Supporting digital competency development for vocational education student teachers in distance education

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Introduction: In Quebec, aspiring vocational education teachers must enroll in a bachelor's degree program in vocational education. At the Université du Québec à Rimouski, the Bachelor of Vocational Education (BVE) program is offered remotely and asynchronously in a digital learning environment. This project explores what digital competency resources are available to BVE students and the characteristics of the resources that students know, use and deem satisfactory.

Methods: This quantitative descriptive study was carried out in two phases. In the first phases, interviews and a literature search were used to identify the resources, which we analyzed according to the Analytical Framework of Resources Supporting Digital Competency Development and the Digital Competency Framework. In the second phase, 137 students evaluated 36 identified resources through a questionnaire.

Results: The findings reveal that the resources are not widely known, and even when known, they are infrequently used. However, when used, they are generally deemed satisfactory. Notably, resources are more frequently used when required for assessment in the introductory BVE course. Additionally, workshops are rated more satisfactory than videos.

Discussion: The results underscore the need for program instructors to actively promote these resources and suggest that further research is needed to better understand student needs.

KEYWORDS

digital competency, vocational education, inter-level transitions, distance education, student teachers

1 Introduction

Quebec, a French-speaking province of Canada, is home to around 150 different vocational training programs in some 20 training sectors. Within their discipline, vocational training teachers must engage in professional development to stay on top of the constant changes in the professional environments where their students will practice their trades. Pedagogically, these teachers are often underprepared: more than 80% of them are already teaching at a vocational education training centre at the point when they begin their academic training in teaching (Deschenaux et al., 2012). In terms of technology, the COVID-19 pandemic increased the need for vocational teachers to develop their techno-pedagogical skills, as many of them were faced with the need to teach remotely (Coulombe et al., 2020).

Meanwhile, Quebec has been implementing a digital action plan (Ministère de l'Éducation et de l'Enseignement supérieur, 2018) and developing a digital competency framework, in which digital competency is defined as "a set of skills necessary to the confident, critical and

creative use of digital technologies to achieve objectives with regard to learning, work, leisure, and inclusion or participation in society" (Ministère de l'Éducation et de l'Enseignement supérieur, 2019, p. 7). This framework was integrated into the most recent reference framework for professional competencies for teachers (Ministère de l'Éducation, 2020), which includes 13 competencies. The "Mobilize digital technologies" competency, made up of 12 dimensions, aims to "use digital technologies in order to benefit students and all education stakeholders" (p. 78). More specifically, it requires teachers to master digital tools and take a critical stance about the use of these tools. Teachers must therefore develop their technological discernment, meaning the ability to regulate their thinking when making decisions to ensure that technological needs are met (Albion et al., 2015). The number of dimensions of digital competency reflects the diversity of teachers' techno-pedagogical development needs. However, there has been very little research on digital competency in vocational education and training (Cattaneo et al., 2022). Existing studies have either overlooked the fundamental role of vocational education teachers as digital citizens or have downplayed the importance of digital competence as a crucial teaching competency for vocational education teachers in the information age (Diao and Yang, 2021). Our aim is to help improve the situation by focusing on vocational education student teachers.

In this article, we will look at the resources supporting the development of digital competency that are made available to Bachelor of Vocational Education (BVE) students. These resources are tools that students use or can use. After contextualizing the study and defining the question, we will address digital competency and outline the research methodology. Finally, we will present and discuss our findings regarding both research questions.

2 Research context and question

The context in which the study took place involves two aspects: on the one hand, the need for students to develop their digital competency, and on the other, the situation of transition to university studies that they are experiencing concomitantly. This particular context calls for answers to two research questions, presented at the end of this section.

2.1 Digital competency development

Upon signing their first teaching contract, vocational training teachers in Quebec are required to enroll in a 120-credit academic training program in vocational education, which is equivalent to a four-year full-time program. At the Université du Québec à Rimouski (UQAR), the program has been offered remotely and asynchronously since it began in 2003. UQAR's decision to use remote training was based on recommendations from the Comité d'orientation de la formation du personnel enseignant (COFPE), which encouraged universities to opt for flexible models tailored to the needs of vocational education student teachers (Comité d'orientation de la formation du personnel enseignant, 1998). Distance education also makes allowances for the vast service area involved. Because students enrolled in the program also teach at training centres, it would be virtually impossible for them to travel to attend classes at a campus

located several hours from their workplace. A digital learning environment (Moodle) is used to provide access to learning and evaluation resources and activities. Knowledge of digital tools is therefore a prerequisite for learning. However, it is clear that students' digital skills vary according to their background and experience with technology (Université du Québec, 2020; Vincent et al., 2019). This is also the case for practising teachers, who say that they need training on topics including remote or online teaching, hybrid teaching and, more broadly, the use of technology (Gagné et al., 2021).

