UNPACKING THE TDSB’S VISION FOR LEARNING: RESEARCH BRIEF ON DIGITAL FLUENCY
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BACKGROUND AND RATIONALE

The Toronto District School Board (TDSB) has recently set forth an innovative vision for learning, and this research brief will unpack this vision for learning, focusing on a core aspect of digital fluency. By doing so, we are targeting to inform recent practices and policies regarding digital fluency across the board and the province. Digital fluency is an essential part of 21st century learning and an important part of preparing young Canadians for a strong future. It is the hope that this research brief will motivate you to think about ways to better support digital fluency.

What is Digital Fluency?
Digital fluency is about having the skills to use digital tools to create, design, communicate, and express oneself in order to synthesize information (Hsi, Pinkard & Woolsey, 2005). Fluency reaches beyond knowledge and usage, to meaningful application (Resnick, 2002; Wang, Wiesemes, & Gibbons, 2012). Digital fluency is the ability to use digital technology skillfully and meaningfully in a variety of ways. Digital fluency includes “constructing new representational practices, design sensibilities, ownership, and strategic expertise gained, taking a practice-oriented perspective rather than a data, information, or knowledge-centred perspective” (Hsi, 2007, p. 1513).

“Digital fluency is a foundational ability to use digital technology skillfully, purposefully and meaningfully in a variety of ways in teaching and learning.”

What is the Difference Between Digital Fluency and Digital Literacy?
At the Education World Forum (2015) underwritten by the United Nations, participants suggested a global challenge is to construct our society in such a manner that “. . . everyone can create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life” (p. 22). Supporting this suggestion is the contemporary belief that literacy is an essential life and workplace skill (Eisenberg, 2008; Howell, 2014). Literacy is currently a basic human right in a digital world (National Forum on Information Literacy, 2005).

It is important to know that literacy (verb) and digital (adjective) are complimentary terms in that they are linked with critical thinking (Mackey & Jacobson, 2011). Literacy is characterized
as a type of human action in the 21\textsuperscript{st} century that includes digital activities. Calvani, Cartelli, Fini, and Ranieri (2009) concluded that our cognitive dimension of digital literacy involves “being able to read, select, interpret and evaluate data and information taking into account their pertinence and reliability” (p. 187). Digital Literacy is not a new term, indeed as early as 1997 authors defined it as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (Gilster, 1997, p.1).

Digital literacy is about knowing how to use digital technology and what to do with it, in comparison to digital fluency, which is about knowing when and why to use a specific digital tool (Savin-Baden, 2015). We are digitally fluent when we have “attitude and aptitude” (Howell, 2013, p. 6). The words digital and literacy are connected by other terms to include more of the background of the 21\textsuperscript{st} century learner. For instance, by adding the word information to digital information literacy we define the new term,

... as a form of literacy that focuses on electronic information: Digital information literacy involves recognising the need for, and being able to access and evaluate electronic information. The digitally literate can confidently use, manage, create, quote, and share sources of digital information in an effective way that demonstrates an understanding and acknowledgement of the cultural, ethical, economic, legal, and social aspects of information. (Jeffery et al., 2011, p. 385)

**How do we Achieve Digital Fluency?**

In order to achieve digital fluency, we need to provide: (1) reliable and robust technology infrastructure, (2) effective technology use, and (3) digital fluency/Information Communication Technology (ICT) frameworks (Saskatchewan Ministry of Education, 2013). Digital fluency cannot happen without having the necessary technological tools (Howell, 2014).

![Figure 1: Recommendations for Achieving Digital Fluency](image)

In order for technology integration to be successful, secure, reliable and up to date, technology infrastructure must be in place (Saskatchewan Ministry of Education, 2013). Having the right tools is critical for effective teaching and learning (Saskatchewan Ministry of Education, 2013).

Digital fluency cannot happen without having the necessary technological tools (Howell, 2014).
Another important factor for achieving digital fluency is effective technology use by administrators and educators (Saskatchewan Ministry of Education, 2013). Effective technology integration must become the new normal in educational environments, for widespread digital fluency (Savin-Baden, 2015). Effective technology integration is about making the use of technology routine, readily available, accessible and supporting curricula and teaching goals (Howell, 2014).

Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2009) unites Pedagogy and Content (PCK; Shulman, 1986) and Technology Knowledge as a central feature of effective pedagogy, Koehler and Mishra (2009) added dimensionality and technology traits as depicted in Figure 2. Individual teachers, grade-level, school-specific factors, demographics, culture, and other factors ensure that every situation is unique, and no single combination of content, technology, and pedagogy will apply for every teacher, every course, or every view of teaching.

Figure 2: Technological Pedagogical Content Knowledge (TPACK)

*Source: (Koehler and Mishra, 2009, p. 67); Reproduced by permission.*
Just as important are technology frameworks, which house TPACK and support digital fluency in educational environments. Digital fluency frameworks should focus on: (1) teaching and learning, (2) administrative use of technology, and (3) infrastructure requirements and needs (Saskatchewan Ministry of Education, 2013).

**What is the TDSB Doing to Achieve Digital Fluency?**

The TDSB strongly supports strategies to achieve digital fluency. The TDSB sees digital fluency as a fundamental aspect of student learning. Digital fluency is at the core of the TDSB’s vision of student learning, and is at the forefront of TDSB initiatives and standards (see Figure 3). We will discuss briefly the TDSB’s initiatives and standards in the following section.

![Figure 3: TDSB’s Vision for Learning which Highlights Digital Fluency at the Core of Student Learning](source:image)

The TDSB’s ICT Standards—“Digital Learning for Kindergarten to Grade 12” (K-12) provide a framework for achieving digital fluency. The ICT Standards include six strands focusing on different areas necessary to build and develop students’ digital fluency.

The six strands of the framework include:

- Technology Operations & Concepts
- Research & Information Fluency
• Critical Thinking and Problem Solving
• Communication & Collaboration
• Digital Citizenship
• Creativity & Innovation (TDSB, 2008)

The TDSB research studies has focused on digital competence and defined it as “Confidently, creatively, & ethically use the rapidly evolving information & communication technologies for learning, leisure, and/or work” (Sinay, 2014, p. 21) to improve students’ ways of knowing in a rapidly changing globalized world.

Improving digital fluency has been the central focus of the TDSB’s vision and action plans suggesting actions that will surely impact digital literacy and fluency. For example:

• Building “. . . Wi-Fi infrastructure support in all schools” (TDSB, YAP, 2013, p. 1).
• Ensuring “. . . continuing Education programs (credit and literacy/numeracy, after school, evening, summer) (TDSB, YAP, 2013, p. 2).
• “[E]xpand[ing] necessary IT infrastructure requirements to sufficiently increase capacity for learners and teachers, including improved bandwidths, 100% of our schools with wireless school zones and/or classrooms and capable of “Bring Your Own Devices” programming for students and more Blended Learning and e-learning services; Development and use of an integrated TDSB Virtual Library, with 24/7 accessibility for students, staff and parents” (TDSB, YAP, 2013, p. 3).
• Develop and implement a “Student Innovation & Entrepreneurialism Strategy, which includes . . . increased opportunities to participate in experiential learning, specialist high skills major, broad based technology and STEM based co-curricular programs; . . . to better realize Employability Skills (TDSB, YAP, 2013, p. 5).

The pursuit of these priority goals will involve both digital literacy and levels of digital fluency within both students and educators.

**What are Effective Instructional Strategies?**

There are a variety of instructional strategies that are recommended for fostering digital fluency through teaching and learning. Specific recommendations on instructional strategies (Saskatchewan Ministry of Education, 2013) can be linked to the TPACK model (see Figure 2). Other recommendations include:

• Help teachers **build content knowledge** and **nurture the use of technology within the classroom/school.** While it is true that most students could possibly be technical
assistants given their digital native status, teachers should be the co-leaders in a digitally centred environment to support meaningful and skill use of digital technologies for knowledge creation (Ryan & Bagley, 2015).

