



At a Glance: Select and use appropriate tools or technology to accomplish a given task, and develop solutions to problems. Examples: software, programming, technical devices, information management and databases, laboratory skills, statistical and qualitative methods/programs, etc.

Understanding Tools & Technology

Identifying and mastering relevant tools and technologies, as well as adapting to emerging ones, will help you to achieve goals and solve problems effectively. Examples of tools and technologies include software applications, programming, technical devices, information management and databases, laboratory skills, and statistical and qualitative methods and programs.

Why does it matter?

In addition to its global impact, digital technology has become essential for achieving professional and personal goals.¹ Keeping track of your budget, searching online libraries, or even meeting your life partner have never been easier. The remarkable innovations in the past fifty years have made expertise with specific tools and technologies a requirement for students or employees who need to access information and data (e.g., digital databases, e-books) and accomplish tasks efficiently (e.g., statistical analysis software, online learning).²

In a research context, the use of appropriate tools and technologies accommodates large-scale studies, while guiding users towards answers and solutions with efficiency and consistency, in a time and cost-effective manner.³ At an individual level, incorporating technologies in education and research has been shown to improve students' self-directed learning (e.g., wikis) and time management abilities, and to equip them with life-long skills (e.g., web navigation, numerical literacy).⁴ Communication of information is an area that has witnessed a significant progress in recent years. In fact, Information and Communication Technology (ICT) literacy governs our current methods to “research, organize, evaluate, and communicate information.”⁵

Cultivating the Ability to Use Tools & Technology

Developing the understanding of novel tools and technologies is considered an important element of procedural knowledge (defined as “the knowledge of the steps required to attain various goals.”⁶ In a North American survey of job-related skills, employers identified statistics and computational skills, cognitive computing, and knowledge of information systems as “skills deficiencies” in newly hired graduates.⁷ Consider learning a new technique or training to use a new device as part of incorporating innovative tools and technologies into your research design during your educational experience. While some tools can be self-taught (e.g., Microsoft Office Suite), others are more specialized and may require more formal training through workshops and/or courses, in order to attain higher levels of proficiency (e.g. programming languages such as Java and C++).

We live in the age of big data, where research and development are governed by gathering and analyzing extensive amounts of information to draw life-changing conclusions whether in business, health, politics, education, or innovation.⁸ Therefore, cultivating data management skills is vital during and following graduate school, regardless of your field.

Proper data management entails the collection of information, a planned generation of data, and the organization, archiving, and publication of the conclusions. For instance, research data management practices have many advantages such as securing data storage and promoting research collaborations by facilitating data sharing.⁹

Quick Guide to the Mastery of Tools & Technology

- Master basic computer applications (e.g., word processing, data storage and management) in managing tasks and problems in school and beyond¹⁰
- Learn about about managing data and use appropriate tools and technologies to set and execute a data management plan (DMP)¹¹
- Demonstrate open-mindedness and adaptability to new and emerging technologies¹²
- Identify specific tools and technologies that will help you to achieve your immediate and future goals (e.g., download a calorie-count app on your smartphone if your goal is to lose weight; Learn how to use WordPress if you want to create your own blog)
- Use technology consciously and ethically (e.g., avoid plagiarism)¹³
- Maintain a balanced approach to the use of tools and technologies:¹⁴
 - While technology virtually connects you to the world, you may risk personal isolation (e.g., overuse of social media and texting instead of a get-together; communicating via lengthy emails instead of an in-person meeting. No, skyping does not count).
 - Beware of technology dependency and unhealthy habits; Can you “arrive at your destination” without your trusty GPS? Are you suffering from insomnia? It may be due to all the screens occupying your life day and night.

Taking Action

Professional Development & Training

At McGill University:

- Courses - [McGill School of Continuing Studies - Information Technology Courses](#): A variety of course selections to learn skills to design and manage information systems.
- Courses - [McGill School of Continuing Studies - Data Science Courses](#): A variety of course selections to learn skills required to manage, manipulate, analyze and extract value from data.
- Courses - [Data Science at McGill - Programs & Courses](#): This site lists courses and professional programs offered at McGill.
- Workshops - [Introductory Data Workshops](#) - McGill Library
- Online Tutorial - [Learn R - McGill Library](#)

External Organizations:

