Fonds de recherche Société et culture Québec

Rapport de recherche

PROGRAMME ACTIONS CONCERTÉES

Les perspectives des étudiants et des professeurs sur l'excellence dans l'utilisation des TIC et du cyberapprentissage au collégial

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Établissement gestionnaire de la subvention

Collège Dawson

Numéro du projet de recherche

2014-RP-179119

Titre de l'Action concertée

Persévérance et réussite scolaires

Partenaires de l'Action concertée

Ministère de l'Éducation et de l'Enseignement supérieur (MEES)
Fonds de recherche du Québec - Société et culture (FRQSC)

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Citation: King, L., Fichten, C.S., Havel, A., Amsel, R. Vaikla-Poldma, T., Lussier, A., Jorgensen, M. et al. (2017). Les perspectives des étudiants et des professeurs sur l'excellence dans l'utilisation des TIC et du cyberapprentissage au collégial. Rapport final présenté au Fonds de recherche du Québec - Société et culture (FRQSC) et au ministère de l'Éducation et de l'Enseignement supérieur (MEES). Montréal, Québec : Réseau de Recherche Adaptech.

COMPLETE SCIENTIFIC REPORT (RAPPORT SCIENTIFIQUE INTÉGRAL)

Les perspectives des étudiants et des professeurs sur l'excellence dans l'utilisation des TIC et du cyberapprentissage au collégial

Part A – Research Context (Contexte de la recherche)

1. Issues (Problématique)

Knowing that motivation is at the crux of learning, we examined students and their motivation to engage - or not - in learning and course activities which include the use of information and communication technologies (ICTs). In fact, today's college instructors reflect a powerful trend in postsecondary education, which is to use diverse ICTs (Cassidy & Scapin, 2013; Lapostolle, et al., 2013). Questions such as, "Does more extensive use of ICTs by instructors ensure better learning?" and "Is teaching using ICTs seen as more or less effective by students and instructors?" have been asked and, yet, these have been shown to be overly simplistic (Abrami et al., 2006; Bernard, et al., 2004; Bell & Federman, 2013; NMC Horizon Report, 2013). The complexity, of course, stems from the fact that technology is not used within a vacuum. Indeed, in his review, Barrette (2009) emphasizes the fact that it is not just the technology but the pedagogical framework in which it is used that is crucial.

Even though students' and professors' views about the effectiveness of different technologies have been shown to differ (Venkatesh et al., 2016), the literature on the use of technology in teaching and learning is based primarily on data from students (Poellhuber et al., 2012; Rashid & Asghar, 2016). Nevertheless, it is professors who set the tone and determine the pedagogical practices used in class. Of course, there are studies of faculty views about technology use in class, including its use in online learning (e.g., Croteau, Venkatesh, Beaudry, & Rabah, 2015; Lloyd, Byrne, & McCoy, 2012).

Despite this, there are no studies on the perspectives of professors identified as exemplary users of technology. Therefore, in this research, we explore the views, experiences and technology-related pedagogical practices of teachers deemed by students to be excellent in their use of technology in teaching.

One of the most current and controversial issues in the area of ICT use in postsecondary education is the use of personal technologies by students in the face-to-face classroom. Lindroth and Bergquist (2010) state that there is no universally accepted protocol that dictates mobile technology usage in the classroom. Thus, neither the teachers nor the students fully understand the appropriate role of laptops and other mobile technologies. This uncertainty surrounding their use in the classroom has resulted in three reactions from teachers: rejecting the use of laptops, ignoring the laptops, and accepting the laptops (Kay & Lauricella, 2011). Some teachers do not allow their students to use their laptops at all in class, due to off-task behavior; thus rejecting laptops all together (Young, 2006). This approach creates a potential confrontation between the teacher and the students wishing to use technologies (Kay & Lauricella, 2011). Other teachers opt to ignore laptop use in their classes which leads to unstructured use where students can choose what they want to do. This approach has the intrinsic risk of facilitating extensive off-task behavior (Fried, 2008). The final approach, which accepts and embraces the use of laptops in class, is also referred to as the structured use approach. This approach attempts to integrate the technology as a tool to support and enhance pedagogical practices (Gay, Stefanone, Grace-Martin & Hembrooke, 2001). The strategies that have been implemented include extensive exercises on the laptop which are preceded by a short lecture, active use of software that is related to the course and virtual experiments which are completed in small