- Digital learning can also be supported in a student centred environment by having students inform and guide digital learning by providing a meaningful student centered task where the Internet and hardware (mobile, desktop) need to be skillfully used (Savin-Baden, 2015).

Recommendations are good, however the application in practical teaching environments bring these recommendations into practice. Following are important practical applications for the K-12 environment. Recommendations herein come from the guide to digital fluency created by the Saskatchewan Ministry of Education (2013) which suggest educators:

- Create and share a comprehensive vision for digital fluency for all students
- Express and benchmark digital fluency competencies for students in Grades K-12
- Ensure curriculum outcomes are aligned with the goal of digital fluency
- Ensure teachers and students are supported to use technology in meaningful and effective ways
- Use technology/digital tools to allow for greater student access to learning
- Have ongoing evaluation of student achievement of digital fluency competencies
- Encourage and support digital fluency in educators through professional development.

(Saskatchewan Ministry of Education, 2013, p. 11)

There are several interrelated factors that dictate how instruction and learning unfolds in a digital classroom. These factors include: having strong implementation strategy, having a clear and consistent message for digital fluency, and ensuring appropriate technology infrastructure. For instance, it is well known that we must infuse digital tools into schools and classrooms and therefore the question of implementation strategy surfaces.

The messaging must come from leadership (teachers, administrators) and government (curricular guides), as modeling appropriate attitudes is imperative. Enabling the environments with quick and reliable Internet access (Wi-Fi) is mandatory coupled with hardware and software that is current.

Supplying hardware and providing professional development with technical support will always be a challenge in education, yet an indispensable one. We must move quickly as the digital divide between students and teachers is widening (Nasah, DaCosta, Kinsell, & Seok, 2010).
student born after 2000 (21st century) has grown up immersed in digital technology, technology (PS1, 2, 3, 4 - Xbox, computers, phones, IPods, IPads, mobile devices such as computer wrist-bands and watches) that they have often mastered without any instruction from parents, teachers or adults in general. Therefore, learning is self-reliant and interactive (Nasah et al., 2010; Howell, 2014).

Some educators (digital immigrants) are not up-to-speed and reluctant to embrace digital devices let alone master digital skills. Some teachers may actually avoid digital instruction content (TPACK) that could very well enhance student digital skills (Honan, 2008). Geiger, Goos, & Dole (2015) admit that there must be a willingness on the part of educators to use unfamiliar technologies in teaching. These digital immigrants may catch up via digital skill building in time (Eshet-Alkalai & Chajut, 2009). Numerous educators are seeking out professional development online and face-to-face and some actually have the time and perseverance to be digital leaders however there remains a puzzling question concerning the learning process of digital immigrants (most adults) and digital natives (most students). How do they learn to be digitally literate and fluent?

Cost is another important factor. Teachers and students may not be able to afford the latest technology, and therefore they do not have the opportunity to learn how to use it.

Li and Ranieri (2010) found many students had limited to no access to computers of any sort or the Internet at home and this impacted digital competence levels. Some factors such as usage, competence, quality of instruction, technical support, availability, and teachers' beliefs dictate the overall instructional and learning strategies in any school or classroom. Ideally, a well-equipped classroom, with digitally literate teachers who have technical support and believe in technology will teach very differently from those teachers who do not have these things. For instance, Eshet-Alkalai and Amichai-Hamburger (2004) located five digital literacy skills: (a) photo-visual, (b) reproduction, (c) branching, (d) information, and (e) socio-emotional aspects. They also found that the younger generation is not always more digitally literate than adults. This finding may be linked to the several reasons as previously noted.
**Figure 4: Summary of Effective Teaching Strategies**

- Embrace TPACK
- Help teachers build knowledge of technology
- Nurture technology in the school/classroom
- Ensure implementation strategy
- Strong and consistent digital fluency message
- Reliable and up-to-date technology infrastructure

*Source:* Inspired by (Saskatchewan Ministry of Education 2013)