Since attitude toward technology and digital tool use frequency both play decisive roles in developing vocational training teachers' digital competency (Cattaneo et al., 2022), it seems essential to work to improve these factors right at the start of vocational education training. Curriculum support is the context-related factor with the largest effect on the development of digital competency (Cattaneo et al., 2022), which speaks to the growing importance of supporting students in developing digital competency so they can learn in a transition situation (Bachy, 2021; De Clercq et al., 2022). However, we need to take a closer look at the resources available to students and, above all, how they use them (Dupéré et al., 2019; Racette et al., 2013).

2.2 A transition situation

The development of students' digital competency occurs in a double transition situation that already has its share of challenges (Balleux, 2006). When they begin their BVE program, students are experiencing a unique type of transition to higher education, since they are transitioning from their identity as an expert tradesperson to that of a novice teacher (Balleux, 2006). They are playing a dual role as teacher and student, with a prolonged transition to higher education as they are studying part-time. They may have spent many years in the workforce since they were last in school. Furthermore, many BVE students have never studied at the college level (in Quebec, the level of education between secondary school and university). As a result, their transition to post-secondary education is unlike the two transitions the system has been built around: one from secondary school to college, and the other from college to university (Doray et al., 2022). Accordingly, these students have not had many prior opportunities to familiarize themselves with what it is to be a student, which may hinder their engagement and integration into university studies (Baudier et al., 2022).

Before they begin their university journey, the highest level of education that vocational education student teachers have completed is often the diploma of vocational studies. Academic training, then, is a significant departure from the pragmatism that has characterized their academic path to date (Deschenaux and Roussel, 2010). These students, characterized as action-oriented individuals, often face challenges when producing academic work (Gagnon et al., 2010). They experience their university studies as a demanding, heavily structured process that can take a very long time (Balleux, 2011).

The ways in which these students prepare to transition to higher education is different from how elementary and secondary school teachers do so, since only a minority of vocational training teachers had planned to teach their trade (Balleux, 2011; Deschenaux and Roussel, 2008). Thus, they are placed [Translation] "in the unusual situation of possessing vast knowledge of their trade (Deschenaux and Roussel, 2011), while experiencing a professional transition as a new

teaching hire concurrently with their initial academic training in teaching (Gagné, 2015)" (Deschenaux and Tardif, 2016, p. 237). How these multiple transitions are navigated by the students who experience them is extremely important (Hussey and Smith, 2010). This is why [Translation] "transitioning from trade to teaching is a delicate situation that should not be trivialized" (Balleux, 2013, p. 16).

The remote, asynchronous learning that characterizes UQAR's BVE program creates another issue for students' ability to thrive in transitions (Schreiner, 2010). Creating meaningful relationships in distance education (making friends, connecting with others, establishing a sense of belonging to the university community) is a challenge for those who support students (Deaudelin et al., 2016; Jézégou, 2010).

As quality transitions are known to promote academic success and student persistence (Centre de transfert pour la réussite éducative du Québec, 2018; Conseil supérieur de l'éducation, 2010), it is essential to support students in their transition to higher education, and specifically to support students in the online BVE program in developing digital competency.

In a research project entitled "Transitions réussies vers les études supérieures: un défi interordres" [Successful transitions to higher education: an inter-level challenge], which aims to build a support model for inter-level transitions, a UQAR research team is leading the "Compétence numérique interordres" ["Inter-level digital competency"] project in collaboration with FADIO (Formation à distance interordres – Bas-Saint-Laurent et Gaspésie-Îles-de-la-Madeleine). The project's goal is to identify, evaluate and improve resources promoting digital competency development that were designed to support a successful transition to higher education. This article aims to document this initiative within the BVE program by exploring the following two research questions:

- Q1: What resources to support digital competency development are offered to students in the BVE program at the institution in question?
- Q2: What are the characteristics of the resources that students know, use and deem satisfactory?

3 Digital competency and support developing it

Many definitions of and frameworks for digital competency (or digital competencies) have been developed. For example, Tremblay and Poellhuber (2022) analyzed more than 70 international frameworks dealing with 21st-century digital and information skills. They concluded that [Translation] "the pervasiveness of digital tools in all fields is evident in the importance of these tools in teaching and learning 21st-century skills and information competencies" (p. 12). Spante et al. (2018) conducted a systematic review on the use of the concepts of digital competency and digital literacy with a corpus of more than 100 publications between 1997 and 2017. They concluded that digital competency is "an essential skill for today's teachers, since they have to manage several aspects from the subject being taught to pedagogical tools."

The European Commission (2019) states that "digital competency involves the confident, critical and responsible use of digital

technologies for learning, at work and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation, safety, intellectual-property-related questions, problem solving and critical thinking." UNESCO (2018) offers an ICT competency framework for teachers that covers knowledge acquisition, knowledge deepening and knowledge creation.

