

## Integrating Digital Technologies by Promoting Digital Competency Development Among University Students

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This article features results from a research project aimed at analyzing, according to the educational intervention model, pedagogical practices used for integrating digital technologies likely to support digital competency development among university students.

For further details, please consult: Lemieux, M.-M. (2020). [Apport du manuel numérique intégré à une intervention éducative sur le développement de compétences numériques d'étudiants universitaires.](#) [Doctoral dissertation, Université du Québec à Trois-Rivières].

## Background

### From Digital Technology Use to Digital Competency Development

The integration of digital technologies into teaching and learning practices has been a challenge for the education system in recent decades. As early as in 2000, the Conseil supérieur de l'éducation (CSE) pointed out that the Québec education system was witnessing a technological revolution that would directly affect teaching methods and learning tools (CSE, 2000). Twenty years later, the reflection has now transitioned to the responsibility of the education system toward competency development to evolve in the digital world (CSE, 2020).

The sound integration of digital technology into teaching and learning practices thereby leads to digital competency development for both teachers and learners. Going beyond the sole use of digital technologies, their integration into a pedagogical context requires a constant updating of knowledge and of multiple competencies. Supporting digital competency development is now targeted as a new responsibility for educational institutions, including at the university level (CSE, 2020). Identified as essential for promoting social and professional integration (Ng, 2012; Roy, Gareau & Poellhuber, 2018), these competencies are unevenly distributed among students, which may lead to digital inequalities (Collin, Guichon & Ntébutsé, 2015) that can have an impact on equity of access to university studies and success.

## Key Concept

### **Digital Competencies: Beyond the Use of Digital Technologies**

There is still a conceptual vagueness in the scientific literature to define digital competencies. However, according to the various reference frameworks consulted in the course of our work (Lemieux, 2020), we have noted the marked presence of the following categories of competencies:

- Mastery of digital technologies;
- Information literacy;
- Competencies related to the social dimension of digital technology (communication and collaboration).

Mastery of technologies, while not always an essential condition, is considered in synergy with the other competencies.

Beyond these three categories, and in order to cover all possible digital technology uses, we have identified other categories in line with the contexts and objectives underlined by the people who have worked on the reference frameworks consulted. Examples include media competencies, productive competencies related to creativity or content creation and problem solving, competencies related to safety, identity and well-being, or professional life.

# Methodology

## Anticipating the Future in Order to Foster Better Actions and Assess the Contribution of Digital Technologies in Students' Digital Competency Development

🔍 Type of research: Qualitative–interpretive exploratory

👤 Study population: 150 undergraduate students and their professor

📍 Place and period of research: Fall 2018 semester at a Québec university

Built according to an adaptation of the educational intervention model (Lenoir, 2009), our case study allowed us to look into the pedagogical activities used for integrating a digital textbook in the curriculum and its contribution to the development of learners' digital competencies. The perceptions of the individuals involved in the pedagogical relationship (learners and their teacher) as well as the researcher's observations were collected throughout the semester.

The digital textbook was defined as a didactic work, i.e. which included the content to be acquired/taught, the objectives, the pedagogical methods and means to be used as well as possible evaluations. It was edited and distributed digitally, and intended for use on screen (Université du Québec, 2013).

The data collection methods used were associated with the pre-active, interactive and post-active phases of educational intervention in order to collect provoked (student questionnaires), elicited (semi-structured interviews and student focus groups) and invoked (observations) data. The complementarity and repetition involved in data collection made it possible to ensure data triangulation.