**How can we Measure Digital Fluency in K-12 Schooling?**

Admittedly, digital fluency looks different for students and educators (Saskatchewan Ministry of Education, 2013). For example, students are digitally fluent when they are able to use digital tools in flexible, creative, and complex ways (Saskatchewan Ministry of Education, 2013); whereas, educators are digitally fluent when they are able to skillfully use technology to improve student learning, increase their own knowledge, and grow professionally (Saskatchewan Ministry of Education, 2013). Measurement (of, for learning) can unfold in a qualitative mode and within a performance based environment with authentic tasks that are rooted in real-world performance (progressivism) for instance, consider the suggestions of JISC (2014; 2015a; 2015b) in their quick guide to developing students' digital literacies.
From the elements of JISC (2014; 2015 ab) we can locate performance-based items that exemplify fluency, and begin to observe, document, and audit skills in classrooms. It may be best to have performance based pre-tests and post-tests that allow educators to use pedagogical documentation to realize levels of fluency and growth as we now have in many other disciplines.

**Suggested Outcomes and Indicators**
Following is a discussion of suggested outcomes and indicators related to digital fluency. The outcomes and indicators are categorized in three categories: (1) teaching and learning, (2) administrative use of technology, and (3) infrastructure requirements and needs (Saskatchewan Ministry of Education, 2013) (see Figure 6).
Teaching and Learning

- Promote and develop digital fluency among students and educators
  - Curriculum outcomes need to focus on digital fluency
  - Classroom practices, teaching pedagogy, and educators need to leverage technology
- Students and educators use digital technology skillfully and meaningfully in a variety of capacities, such as to create, design, communicate, share, and synthesize.
  - Engage in authentic activities that allow for meaningful and varied uses of technology
- Students and educators participate in the digital society in safe ways
  - Use technology for personal, social, advocacy, or societal ways safely
- Equitable access to high levels of learning
  - Ensure assistive technology are available
  - Allow for different ways to access learning such as distance or online learning
- Sufficient availability of up-to-date digital resources for educators and students
  - Availability of high quality resources that meet educational goals and curriculum outcomes (Saskatchewan Ministry of Education, 2013)

Administrative Use of Technology

- Administrative staff need to use technology for improved efficiency and effectiveness
  - Use technology for information management, communication, resources, reporting, and collaboration
- Administrative staff support equitable and effective use of technology
  - Procedures and frameworks are in place to ensure equitable and effective use of technology
- Administrative staff strongly encourage technology use in teaching and learning
  - New technology is continuously evaluated
  - Technology are provided for teaching and learning (Saskatchewan Ministry of Education, 2013)

Infrastructure Requirements and Needs

- A secure, reliable, up to date, and accessible technology infrastructure must be in place (Saskatchewan Ministry of Education, 2013)
Suggested Assessment and Evaluation Practices
There are a variety of recommended evaluation and assessment practices for digital fluency. They have been categorized in three areas: (1) system-level assessment, (2) assessment for schools, and (3) assessment for teachers.

System-level Assessment
- Provide reliable, up-to-date and accessible technology infrastructure (Saskatchewan Ministry of Education, 2013)
- Vision for digital fluency (Saskatchewan Ministry of Education, 2013)
- Establish curriculum outcomes on digital fluency (Saskatchewan Ministry of Education, 2013; White, 2013)
- Establish funding for infrastructure and digital technology (Saskatchewan Ministry of Education, 2013)
- Provide professional learning on digital technologies (Saskatchewan Ministry of Education, 2013)

Assessment for Schools
- Implement system’s vision for digital fluency (Saskatchewan Ministry of Education, 2013)
- Ensure appropriate and equitable use of technology (Saskatchewan Ministry of Education, 2013)
• Use **technology tools effectively** to support teaching, learning, and administrative tasks (Saskatchewan Ministry of Education, 2013)
• Provide **professional learning** on digital technologies (Saskatchewan Ministry of Education, 2013)

**Assessment for Teachers**
• **Embody** digital fluency vision (ISTE, 2015c; Saskatchewan Ministry of Education, 2013)
• **Follow curriculum outcomes** on digital fluency (White, 2013)
• Attend professional development on digital technology (ISTE, 2015c; Saskatchewan Ministry of Education, 2013)
• **Use technology meaningfully and regularly** in classroom practices (ISTE, 2015c)
• Provide students with **multiple opportunities** to use technology in a variety of authentic ways (ISTE, 2015c; Saskatchewan Ministry of Education, 2013)