groups (Barak, Lipson & Lerman, 2006). Kay and Lauricella (2011) found that students engaged in more on-task behaviors, such as note-taking and other academic tasks, when teachers used a structured approach to laptops in the classroom. Likewise, students spent less time on off-task behaviors, such as instant messaging and sending personal emails, when a structured approach was used.

Finally, our last concern was that there is very little *comparative* research on the use of ICTs in college and university classrooms where similarities and differences between students' and teachers' perspectives are directly compared. In our literature search we were able to find few studies which directly compared these two groups in terms of ICT use and views. Among these, only the study by Venkatesh et al. (2016) asked the same questions of both groups on a broad variety of technologies from email to course management systems to blogs. Their study, which included large sample sizes for both students and teachers, showed that, generally, students are more satisfied with courses where lecture-related ICTs are used (i.e., PowerPoint, videos), whereas teachers felt that constructivist uses of ICTs (i.e., blogs, wikis) were more effective.

2. Hypotheses (hypothèses)

We had three main hypotheses:

- Phase 1 - Students who are immigrants, compared to non-immigrants, will have a preference for ICTs used in teaching that are (a) text-based and visual rather than soley audio, and (b) not based on synchronous (i.e., simultaneous) interactivity.
- Phase 2: Teachers nominated by their students for best ICT practices in their teaching will have a reasoned approach to how they use ICTs, feel that they enhance student learning but face a variety of challenges.

- Phase Three: Category frequencies of ICTs used by instructors reported by students and instructors will be compared; significant differences will be discovered.

3. Objectives (Objectifs)

What makes this investigation unique is that excellence in ICT related pedagogical practice has been determined by the students and then operationalized by their instructors. We were interested in the diversity of the student participants because different ICT-related pedagogical practices may be beneficial for one group of students (e.g., males versus females, immigrants versus non-immigrants) but not for another. The results can be used to guide decisions about which ICTs should be used by instructors to meet specific learning objectives in diverse pedagogical contexts.

Studying the experience of instructors deemed effective in their use of ICTs, including the facilitators and obstacles they experience, has allowed us to gather information concerning “best practices”; something many faculty want to know about when designing courses which incorporate ICTs to ensure that these promote student engagement and motivation. This further emphasizes the need for understanding ICT “best practices” from the students’ perspective.

Part B – Implications of the Results (Pistes de solution en lien avec les résultats, retombées et implications de vos travaux)

1. Audience (Auditoires)

Our project is pertinent to the ministère de l'Éducation et de l'Enseignement supérieur (MEES), Fonds de recherche du Québec - Société et culture (FRQSC), Cegep administrators, Cegep professionals, university and Cegep teachers as well as the Association pour les applications pédagogiques de l'ordinateur au post-secondaire (APOP), Association pour la recherche au collégial (ARC), Association québécoise de pédagogie collégiale (AQPC), Cégep à distance, Centre de documentation collégial (CDC), Profweb, Réseau des répondants et répondantes TIC (Reptic), and La Revue Pédagogie collégial.

2. Interpretation of the Results (Significations des conclusions)

New policies could be put into place which include guidelines for how face-to-face teaching environments could include students' personal technologies, where appropriate. Using a needs-analysis framework to survey students on a regular basis about their ICT likes and dislikes in the postsecondary environment would allow teachers to target the ICTs most likely to increase student engagement and motivation. We need to hear from exemplary teachers on a more regular basis as this is essential for identifying facilitators and barriers. Finally, asking students and teachers identical questions provides a framework for comparative analysis which, in turn, allows teachers to get the 'right fit' when choosing and effectively using ICTs in their teaching.