In Quebec, the Digital Competency Framework (Ministère de l'Éducation et de l'Enseignement supérieur, 2019) was developed in the wake of the Digital Action Plan's implementation (Ministère de l'Éducation et de l'Enseignement supérieur, 2018). The creation of this framework was based on the review and analysis of over 100 reference documents from several countries (Ministère de l'Éducation et de l'Enseignement supérieur, 2018).

Digital competency is "the ability to find, organize, understand, evaluate, create and disseminate information using digital technology" (Ministère de l'Éducation et de l'Enseignement supérieur, 2019, p. 28). It is expressed in 12 interrelated dimensions that may come into play simultaneously:

1. Exercising ethical citizenship in the digital age
2. Developing and mobilizing technological skills
3. Harnessing the potential of digital resources for learning
4. Developing and mobilizing information literacy
5. Collaborating via digital technology
6. Communicating via digital technology
7. Producing content via digital technology
8. Using digital tools to foster inclusion and address diverse needs
9. Mobilizing digital technology for personal and professional empowerment
10. Solving diverse problems via digital technology
11. Developing critical thinking with regard to the use of digital technology
12. Adopting an innovative and creative approach to the use of digital technology

The Digital Competency Framework was used to study the support resources offered to students, in particular because the complete framework is included in the professional competencies expected from Quebec teachers. This means that it is among the competencies that these teachers must develop during their vocational teacher training in university.

The work requirements in vocational professions and the teaching of these professions are evolving, as evidenced by the modernization of vocational training in Quebec (Ministère de l'Éducation, 2023). The inevitable consequences for teachers' work and training needs are significant, as highlighted by UNESCO-UNEVOC (Yang and Wu, 2024). In this context, pre-service vocational teachers should develop digital competencies that extend beyond their subject area and encompass multidisciplinary skills (Ifenthaler, 2018; OECD, 2019, 2021; Roll and Ifenthaler, 2020, 2021; Subrahmanyam, 2020). This underscores the relevance of the Digital Competency Framework for vocational education student teachers, as it is designed to be multidisciplinary, with dimensions and elements not tied to a specific subject (Ministère de l'Éducation et de l'Enseignement supérieur, 2019).

Supporting digital competency development requires resources to be made available. These resources can be categorized using the

analytical framework suggested by De Clercq et al. (2022), adapted from Dony et al. (2015). This framework evaluates the parameters of various practices supporting success and [Translation] "has many advantages for accurately determining the expected effects, the audience most likely to discuss these effects, the best measures for identifying the effects and the right time to conduct evaluations" (De Clercq et al., 2022).

4 Methodology

To answer the research questions, we conducted a quantitative descriptive study, a research design that "uses numerical data to describe and interpret events, conditions, or situations that are occurring in the present" (Picciano, 2004, p. 52). The research was conducted in two stages. The first stage, resource identification, aimed to answer the first research question: What resources to support digital competency development are offered to students in the BVE program at UQAR? The second stage, students' evaluation of resources, aimed to answer the second research question: What are the characteristics of the resources that students know, use and deem satisfactory?

4.1 Stage 1: resource identification

This first stage took place in May and June 2022. Data were collected during discussions (videoconferences and emails) with professors and lecturers in the program, a program advisor for the BVE program, the head of the centre for university pedagogy, an advisor at the Centre d'aide à la réussite (CAR, the student success centre), a librarian and the person in charge of the educational software library. All initiatives supporting digital competency development were compiled, and documentary information retrieval completed this first stage of data collection. Documents used included: program course frameworks; the course outline template; the training program; the University's strategic plan; the UQAR, CAR, library and educational software library websites; the CAR's Moodle sites; and various University policies. We identified the measures available at either or both campuses attended by undergraduate students (Rimouski and Lévis).

The initial analysis identified resources for evaluation in the second stage. We selected stable resources—in other words, resources that did not depend on a particular individual. For example, teachers' individual initiatives within a course were not selected. A second analysis characterized the selected resources using the framework from De Clercq et al. (2022). The framework was adapted to the context of supporting digital competency development in a remote, asynchronous training program at a Quebec university, as Table 1 shows.

4.2 Stage 2: students' evaluation of the resources

In the second stage of the study, students evaluated the resources identified in the first stage. This second stage answers the second research question: What are the characteristics of the resources that students know, use and deem satisfactory?

4.2.1 Data collection technique and instrument

In order to identify the characteristics of the resources that students know, use and deem satisfactory, an online questionnaire was selected as the data collection tool because it was a low-cost way to reach a large number of participants and give them the flexibility to choose when and where they respond (Lachance et al., 2020). As no validated questionnaire met the needs of the study, a questionnaire was specifically designed for this study by a research team. Five researchers and one research coordinator worked together to design the questionnaire, which was made up of socio-demographic questions (including questions about students' profiles and their academic career) and questions about the current resources (including one question per resource identified in stage 1). For each resource, the students had to select which one of the following options best matched their experience:

A. I'm not familiar with this resource.
B. I'm familiar with it but have not used it.
C. I've used it and I'm very dissatisfied.
D. I've used it and I'm dissatisfied.
E. I've used it and I'm satisfied.
F. I've used it and I'm very satisfied.