- Courses - [Decode MTL Coding Bootcamp](#): An intensive program offering hands-on approach to learn computer programming in Montreal area.
- Courses - [Lighthouse Labs Coding Bootcamp](#): This Montreal-based organization offers several
- Courses - [edX Microsoft MOOCs](#): A series of free online courses from Microsoft, from how to effectively use the MS Office suite to computer programming and data warehousing.
- Courses - For more technology courses such as computer science or data & statistics, consider taking self-paced online courses (from web development to IOS fundamentals) at: [edX](#), [Coursera](#), [udacity](#), [codecademy](#).
- [Complete guide to the top 24 coding bootcamps](#) - TechBeacon

Gaining Experience

- Apply for a [McGill Digital Humanities Research Assistantship](#) to gain experience in digital skills
- Learn to code by building apps for non-profit organizations: [Non-profit agencies in Montreal](#)
- Discover and collaborate with others on a [HackMcGill](#) project.

Resources

Websites & Apps

- [Teaching and Learning Technologies](#) - McGill Teaching and Learning Services.
- [McGill Lab Manager](#): This site provides the latest trends, innovations and insights for lab managers.
- [McGill OSD - Access Technology & Computing Resources](#): This site provides quick technology resources such as apps and software for writing, how to organization your digital clutter, etc.
- [eLabFTW](#): free open source electronic lab notebook.
- [Montreal ICT](#): an application that allows you to discover Greater Montreal's Information and Communications Technologies (ICT) sector.
- [TechnoMontreal](#): a non-profit organization and ICT cluster of the Greater Montreal region - provide resources about the local ICT sector.
- [GraphPad Scientific Software](#): offer user-friendly statistical and graphing tools tailored for various audience - special rates for students.
- [Data Analysis Resource Centre](#) - GraphPad: offers a clear and comprehensive review of statistics principles.
- [QuickCalcs](#) - GraphPad: free online calculators for detecting outliers, t tests, randomizing and more.

Groups & Associations

- [HackMcGill Coding Community](#): HackMcGill is beginner-friendly community that offers hands-on help for people with little to no experience in programming at the Learn to Code events.
- [freeCodeCamp Community](#): A community that helps you learn to code and get experience by contributing to open source projects used by nonprofits.
- Kaufman, J., & 3M Company. (2013). *The first 20 hours: How to learn anything ... fast*. New York: Portfolio/Penguin. <http://mcgill.worldcat.org/oclc/856983589>

Books & Articles

- [How to become a good lab manager](#) (ASBMB)
- [Learn by Doing: The 8 Best Interactive Coding Websites](#) (Coderbyte)
- [Journal of Technology and Teacher Education](#): peer-reviewed articles about the use of technology in education.
- Barker, K. (2002). *At the helm: A laboratory navigator*. Cold Spring Harbor, N.Y: Cold Spring Harbor Laboratory Press. <http://mcgill.worldcat.org/oclc/47849507>
- Cohen, C. M., & Cohen, S. L. (2005). *Lab dynamics: Management skills for scientists*. Cold Spring Harbor, N.Y: Cold Spring Harbor Laboratory Press. <http://mcgill.worldcat.org/oclc/57366543>

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- ³ [The Effect and Importance of Technology in the Research Process. Cuff, E. \(2014\).](#)
- ⁴ [What is Web 2.0? Ideas, technologies and implications for education. Anderson, P. \(2007\).](#)
- ⁵ [Defining Twenty-First Century Skills. Binkley, M. \(2011\).](#)
- ⁶ [Role of Conceptual Knowledge in Mathematical Procedural Learning. Byrnes, J. P. \(1991\).](#)
- ⁷ [Professional Development: Shaping Effective Programs for STEM Graduate Students. Denecke, D. \(2017\).](#)
- ⁸ [Big data: The next frontier for innovation, competition, and productivity. Manyika, J. \(2011\).](#)
- ⁹ [Make a data management plan. McGill Library.](#)
- ¹⁰ [Defining Twenty-First Century Skills. Binkley, M. \(2011\).](#)
- ¹¹ [Make a data management plan. McGill Library.](#)
- ¹² [Defining Twenty-First Century Skills. Binkley, M. \(2011\).](#)
- ¹³ [Professional Development: Shaping Effective Programs for STEM Graduate Students. Denecke, D. \(2017\).](#)
- ¹⁴ [Emerging Trends in Psychology: Tech Dependency. Hussung, T. \(2015\).](#)