**Table 1.**  
**Data Collection Methods Associated with the Three Phases of Educational Intervention, Used to Solicit Learners and their Professor with Regard to Anticipated, Effective and Reflective Practices**

	<b>Pre-active phase</b> <i>Anticipated practices</i>	<b>Interactive phase</b> <i>Effective practices</i>	<b>Post-active phase</b> <i>Reflective practices</i>
	Inherent in preparation and planning of teaching	Implemented in support of teaching and learning, while integrating digital technologies	Based on the professor’s and students’ perceptions of the contribution of digital technologies in digital competency development
<b>Data collection methods</b>		<b>Situational observation</b> During each session of the semester <i>Invoked data</i>	<b>Student focus groups</b> At the end of the semester <i>Elicited data</i>
		<b>Questionnaires sent to students</b> During each session <i>Provoked data</i>	
	<b>Semi-structured interviews with the professor</b> Preliminary interview before the semester + before and after each session <i>Elicited data</i>		

Triangulation ensured by:

- 1- Complementarity and repetition involved in data collection
- 2- Diversity of the individuals involved

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# Results

## Mobilization of Digital Competencies that Goes Beyond Expectations

The three-phase methodology allowed us to take an evolutionary look at the perceptions of the individuals (learners and their professor) who made use of the technologies and the contribution of the latter with respect to students' digital competency development.

1

An initial overestimation of students' digital competencies prevailed at the beginning of the semester.

Whether on the part of the professor or learners, there was an overestimation of students' digital competencies at the beginning of the semester. This overestimation was noted by the professor and identified in the discourse of learners and their professor. This, from the outset, hindered the creation of conditions conducive to the use of digital technologies for learning purposes. However, over the course of the sessions, the perception of those involved with regard to the mobilization of certain competencies through the use of digital technologies evolved.



2

Students experienced difficulties using the digital textbook.

The evolution of the professor’s perceptions is based in particular on the difficulties encountered by students in their learning. Inspired by the work of Araújo-Oliveira (2012), these can be classified into three types of difficulties.

Table 2.  
**Three Types of Difficulties Encountered by Students in their Learning Using the Digital Textbook**

<b>Pedagogical Difficulties</b>	<ul style="list-style-type: none"> <li>• Lack of familiarity with the digital textbook and its features</li> <li>• Lack of competencies with digital technologies</li> <li>• Lack of adaptation with respect to learning strategies</li> </ul>
<b>Didactic Difficulties</b>	<ul style="list-style-type: none"> <li>• Constraints in navigating the digital textbook</li> <li>• Complexity of the digital environment due to the multiple digital technologies used</li> </ul>
<b>Organizational Challenges</b>	<ul style="list-style-type: none"> <li>• Poor Internet connection quality</li> <li>• Limitations imposed by the device or reading software used</li> </ul>

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In order to overcome some of the difficulties associated with the use of digital technology, as well as to foster learning, it was necessary to mobilize certain digital competencies.

## 3

The mobilization of digital competencies was influenced by context.

Over the course of the data collection process, a progression in perceptions, but also discrepancies, were identified with regard to the contribution of digital technologies in students' digital competency development. In the course of using the digital textbook, both the professor and the students came to identify that this technology had contributed to the development of certain competencies. For student respondents, these competencies included:

- The functional sphere, i.e. the mastery of digital technologies: understanding computers, coding or information processing, etc. (94%);
- Pedagogical development: the adoption and development of new ways of learning, etc. (87%).

On the other end of the spectrum, the least mobilized competencies according to student respondents were:

- Communicating effectively with others (49%);
- Participating in and facilitating communication on social networks as well as building social networks (32%).

These data are consistent with what the professor reported during the interviews.

# What Can we Learn from our Results?

## The Analysis of the Pedagogical Practices Surrounding the Use of Digital Technologies Fosters Students' Digital Competency Development



Adapting the educational intervention model makes it possible to integrate digital technologies wisely while supporting digital competency development.

The study leads us to consider the integration of any digital technology as a dynamic pedagogical process. To support this integration and the contribution to digital competency development, the adaptation of the educational intervention model is a relevant methodology that can be used to provide answers to the questions below.