TABLE 1 Analytical framework of resources supporting digital competency development, adapted from the descriptive framework of practices supporting success (De Clercq et al., 2022).

Questions	Categories	Options
What?	Form	Workshops, videos, web documents (webpages or PDF documents with text, images and hyperlinks), personalized support
	Purpose	The 12 dimensions of digital competency
	Function	Prevention or remediation
When?	Timing	Asynchronous or synchronous
	Part of the schedule	Yes or no
	Part of the course program	Yes or no (yes indicating that the resource is integrated into the introductory course of the BVE program)
How?	Attendance requirement	Yes or no (yes indicating that this resource is needed to complete an assessment in the introductory course of the BVE program)
	Mode	In person or remote
	Staff member	Advisors from the library, the Centre d'aide à la réussite or the BVE program
	Format	Individual or in a group

Four versions of the questionnaire were made, as it was administered in four different environments. The results presented in this article are those collected in one of the settings, for students in the BVE program. The questionnaire was integrated into Lime Survey, hosted on the secure server of the Research Centre on Academic Success (CRIRES), and then submitted to a professor of vocational education teachers' training, a lecturer, one graduate student and two actual students from the BVE to confirm that the questions were clearly worded. The French version of the questionnaire is available on request. Data collection took place between November 2022 and March 2023.

4.2.2 Population and sample

The population of the study was comprised of all active students enrolled since 2016, the year that the program was updated. The inclusion criterion was that people had to be registered with the BVE (part-time or full-time) at the time of completing the questionnaire. No exclusion criteria were used. The population consisted of 1,426 students, 56.5% women and 43.5% men, and was divided into the following age groups: 9.3% in their 20s, 37.2% in their 30s, 39.0% in their 40s, 13.0% in their 50s and 1.5% in their 60s. Most of them (70.4%) were enrolled at the main campus in Rimouski, and the rest were enrolled at the Lévis secondary campus.

After ethics approval was received, students were invited to participate in the study. UQAR's registrar sent an email to the students targeted by the study, and a video explaining the research was produced and shared in the students' digital environment. Free, informed and ongoing consent was asked at the start of the questionnaire, after information on participation had been provided. Of the 180 students who started answering the questionnaire, 137 completed it; 73.0% of these students were enrolled at the Rimouski campus and 27.0% at the Lévis campus. A majority of respondents (57.7%) were women. Respondents were divided into the following age groups: 8.0% in their 20s, 27.0% in their 30s, 49.6% in their 40s, 13.9% in their 50s and 1.5% in their 60s.

4.2.3 Data analysis

Given the number of participants (9.6% of the student population), the data were weighted using post-stratification to present the findings of questions 2 and 3. Post-stratification improves the accuracy of the results by reducing bias (Little, 1993). To increase the consistency between estimates resulting from the sample's responses to the questionnaire and the demographic data of the population, the responses were adjusted to match the population distribution. Three variables were used: campus, gender and age group. The corrected weights associated with the responses have here been used to present the findings.

For each identified resource, the percentage of each possible option (answers A through F in the data collection section) was calculated. For a resource to be considered "known," at least 50% of the responses had to be from options B through F. For a resource to be considered "used," at least 50% of the responses had to be from the remaining responses from options C through F (that is, excluding the "I'm not familiar with this resource" response). For a resource to be considered "satisfactory," at least 50% of the responses had to be from options E and F (excluding the "I'm not familiar with this resource" and "I'm familiar with it but have not used it" responses).

The final step was to cross-reference these data on resource knowledge, use and satisfaction with the characteristics of these resources according to Analytical Framework of Resources Supporting Digital Competency Development (De Clercq et al., 2022). For each of the framework's categories, we compared the number of resources known and unknown, then used and not used, and finally, judged satisfactory or not.

An individual with the necessary statistics expertise performed the external validation of the analyses.

5 Findings

This section describes the respondents and answers both research questions: the resources identified (Q1) and the characteristics of the resources that students know, use and deem satisfactory (Q2).

5.1 Description of respondents

Among the 137 students who completed the questionnaire, 17 self-identified as having learning difficulties. Of this group, 11 had been diagnosed with disorders such as attention-deficit disorder or attention-deficit/hyperactivity disorder, dyslexia, dysorthographia or anxiety. In addition, 56.2% of respondents were first-generation students—in other words, none of their parents had attended college or university. Three quarters of the students (74.5%) had dependent children (on average, two). French was the first language of all but four respondents.