3. Immediate and In-the-Near-Future Implications (Retombées immédiates ou prévues)

This report offers take-home messages and solutions which have been disseminated, and continue to be, to the post-secondary level of education. For instance,

we are presenting our comparative-analysis results at ARC-ACFAS in May of 2017 and then in June of 2017 we are presenting at the collegial-level conference (AQPC). In this presentation, an ICT-pedagogical counsellor will collaborate with one of the researchers in order to focus on the practical implications of our results. In other words, we are offering data-driven instructional design recommendations for the postsecondary level. Since we interviewed students and teachers from diverse pre-university and technical Cegep programs, our results can be generalized.

Since universal design in pedagogy is becoming increasingly more popular, near-future implications of our work would be to framework our findings within the principles of universal design in pedagogy (McGuire, Scott & Shaw, 2003; Nguyen, Fichten, Barile et Lévesque, 2006; Barile, Nguyen, Havel & Fichten, 2012). In fact, one of our presentations (in Alberta in 2016, *Connecting the dots: How student data on their use of ICTs fits into a UDL Framework)* used our student results to inform and refine ICT practices in postsecondary teaching within a UD framework.

4. Limitations of the Research (Limites des l'étude)

Our student and teacher samples are not representative as they are only from one Anglophone and one Francophone Cegep. The teacher sample is a quota sample, which is determined by the different numbers of participants that were required from selected categories. In this case, we wanted to interview teachers from all the programs so we targeted ten teachers per institution, from both pre-university and technical programs, who had the most nominations per category (e.g., Sciences and Engineering, Arts, Social Sciences). In both the student and teacher studies, some of the data were difficult to code into a limited number of categories (e.g., students' suggestions and

teachers' advice). Finally when comparing student and teacher data, only certain questions were equivalent across both samples.

5. Take-Home Messages (Messages clés)

- These results can be applied to many college-level students as there were few significant differences between students born in Canada versus those who were born outside of Canada, males versus females, program of study and French versus English Cegeps.
- These results can also be used by teachers from both pre-university and technical programs across various disciplines. Thus, for instance, we know that students like it when their teachers use videos and presentation software, keeping in mind though that they have a clear sense of how their teachers should do this so that it is effective; these student likes apply to all types of courses across the Cegep spectrum.
- These results can also be used in department presentations and specialized conferences. For instance, when we presented to science teachers at SALTISE (Supporting Active Learning & Technological Innovation in Studies of Education), we were able to share data on specialized ICTs in this field and science-pertinent advice from expert ICT science teachers (e.g., the use of virtual simulations in science classrooms and laboratories).
- As simple as it is, the message is clear: an overwhelming number of students like it when their teachers use ICTs in their teaching. This means that yes, it is indeed worthwhile to invest in this area of pedagogy and that teachers who are reluctant to use ICTs need to be encouraged to embrace this reality.

- Not all teachers are ICT experts and there is only so much time per session that teachers can dedicate to acquiring new knowledge and then applying this to their teaching. Here is the encouraging news: the students did not expect or want their teachers to use complicated ICTs. Instead, they wanted the simple things like posting grades online to be done in a clear (i.e., provide the correct grade as well as the average and standard deviation) and timely fashion. This message has been coined in one of our presentations titled "*Doing ordinary things extraordinarily well: Faculty perspectives on excellence in ICT and e-Learning use in colleges".*
- Finally, the biggest difference between Cegep teachers in general and the exemplary ICT user teachers was whether or not they allowed their students to use their own mobile technology in the classroom and laboratories. As is perhaps predictable, the nominated teachers allowed their students to use their own technology on a significantly higher basis than students reported that Cegep teachers in general allowed. This is a current debate among teachers, departments, programs and institutions. Some institutions have created guidelines and policies (see for example, the University of Montreal which requires all professors to permit students to use their own mobile technologies in class (Conseil des études de premier cycle, 2013). More policies are required, the debate needs to continue based on informed research and more importantly, effective guidelines for how to use students' mobile technologies in teaching need to be made available to teachers.