- What – Which definition for which digital competencies targeted?
- Who – Who is responsible for digital competency development and what are their roles in supporting it?
- How – What practices and conditions are likely to promote their development? (Lemieux, 2023)

The application of this methodology:

- provides for further analysis when planning teaching–learning situations, their effective implementation as well as the justification of the pedagogical practices adopted as to their contribution to university students' digital competency development.

- allows considering digital competencies in their own context, in order to target:
  - ◇ the reasons to take an interest in their development;
  - ◇ content elements to be taught to students, to support their development;
  - ◇ the considerations involved in the spatiotemporal and social context of the course in question;
  - ◇ the conditions to be implemented to promote the pedagogical integration of digital technologies.

## 2

Creating multiple conditions to remove barriers to digital competency development is paramount.

In order to limit the digital inequalities that may be created by the integration of digital technologies, and thus promote digital competency development, it is suggested to implement certain conditions in pedagogical practices to support teaching and learning with digital technologies. Drawing on the work of Depover and Strebelle (1997), possible support can be classified according to the three categories of conditions below.

Table 3.  
**Conditions to Implement in Pedagogical Practices to Support Teaching and Learning with Digital Technologies**

Technical Conditions	Methodological Conditions	Relational Conditions
<ul style="list-style-type: none"> <li>• Support to promote the use of technologies by students</li> </ul> <p>Example: troubleshooting or competency upgrades, support resources</p> <ul style="list-style-type: none"> <li>• Infrastructure available to enable the use of technologies</li> </ul> <p>Example: availability of electrical outlets, Wi-Fi</p>	<ul style="list-style-type: none"> <li>• Support for the integration of digital technologies into learning</li> </ul> <p>Example: explanation and modelling for the use of the features of the technologies used</p>	<ul style="list-style-type: none"> <li>• Promote openness to change in the face of digital technology</li> <li>• Foster the motivation and engagement of learners</li> </ul> <p>Example: take the time to validate the technological requirements to reassure students</p>

Source: Lemieux, M.-M. (2020). *Apport du manuel numérique intégré à une intervention éducative sur le développement de compétences numériques d'étudiants universitaires*. [Doctoral dissertation, Université du Québec à Trois-Rivières].

## Courses of Action

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### For teachers

- ✓ Anticipate students' digital competency development as early as the preparation and planning of teaching.
- ✓ Remove barriers to digital competency development by implementing appropriate and context-specific technical, methodological and relational conditions.
- ✓ Think about the integration of digital technologies in an aligned and authentic way when planning courses.

### At the institutional level

- ✓ Aim for an institutional approach to progressive and sustainable digital competency development in curricula and courses.

## Lines of Research

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- ✓ Replicate and adapt the methodology applied in this research to other similar experiments on digital competency development, in various fields of study, using different digital technologies.
- ✓ Test, as part of similar research, the Digital Competency Framework proposed by the ministère de l'Éducation et de l'Enseignement supérieur (MEES) in 2019 to help shed light on the profile expected of university students in the Digital Competency Development Continuum, also proposed by the MEES.

## For Further Reading

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## Biographical Note

**Marie-Michèle Lemieux** is a graduate of the Université du Québec à Rimouski with a bachelor's degree and a master's degree in education. She also holds a doctorate in education from the Université du Québec à Trois-Rivières (UQTR), which she received in 2020. From the very beginning of her career in education, she has been interested in the pedagogical integration of digital technology. In addition to her position as a research professional in university pedagogy at the head office of the Université du Québec, which she has held since 2010, she sat on the executive committee of the Communauté pour l'Innovation et la Recherche sur les Technologies dans l'enseignement/Apprentissage (CIRTA) and participated in the work of the Comité du rapport sur l'état et les besoins de l'éducation (2020) of the Conseil supérieur de l'éducation. Since 2021, she has had the pleasure of sharing her acquired knowledge and competencies with future teachers by acting as a lecturer, for the UQTR, on the pedagogical use of digital technology. In 2023, she joined the Observatoire sur la réussite en enseignement supérieur as content editor.



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