Academically speaking, 94.2% of respondents were enrolled part time, and 45.3% were in their first year of university. The Bachelor of Vocational Education is a program that may take part-time students up to 10 years to complete. For most respondents (62.0%), their highest completed level of education before starting their current university program was the diploma of vocational studies, and 27.0% had completed a diploma of college studies. The other respondents had completed an undergraduate or graduate university degree. Finally, students said that on average, they dedicated around 10 h per week to their studies and nearly 40 h per week to their job.

5.2 Identified resources (Q1)

A literature search combined with discussions with university staff identified 36 resources that support digital competency development. These resources included, for example, the library web page about avoiding plagiarism and citing sources, videos and methods for using different tools, copyright-free resource banks, personalized support guides from library and CAR advisors.

The resources were analyzed according to the three questions and 10 categories of De Clercq et al. (2022) framework. The three "what?" parameters examine the resource's form, purpose and function. In form, half of the resources were web documents. The others included nine videos, six workshops and three types of personalized support. Each resource's purpose was assessed for alignment with the digital competency dimensions. We found that a third of all resources

targeted Dimension 2 (developing and mobilizing technological skills). As Table 2 breakdown of resources by dimension shows, the resources available to students targeted only 5 of the 12 dimensions. It should be noted that resources were categorized according to their primary dimension.

Dimension 1 resources covered ways to prevent plagiarism, best practices for citing sources and ethical use of images and videos. Resources relating to Dimension 2 addressed developing skills in applications like Word, Excel, PowerPoint and Antidote. Dimension 3 resources included a handbook on remote learning and procedures sent by program advisors. As for Dimension 4 (developing and mobilizing information literacy), the identified resources discussed how to use databases for research and how to evaluate sources. All of the Dimension 7 resources addressed how to present written work. A review of the resources' functions showed that all resources were preventive. None were remedial.

Analysis of resources using the "when?" question showed that 28 resources were asynchronous and eight were synchronous. None of the resources were part of students' schedules. However, 11 resources were part of the course program and provided in the three-credit introductory course for the bachelor's degree program in vocational education.

For the last question in the framework (the "how?"), four elements were studied: mode, staff member, requirement and format. All resources were offered remotely, which is consistent with the remote nature of the students' program. Two-thirds (24) of the resources involved a CAR staff member, while nine resources involved a library staff member. Just one resource fell under the aegis of the BVE program. As for the requirement element, only seven of the 36 resources could be considered required as they are used for assessment in the introductory course for the BVE program. Lastly, only five resources are available in a group setting (the five synchronous CAR workshops); the other 31 resources are offered to individuals.

5.3 Characteristics of resources that students know, use and deem satisfactory (Q2)

In total, more than 4,200 student resource evaluations were reviewed to identify which resources are known, used and deemed satisfactory.

5.3.1 Knowledge of resources

A review of the resource evaluations showed that 54.7% of students responded, "I'm not familiar with this resource." This means that only 45.3% of responses were from students familiar with the resource under evaluation. The least-known resource was the CAR video series about designing posters and flyers in Publisher (familiar to 20.0% of students) while the best-known resource was the library webpage explaining how to avoid plagiarism and cite your sources (familiar to 87.3% of respondents).

The aim of this section is to identify the characteristics of known and unknown resources. To qualify as "known," resources had to score lower than 50% for "I'm not familiar with this resource." There were 13 resources that met this criterion. It should be noted that the following parameters were omitted from this analysis: function (always preventive), mode (always remote), and whether the program was part of the schedule (never).

Table 3 shows the number of known and unknown resources according to each category option. Asterisks identify cases where resources are more often known than unknown. For the "what?" question, resources in the form of web documents or personalized support were better known, whereas students were aware of only one workshop and no videos. Regarding purpose, resources related to Dimension 1 were clearly the best known, while resources related to dimensions 2, 3 and 4 were less widely known. A review of the "when?" question shows that the majority of resources were unknown, regardless of their timing or presentation in the introductory course (part of the course program). For the "how?" question, meanwhile, whether the resource was known was not impacted by the staff member involved. A majority of resources that had been made a requirement were known, while non-required resources were less likely to be known. Regardless of format, however, most resources were unknown.

5.3.2 Use of resources

We removed responses of "I'm not familiar with this resource" from our analysis of resource use, leaving a total of 1,911 responses remaining. These responses can be split into two categories: the student had not used the resource (answer B) or the student had used the resource and rated their satisfaction (answers C through F). Students had used 52.9% of known resources, ranging from 3.1% for the least well-known (a CAR video about recording videos in Zoom) to 91.8% (the CAR work presentation handbook).

Characteristics were again identified for used and unused resources (Table 4). To qualify as "used," a resource had to score lower than 50% for "I'm familiar with it but have not used it." There were 14 resources that met this criterion.