6. Solution-Oriented Suggestions (Principales pistes de solution)

- Have students list their preferred ICTs for postsecondary learning and briefly explain why.
- Have students explain how these preferred ICTs should be used by their teachers.
- Have students list the ICTs they do not like their teachers to use and briefly explain why.
- Have students nominate teachers for best practices in the use of ICTs in teaching.
- Address the infrastructure barriers which exemplary ICT user teachers listed.
- Distribute the facilitators for exemplary ICT use to teachers, colleges, university and ICT groups within the college network.
- When examining ICT use at the postsecondary level, place students and teachers within a comparative framework so as to offer a complete picture when reforming policy and pedagogy.
- Strongly encourage reluctant teachers to use a few simple ICTs in their teaching in effective ways and provide them with the support they need to accomplish this.
- When appropriate, allow students to use their personal technology in face-to-face classrooms (note: of course this is already an undisputed reality in blended and online learning environments).

Part C – Methodology (Méthodologie)

1. Methodological Approach

Descriptive and comparative study

2. Data Collection

Phase 1 – Student Perspective In the autumn of 2014 we distributed paper and pencil surveys (*Questionnaire for Cegep Students*) in general-education courses at Cégep André-Laurendeau and Dawson College. This questionnaire was used to recruit students for the online questionnaire. In the winter of 2015, students completed our online questionnaire (*E-Learning Questionnaire*), which included a checklist (*Computer Technology Checklist*).

Phase 2 – Teacher Perspective Teachers nominated by their students for excellent use of ICTs met with one interviewer and one note taker. A checklist (Computer Technology Checklist) and nine questions (Interview Questions for Teachers) were used and answers were coded.

Phase 3 – Students and Teacher Perspectives: A Comparative Framework In fall 2016 and winter 2017 student and teacher data from the *Computer Technology Checklist* were analysed.

3. Sample Sizes

N= 1387 paper questionnaire (337 were immigrants). Three hundred and eleven students provided extensive online data: 95 of them were immigrants (online questionnaire and checklist), 114 of them nominated teachers.

4. Statistical Analyses

Inferential statistical tests (ANOVA, X^2, test t, correlations), additional statistical measures (Kurtosis: checks for skewness) and descriptive statistics

Part D – Results (Résultats)
1. Main Results

Phase 1 – Student Perspective Overall, the student sample can be treated in its entirety when it comes to *the E-learning Questionnaire* (includes 23 technology-related questions and the 37 item checklist of technology used by professors) because there were few significant differences between students born in Canada and those born outside of Canada (this is how we defined immigrants in our study), the Cegep they attended (French versus English) or gender. Items included statements like 'I like courses where my teachers use technology' and 'I am comfortable using technology'. The absence of differences allowed us to report the following results for the entire student group. Here are some of the findings:

- 93% of students indicated that they liked courses where their teachers used ICTs.
- 32% of students disagreed with the statement that professors showed them how to use ICTs needed in their courses.
- 49% of students disagreed with the statement that instructors allowed them to use their personal technologies in class.
- Over 260 of the 311 students felt that the following ICTs worked well for them: grades, assignments, course outlines and course notes posted online; online submission of assignments; computer labs; emails; and presentation software.
- Digital textbooks and online courses, in contrast to the above, only had ratings around 3 on 6-point scales; thus, perceived effectiveness was low.
- Many types of infrequently used ICTs (i.e., fewer than 2/3 of students indicated their teachers used this) were identified as working well for students (i.e., over 2/3 of students). These include online materials such as attendance records and tests/quizzes; a variety of ICT tools used in class (i.e., grammar tools and checkers, language learning

software, simulations/virtual experiments, mind mapping and web conferencing); hardware such as clickers; several online tools (i.e., wikis, portfolios and podcasts) as well as virtual office hours.

