011, 21(2), 158-167.

[15] Smallwood, J., & Schooler, J.W. The restless mind. **Psychological Bulletin**, 2006, 132(6), 946-958.

[16] Smallwood, J., Fishman, D.J., & Schooler, J.W. Counting the cost of an absent mind: Mind wandering as an underrecognized influence on educational performance. **Psychonomic Bulletin & Review**, 2007, 14(2), 230-236.

[17] Killingsworth, M.A., & Gilbert, D.T. A wandering mind is an unhappy mind. **Science**, 2010, 330(6006), 932.

[18] Cameron, P., & Giuntoli, D. Consciousness sampling in the college classroom or is anybody listening? **Intellect**, 1972, 101(2343), 63-64.

[19] Shaw, G.A., & Giambra, L. M. Task-unrelated thoughts of college students diagnosed as hyperactive in childhood. **Developmental Neuropsychology**, 1993, 9, 17-30.

[20] Smallwood, J., & Schooler, J.W. The restless mind. **Psychological Bulletin**, 2006, 132(6), 946-958, 956.

[21] Bunce, D.M., Flens, E.A., & Neiles, K.Y. How long can students pay attention in class? A study of student attention decline using clickers. **Journal of Chemical Education**, 2011, 87(12), 1438-1433, 1442.

[22] Wilson, K., & Korn, J.H. Attention during lectures: Beyond ten minutes. **Teach Psychology**, 2007, 34(2), 85-89.

[23] Lindquist, S.I., & McLean, J.P. Daydreaming and its correlates in an educational environment. **Learning and Individual Differences**, 2011, 21(2), 158-167.

[24] Smallwood, J., Fishman, D.J., & Schooler, J.W. Counting the cost of an absent mind: Mind wandering as an underrecognized influence on educational performance. **Psychonomic Bulletin & Review**, 2007, 14(2), 230-236.

[25] Schooler, J.W., Reichle, E.D., & Halpern, D.V. Zoning out while reading: Evidence for dissociations between experience and metaconsciousness. In D.T. Levin (ed.), **Thinking and Seeing: Visual Metacognition in Adults and Children**. Cambridge, MA: MIT Press, 2004. 204-226.

[26] Schooler, J.W., Reichle, E.D., & Halpern, D.V. Zoning out while reading: Evidence for dissociations between experience and metaconsciousness. In D.T. Levin (ed.), **Thinking and Seeing: Visual Metacognition in Adults and Children**. Cambridge, MA: The MIT Press, 2004, 204-226.

[27] Smallwood, J., McSpadden, M., & Schooler, J.W. The lights are on but no one's home: Meta-awareness and the decoupling of attention when the mind wanders. **Psychonomic Bulletin & Review**, 2007, 14(3), 527-533.

[28] Lindquist, S.I., & McLean, J.P. Daydreaming and its correlates in an educational environment. **Learning and Individual Differences**, 2011, 21(2), 158-167.
[29] Smallwood, J., Beech, E.M., Schooler, J.W., & Handy, T.C. Going AWOL in the brain – mind-wandering reduces cortical analysis of the task environment. J**ournal of Cognitive Neuroscience**, 2008, 20(3), 458-469.
[30] Risko, E.F., Anderson, N., Sarwal, A., Engelhardt, M., & Kingstone, A. Every attention: Variation in mind-wandering and memory in a lecture. **Applied Cognitive Psychology**, 2012, 26(2), 234-242.
[31] Kagan, S., & Kagan, M. **Kagan Cooperative Learning**. San Clemente, CA: Kagan Publishing, 2009.
[32] Kagan, S. **Brain-Friendly Teaching. Tools, Tips, and Structures**. San Clemente, CA: Kagan Publishing, 2014, in press.
[33] Kagan Publishing, San Clemente CA: http://www.kaganonline.com.
[34] Studies described in: Kagan, S. **Kagan Cooperative Learning Structures**. San Clemente, CA: Kagan Publishing, 2013.

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