It should be noted that three resources that were identified as "known" in the previous section did not make it to the list of 14 resources used by students familiar with them (web documents on plagiarism and personalized support for plagiarism and the office

TABLE 2 Number of resources by digital competency dimension.

Competency dimension	N
1. Exercising ethical citizenship in the digital age	11
2. Developing and mobilizing technological skills	13
3. Harnessing the potential of digital resources for learning	4
4. Developing and mobilizing information literacy	4
5. Collaborating via digital technology	0
6. Communicating via digital technology	0
7. Producing content via digital technology	4
8. Using digital tools to foster inclusion and address diverse needs	0
9. Mobilizing digital technology for personal and professional empowerment	0
10. Solving diverse problems via digital technology	0
11. Developing critical thinking with regard to the use of digital technology	0
12. Adopting an innovative and creative approach to the use of digital technology	0
Total	36

TABLE 3 Resources known or unknown to students, categorized using the analytical framework of resources supporting digital competency development.

Categories		Number of resources		
		Known	Unknown	Total
What?	**Form**			
	Personalized support*	2	1	3
	Videos	0	9	9
	Web documents*	10	8	18
	Workshops	1	5	6
	Purpose			
	Exercising ethical citizenship in the digital age*	9	2	11
	Developing and mobilizing technological skills	1	12	13
	Harnessing the potential of digital resources for learning	1	3	4
	Developing and mobilizing information literacy	0	4	4
	Producing content via digital technology	2	2	4
When?	**Timing**			
	Asynchronous	11	17	28
	Synchronous	2	6	8
	Part of the course program (presented in 1st BVE course)			
	No	8	17	25
	Yes	5	6	11
How?	**Requirement (part of an assessment in 1st BVE course)**			
	No	8	21	29
	Yes*	5	2	7
	Staff member			
	BVE program advisor*	1	0	1
	CAR advisor	10	16	26
	Library advisor	2	7	9
	Format			
	Group	0	5	5
	Individual	13	18	31

*Identify cases where resources are more often known than unknown.

suite). Conversely, four resources that were not classified as "known" were used by at least 50% of the students who were familiar with them (a remote learning handbook, a guide to presenting written work, a summary of presentation rules and five videos on remote learning).

Table 4 shows that students primarily used resources in the form of web documents, whereas resources in other forms largely went unused. Resources were also more likely to be used if they fell under Dimensions 1, 3, or 7; none of the resources related to Dimensions 2 or 4 were used. Students used half of the asynchronous resources and appeared to use no synchronous resources.

The majority of resources presented in the introductory course were used, while resources that are not presented were not used. All resources that are required (necessary for an assessment in the introductory BVE course) were used.

Resources involving library and CAR staff members were mostly unused. The only resource offered by the program advisors is used, but the majority of all other resources went unused. Lastly, as with the knowledge of a resource criterion, most resources were unused no matter their format.

5.3.3 Satisfaction with resources

This section looks at responses about satisfaction (answers C through F). Of the 1,008 responses, 87.5% were from satisfied or very satisfied students. Table 5 shows the distribution of responses.

It is important to note that for some resources, specifically lesser-known and lesser-used resources, there were few responses about satisfaction. For this reason, we should examine in more detail the 14 resources in use presented above. The average satisfaction rate across all resources (88.3%) was comparable to the average satisfaction rate for each of the 14 resources, ranging from 73.4% (CAR webpage with links and text about preventing plagiarism) to 93.0% (CAR guide to presenting work).

The following resources received the highest satisfaction ratings:

TABLE 4 Resources that students do and do not use, categorized using the analytical framework of resources supporting digital competency development.

Categories		Number of resources		
		Used	Unused	Total
What?	**Form**			
	Personalized support	0	3	3
	Videos	1	8	9
	Web documents*	12	6	18
	Workshops	1	5	6
	Purpose			
	Exercising ethical citizenship in the digital age*	7	4	11
	Developing and mobilizing technological skills	0	13	13
	Harnessing the potential of digital resources for learning*	3	1	4
	Developing and mobilizing information literacy	0	4	4
	Producing content via digital technology*	4	0	4
When?	**Timing**			
	Asynchronous	14	14	28
	Synchronous	0	8	8
	Part of the course program (presented in 1st BVE course)			
	No	6	19	25
	Yes*	8	3	11
How?	**Requirement (part of an assessment in 1st BVE course)**			
	No	7	22	29
	Yes*	7	0	7
	Staff member			
	BVE program advisor*	1	0	1
	CAR advisor	9	17	26
	Library advisor	4	5	9
	Format			
	Group	0	5	5
	Individual	14	17	31

*Identify cases where resources are used more often than not.

TABLE 5 Distribution of satisfaction levels for resources that students know and use.