Students also offered ICT-related suggestions. Table 1 shows the top five with examples, in rank order of frequency.

Table 1: Top Five Suggestions

1. Use and availability of technology at school

   (e.g., more power outlets in class / in the library; more printers around school; better access to computer labs to work on assignments; more accessible areas for Wi-Fi for phones and tablets)

2. Instructors' knowledge and use of technology

   (e.g., make sure that all instructors have a basic understanding of how a projector works; classes should not revolve around technologies; a small 101 course for teachers who are not used to using a computer given by the college's tech support; technology should be an aid to teaching rather than replacing my instructor)

3. Presentation software: PowerPoint

   (e.g., More in class PowerPoint lectures; PowerPoint presentations that highlight key terms; interesting visual components like photos rather than just text; clearer PowerPoints; less busy; no need to use PowerPoint if slides are useless; avoid presentations were the instructor simply reads the PowerPoint)

4. Performance of technology at school

   (e.g., Better quality projectors; often problems with Wi Fi; computers in computer labs require improvement; problems with the "online classroom"; Adobe Connect did not work well; speakers did not work; the webcam was frozen; computers are very slow in labs and classrooms; better software leases; replace computers with faster ones)

5. CMS features (due dates; calendar; on-line practice/exercises)

   (e.g., put up online course announcements (for example notification of a project submission date approaching or exam dates); upload practice exams/questions/quizzes; upload practice quizzes that provide full explanation; practice quizzes/exercises that will tell us right away that we have a mistake and what that mistake was; use a single CMS platform by all instructors; create a calendar online; put a digital version of all documents online; post everything done in class online)

Phase 2 – Teacher Perspective Our exemplary teachers, nominated by their students for excellence in the use of ICTs in their teaching, mostly learned to use technology on their own or had previous experience with technology. Their most common challenges were technical and institutional problems; they mainly dealt with these problems on their own. The ten technologies most frequently used were e-mail, grades available online, assignments available online, computer labs, presentation software, web links available online, online submission of assignments, course notes / PowerPoints available online, videos, and tutorials / practice exercises available online. The ten technologies least frequently used were web conferencing, Twitter, chat rooms, mind mapping, podcasts, LinkedIn, clickers, blogs, Wiki sites, and Facebook.

In terms of the Course Management System (CMS), this was primarily used by the teachers to post course notes / PowerPoints (83%), grades (73%) and assignments (52%) online. It was also used to post attendance (37%), the course outline (33%), web links (21%), readings (18%) and to receive assignments (29%) online. For communicating with their students, most teachers used e-mail associated with the CMS (87%), although some used other e-mail systems (26%) such as Gmail, Hotmail, or a college e-mail. Some of them (25%) also used other means to communicate with students, including instant messaging, online chats on the CMS, texting, Facebook and virtual office hours. Only 9% used Facebook to communicate with their students.

There were no significant differences between females and males for comfort level, $t(112) = 1.09$, $p = 0.280$, or proficiency, $t(111) = 1.52$, $p = 0.132$ in the use of technology. The number of years that they had taught at college (median cut-point = 6.89) was not significantly related to the teachers' levels of comfort with, $t(112) = 1.46$, $p = 0.146$, or knowledge of technology, $t(111) = 1.51$, $p = 0.252$. There was a