**Figure 7: Assessment and Evaluation Practices**

*Source:* (Saskatchewan Ministry of Education 2013)
NEXT STEPS

Digital action is a daily behaviour in 2016 life and one that we can observe in our community. This digital action is transformative and illusive since the rapid change of pace caused by technologic innovation creates issues for our community. Education needs to support, monitor, and observe technology in a manner that continues to enable users. Martin (2015) in a tone of exasperation asks: “How we can expect students to grow when we have not grown ourselves as instructors? We cannot teach with 19th century skills and expect our students to be prepared in the 21st century” (p. 24). Cost, time, hardware issues, and the professional development of stakeholders are essential (Tingen, Philbeck, & Holcomb, 2011; Parr & Ward, 2011). Perhaps, we need not lead, and instead only participate in this area, to enable all to move forward in a style that causes leaders to emerge in a new manner.
REFERENCES


# JISC Digital Capabilities: Six Elements Defined

<table>
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<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>ICT Proficiency</strong></td>
<td>The capacity to use ICT-based devices, applications, software, and services via their interfaces (mouse, keyboard, touch screen, voice control, and other modes of input; screens, microphones, haptic feedback, and other modes of output); to use basic productivity software, web browser, and writing/presentation software; to use digital capture devices such as a camera. At higher levels, the capacity: to choose, adapt, and personalize ICT applications and systems; to critically assess the benefits/constraints of ICT applications and approaches; to design and implement ICT solutions; to recover from failures; to stay up to date with ICT as it evolves; to adopt computational modes of thinking (coding, algorithms, etc.).</td>
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<td><strong>Information, Media, and Data Literacy (critical use)</strong></td>
<td>Information Literacy The capacity to find, evaluate, manage, curate, organize, and share digital information, including open content. At higher levels a critical awareness of provenance and credibility. Capacity to interpret information for academic and professional/vocational purposes. Ability to act within the rules of copyright and to use appropriate referencing. Ability to record and preserve information for future access and use. Media Literacy The capacity to critically read communications in a range of digital media – text, graphical, video, animation, audio, haptic, etc. (also 'multimodal literacy'). At higher levels, the capacity to appreciate audience, purpose, accessibility, impact, modality, and to understand digital media production as a practice and an industry. To act within digital copyright law. Data Literacy The capacity to collate, manage, access, and use digital data in spreadsheets and other media; to record and use personal data; to ensure data security and to use legal, ethical, and security guidelines in data collection and use. At higher levels the ability to interpret data by running queries, data analyses, and reports.</td>
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<tr>
<td><strong>Digital Creation, Scholarship, and Innovation (creative product)</strong></td>
<td>Digital Creation The capacity to design and/or create new digital artefacts and materials; digital writing; digital imaging; digital editing of images, video, and audio. At higher levels the ability to code and to design apps/applications, games, virtual environments, and interfaces. Digital Research and Scholarship Digital research and scholarship. The capacity to collect and analyze research data using digital methods. At higher levels to discover, develop, and share new ideas using digital tools; to undertake open scholarship; to design new research questions and programmes around digital issues/methods; to develop new digital tools/processes; to evaluate impacts of digital interventions. Digital Innovation The capacity to develop new practices with digital technology in organizational settings and in specialist subject areas (professional, vocational, and disciplinary); digital entrepreneurship. At higher levels the ability to lead organizations, departments, teams, and practice/subject areas in new directions in response to digital challenges and opportunities.</td>
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<td>Digital Communication, Collaboration, and Participation (participating)</td>
<td>Digital Communication</td>
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<td>Digital Participation</td>
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<td>Digital Learning and Personal/Professional Development (learning)</td>
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<td>Digital Identity and Well-being (self-actualizing)</td>
<td>Digital Identity Management</td>
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<td>Digital Well-being</td>
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Source: (JISC, 2015b, p.1; JISC, 2015a)