Satisfaction	Distribution
I've used it and I'm very dissatisfied.	1.9%
I've used it and I'm dissatisfied.	10.7%
I've used it and I'm satisfied.	52.9%
I've used it and I'm very satisfied.	34.5%

- CAR guide to presenting work. This PDF document is presented during the introductory BVE course. Students use the handbook when writing papers.
- CAR web page with links to tools for improving research methods, deciding between quoting and paraphrasing and referencing sources.
- Library web page on APA style, preventing plagiarism and tools for citing sources.

- Three-part CAR plagiarism prevention workshop (covering definitions and observations, skill development, citation techniques). Students enrolled in the introductory course are required to sign up for the workshop, complete it at the start of the session and take a quiz on the material that counts towards the student's final grade.
- CAR PDF document on using images. This document covers the Copyright Act, the right to privacy, examples of references, helpful links for finding images and citing image sources. Intro-level students learn about and are required to apply this information to a paper in which they must include images.

Table 6 shows the percentages of students satisfied with the resources, according to the different parameters. As there are only 14 resources under review, some categories have been removed from the table, in addition to those removed in Tables 3, 4. These include timing (all are asynchronous) and format (all are individual). Some category options were removed as well, as none of the 14 resources used

TABLE 6 Resources deemed satisfactory or unsatisfactory by students, categorized using the analytical framework of resources supporting digital competency development.

Categories		Percentage of students satisfied with the resources
What?	**Form**	
	Videos	83.0%
	Web documents	88.3%
	Workshops	90.4%
	Purpose	
	Exercising ethical citizenship in the digital age	89.0%
	Harnessing the potential of digital resources for learning	85.9%
	Producing content via digital technology	88.4%
When?	**Part of the course program (presented in 1st BVE course)**	
	No	88.0%
	Yes	88.5%
How?	**Requirement (part of an assessment in 1st BVE course)**	
	No	87.6%
	Yes	89.0%
	Staff member	
	BVE program advisor	88.3%
	CAR advisor	88.1%
	Library advisor	88.6%

provided personalized support or related to Dimensions 2 or 4. This table shows little variation in student satisfaction across framework categories, except for a drop in satisfaction between workshops and videos.

6 Discussion

Our findings show that students were most familiar with resources that were provided in the form of web documents, related to digital competency Dimension 1 (exercising ethical citizenship in the digital age) and required for assessment in the introductory BVE course. The resources students used were likewise provided in the form of web documents and related to three digital competency dimensions: exercising ethical citizenship in the digital age (Dimension 1), harnessing the potential of digital resources for learning (Dimension 3) and producing content via digital technology (Dimension 7). These resources were asynchronous and assessed as part of the program. As for student satisfaction, our findings showed no major differences across the descriptive framework categories used (De Clercq et al., 2022), except for a preference in form for workshops (90% satisfaction) over videos (83% satisfaction).

In the weeks following our review, we shared our findings with our resource identification partners, a current student and a graduate

of the program who is now a program consultant at a vocational centre. Our analyses and these discussions enabled several conclusions to emerge, sometimes raising new questions, which will be addressed below.

6.1 Disparities in purpose in the resources identified

There are some disparities regarding which digital competency dimensions were targeted for development by the resources. The first two dimensions alone accounted for two-thirds of the available resources. That is likely related to the fact that the digital competency framework states that these two dimensions "are the central dimensions around which the other dimensions are articulated" (Ministère de l'Éducation et de l'Enseignement supérieur, 2019, p. 9). These two dimensions are extensively documented in the frameworks analyzed by Tremblay and Poellhuber (2022). This is in line with Diao and Yang's (2021) emphasis on digital citizenship as a crucial teaching competency for vocational education teachers in the information age (Diao and Yang, 2021). This is also in line with the OECD (2021), which states that "digital skills is one of the areas where VET teachers report the highest need for further professional development" (p. 141), reinforcing the value of beginning this development as early as initial teacher training.

It should also be noted that 7 of the 12 dimensions are not addressed by any resource. In some cases, it appears that such resources should be provided to students as the dimensions in question are essential to succeeding in university, even more in programs offered remotely and asynchronously in a digital learning environment (e.g., collaborating and communicating via digital technology). Additionally, it is likely that the BVE courses develop some of the dimensions unaddressed by the resources studied. However, it should be noted that several courses are part of the psychoeducational training requirements that students take after several sessions and are targeted towards their future profession in teaching rather than their current role of student. This is critical given that a lack of familiarity with the role of student can hinder integration into university studies (Baudier et al., 2022). Lastly, it is probable that some digital competency dimensions will be further developed later in students' education when there are fewer school-to-work transition challenges. This raises a new question: is it the university's role to offer resources that support the development of all 12 digital competency dimensions?