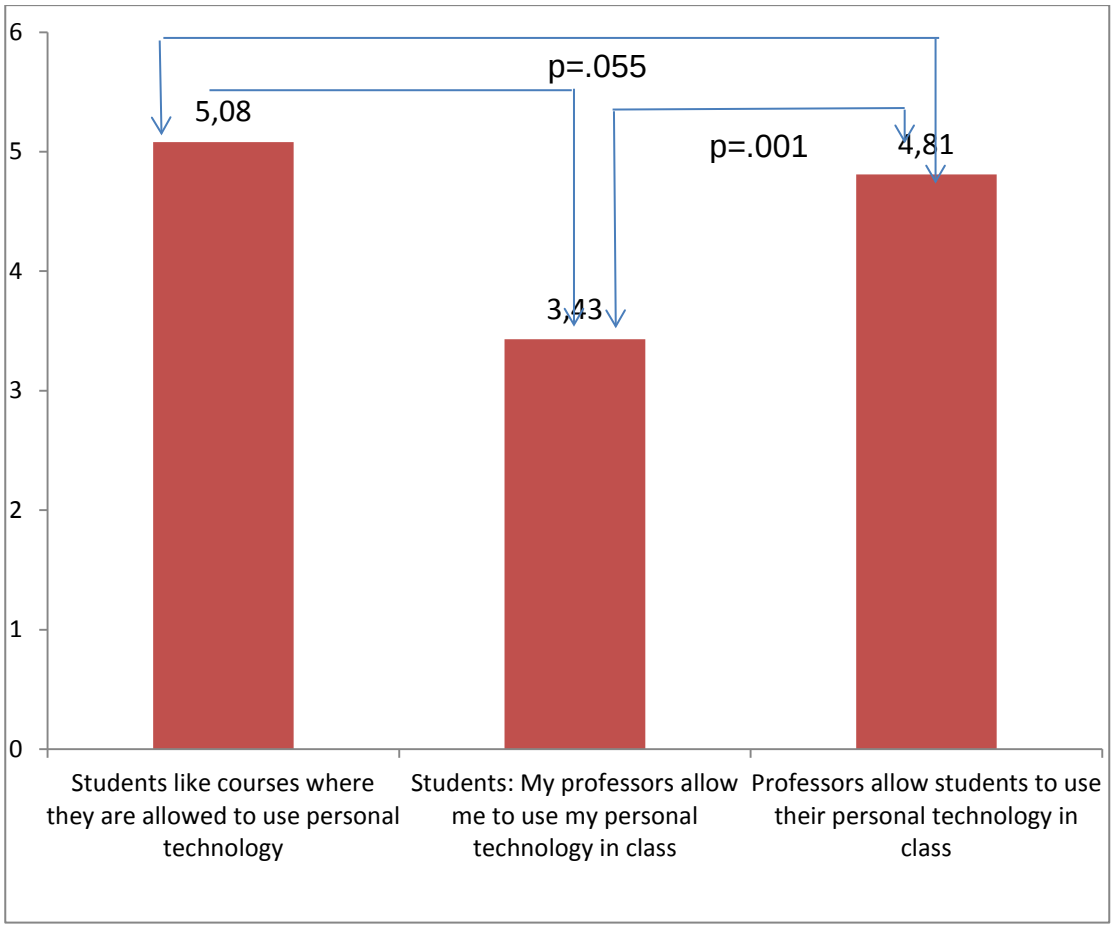
significant, positive correlation between the teachers' level of knowledge and comfort in the use of technology, $r(113) = 0.880$, $p < 0.001$. Eighty-three percent of teachers allowed their students to use their personal technology in class. Gender and number of years teaching at a Cegep did not significantly affect this.

Phase 3 – Students and Teacher Perspectives: A Comparative Framework

Here the 37 items on the *Computer Checklist* were compared in terms of the teachers' use of the type of technology versus how effective the students perceived it to be. Both groups felt that many online tools (e.g., gradebooks) enhanced the teaching-learning experience; they also agreed on the usefulness of online submission of assignments, the use of computers, videos and presentation software to teach, and email to communicate. Neither group found digital textbooks, blogs, collaborative work online, chat rooms, the use of interactive white boards, discussion forums, instant messaging and all types of social networking to be particularly helpful. The discrepancies, perhaps the most interesting findings, included online tests, wikis, 'clickers', mind mapping, the use of simulations / virtual experiments and virtual office hours (see Table 2 below where the percentage of ICT use by teachers is compared to the percentage of students who stated that these ICTs worked well for them).