6.2 Resources are little known to students

More than half of the student were not familiar with the resources. This finding is consistent with postsecondary students' previously documented lack of awareness of support resources (Dupéré et al., 2019). It is worth asking how these resources could be promoted better. Previous studies have shown that pooling resources would enable students to access resources without wasting time compiling all the resources (Deschênes and Laferrière, 2020). This most likely applies to resources that support the development of students' digital competency. Rather than needing to figure out which staff members offer which resources, students could access all resources in one central location. This sound promising, but raises

another question: how should resources be organized to optimize student access?

Our results also showed that when resources are presented in the intro-level course, students appear to be more familiar with them. If that is the case, should all of the resources be presented in this introductory course? We hypothesize that this would overwhelm students, resulting in them forgetting resources, given that university studies can last up to 10 years. That is why it is essential to call upon program instructors to help make these resources known. Presumably, students are more familiar with and more likely to use resources presented by their instructors, whether for assessment (categorized as a requirement in this analysis) or for remedial assistance. Instructor recommendations were not documented in this article, as only permanent resources were evaluated by students. Instructors may in the future be able to formally incorporate digital competency development into educational requirements, which again recalls a proposal from Bachy (2021).

6.3 Resources are little used by students

Only 14 of the 36 resources were known and used by students. This observation aligns with Racette et al. (2013) finding that for students to take advantage of available resources, it is not enough for them to be aware of their existence. The resources must meet the students' needs, and they must also have the motivation and energy to actively seek them out. There are several reasons why students might use resources, such as if they are struggling, have made a mistake, want to learn more, are curious or were recommended the resource by a teacher. This study did not examine these reasons. However, it is worth asking whether these resources meet student needs—or at least, what they perceive to be their needs. Our findings are in line with an approach proposed by Bachy (2021) to encourage student diagnostic assessments so that students can better understand their own needs.

By better understanding student needs, instructors could adapt the format of the resources they offer (individual or group). If it were clear that several students had the same needs, group activities could be offered that make use of the collaborative nature of digital learning environments. This aligns with the approach proposed in Bachy (2021), which suggested [Translation] "supporting digital competency acquisition (digital knowledge) through a variety of group workshops" (p. 31). This would be an opportunity to create presence in e-learning (Jézégou, 2010) and spark engagement in the remote learning setting (Parent and Deschênes, 2021).

Lastly, a better understanding of student needs would make it possible to grow the personalized support practices, defined by De Clercq et al. (2022) as practices that are tailored to fit students' own unique lived experience. This avenue is especially worth pursuing as BVE students have different responsibilities, schedules and needs.

6.4 Limitations

The study has certain limitations, including the sample size and the profile of respondents. The response rate was only 9.6% of the study population. Although we used post-stratification weighting, there remains a possibility of biased results. Additionally, the digital format of the questionnaire may have discouraged participation from students with lower digital competence. Finally, it is impossible to determine whether the same person completed the questionnaire more than once.

6.5 Future work

This study raised new research and practice questions. A research topic worthy of future exploration would be the mastery of digital competence of vocational education student teachers and investigate how the use of support measures enables the development of digital competence. To achieve this, it would be interesting to study student teachers' experiences in greater depth, to better understand their needs, the factors influencing their use or non-use of resources, and the benefits they perceive.

Additionally, this study raised questions about how to produce resources (e.g., form and format), how to organize and pool resources and when best to introduce resources to students. To address these questions, we propose the co-design of a tool for pooling resources based on needs expressed by students, followed by iterative testing and refinement with student input.

What is clear is that further research and interventions are necessary to support the development of digital competence among vocational education student teachers, enabling them to, in turn, cultivate the digital competence in their vocational training students.

7 Conclusion

In this article, our research questions sought to identify resources to support digital competency development offered to students in the Bachelor of Vocational Education program at the institution in question and the characteristics of the resources that students know, use and deem satisfactory.

The resource results are consistent with the timing (asynchronous) and the mode (remote) of the BVE program at UQAR. Synchronous activities may not be compatible with student schedules. More than 90% of students are enrolled part-time, working approximately 40 h each week on average, and three-quarters of students have children to care for. Similarly, students are spread out across Quebec and cannot always attend in-person activities. As in many other educational establishments, during the pandemic, the library and CAR diversified their support services, and more resources were made available remotely, and have maintained them ever since.

Our research concluded that students were not very familiar with the resources available to them and, when they were familiar with them, resources often went unused; however, when students did use resources, they were satisfied with them. It should be noted that the program and practices we studied are currently being updated. In recent months, the program advisors have rolled out new initiatives, including a student support network for tutoring, which was also proposed by Bachy (2021). This initiative can build on the results of the present study to raise awareness of the support resources available to facilitate a successful transition to university studies.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author, MD. The data are not publicly available as they contain information that could compromise the privacy of research participants.

Ethics statement

Author contributions

MD: Writing – original draft, Writing – review & editing. LD: Writing – original draft, Writing – review & editing. SP: Writing – original draft, Writing – review & editing.

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