	% of teachers: ICT Use	% of students: ICTs worked well
Simulations / virtual experiments	37%	88%
Attendance record available online	59%	90%
Tests / quizzes available online	39%	86%
Clickers	17%	73%
Mind mapping	11%	71%
Virtual office hours	30%	85%
Wiki Sites	22%	74%

In general, students were significantly more likely to appreciate courses where teachers permitted them to use their own technology in class (*M = 5.07, SD = 1.13)* than to indicate that their teachers allowed them to do so (*M = 3.45, SD = 1.58*), *(*paired samples *t*-test*)* $t(285) = 13.98$, $p = 0.001$. Despite this, the extent to which teachers allowed students to use their own technology in class (*M= 4.81, SD = 1.62*) was significantly greater than students' belief that, in general, their teachers allowed them to do this (*M = 3.43, SD = 1.59*), (independent samples *t*-test) $t\ (416) = 7.56$, $p = 0.001$. See graph below where the means of students liking courses where they were allowed to use personal technology, students reporting that their teachers allowed them to use it, and the nominated professors reporting that they allowed students to use their personal technology are compared.



2. Conclusions and Suggested Solutions (Conclusions et pistes de solution)

- Phase One: Since liking something is often linked to engagement and motivation, students' ICT likes (e.g., use of videos) should be considered in course planning and teaching. Not only is it important to note these likes, how students want the ICTs to be used is essential if not even more important (e.g., short and recent videos which are pertinent to the course content).
- Phase Two: Learning from 'the best' is logical; however, we do not use this type of data enough when marrying research with its practical implications nor do we always recognize this when it is a student-conferred status.

- Phase Three: It is important to place student and teacher data within a comparative framework to identify harmony and disharmony in terms of ICTs that students like and those the teachers actually use.

3. Main Contributions (Principales contributions)

Our research contributes to the firmly established field of ICTs and postsecondary pedagogy and less common research on ICTs in postsecondary education for certain populations like immigrants. Practically speaking; it allows administrators, professionals and practitioners to learn and apply best practices. Below is a breakdown of these contributions:

- An overwhelming majority of students, including immigrant students, like it when their teachers use technology in their teaching.
- Most students liked it when their teachers used simple forms of technology (i.e., emails to communicate, posting grades online, PowerPoint); however, these ICTs had to be used well (i.e., a quick response time, clear and engaging visual support).
- Exemplary teachers are more likely to allow students to use their personal technology in the classroom than teachers in general.
- Exemplary teachers use ICTs for meaningful pedagogical reasons – as opposed to using an ICT for the sole purpose of using technology in teaching.
- When student and teacher results are compared, there are still discrepancies in a variety of ICT areas (i.e., online testing, clickers, mind mapping).

Part E – Implication for Future Research (Pistes de recherche)

1. New Directions & Questions (Nouvelles pistes et questions de recherche)

- As ICTs evolve, how can continued research on exemplary teachers for their use of ICTs in their teaching contribute to the effective teaching of immigrant students, second-language students, students with disabilities and students in general studying at the post-secondary level?
- Why did the students like versus dislike the use of certain ICTs? In answering this key question, can we develop a generalizable framework for the effective use of ICTs in teaching at the postsecondary level?
- If both students and teachers agree on the use of certain ICTs, does this increase student engagement and significantly improve grades? What else can be discovered within this comparative framework?
- How can our current research results and further investigation in this area be integrated into a universal design paradigm?
- For what purpose do students indicate that they use or would like to use their personal technologies in class?
- How can students and professors work collaboratively to use ICTs effectively?

2. The Key to Exploring New Avenues (Principale piste de solution)

As obvious as it may seem, it must be emphasized that the key to exploring new avenues in research on ICTs and immigrant students is to support applied research (i.e., funding, infrastructure and mentoring for both teacher and student researchers alike).

Part F – References and Bibliography (Références et bibliographie)

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