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Building Research Capacity of Future Teachers: A Canadian Case Study

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Abstract: Since their first day in school, in-service teachers are expected to act professionally, make good judgments, think critically, and problem-solve effectively. The literature suggests that engaging pre-service teachers in research can help them to develop several key skills. In this paper, we present the outcomes from a year and a half long mixed-methods case study that was conducted in two phases (i.e., a pilot and a follow-up study) with two groups of pre-service teachers enrolled in a teacher education programme in a Canadian mid-size university. The purpose of this research was to examine how an in-course research component might have shaped the perceived research capacity of the pre-service teachers and their disposition toward teacher research. The participants reported that the research component had improved their inquiry, reflective, critical thinking, and research-related skills. We conclude by discussing the study outcomes and proposing a set of recommendations for theory and practice.

Introduction

In this era of fast changing societies, classroom teachers, especially the newly recruited, need to exercise advanced skills to deal with everyday challenges in their classrooms. According to Zambo and Zambo (2007), since their first teaching day, new classroom teachers "must think like experts […,] make good judgments, think critically, and problem-solve effectively" (p. 63). Thus, it proves crucial that teacher preparation programs strive to equip students with the appropriate skills and experiences to become effective and advanced thinking educators. As an extension, introducing both pre-service and in-service teachers to research (e.g., action research, study groups, and collaborative inquiry) would contribute to educators espousing inquiry stance, highlighted in the 21st Century skills frameworks (Pellegrino, 2017).

Currently, a greater attention is being placed on "the role of pre-service teacher research in teacher education" (van Katwijk et al., 2019, p.1). The literature suggests that engaging pre-service teachers in conducting a full research study, or parts of a study, could help them develop the ability to think critically (Bower, 2010; Crawford-Garrett et al., 2015; Gordon, 2011; Kotsopoulos et al., 2012) and link theory with practice (Bower, 2010; Kitchen & Stevens, 2008). In this paper, we present results from a year and a half long study that was organized in two phases. The first phase consisted of a pilot project with a small group of pre-service teachers who were exposed to an in-course research-related assignment. In the second phase (i.e., the follow-up study), a larger group of pre-service teachers took a semester-long Teacher-as-Researcher course. In both phases, we looked at the impact of the

research-related components of the course on pre-service teachers' perceived research capacity and disposition toward teacher research. The overarching question that guided the study was: In what way an in-course research component might have shaped the perceived research capacity of pre-service teachers? This study was conducted at a mid-size public university in Ontario, Canada.

Literature Review

Traditionally, research belonged exclusively in the portfolio of academics; pre-service and most in-service teachers learned about effective teaching from the research conducted by others. The recent push to involve teachers in research grew from the realization that teachers may be alienated from research, finding it irrelevant to their contexts and non-generalizable (Hemsley-Brown & Sharp, 2003). Except from taking part in research teams, the most likely venue for teachers to gain some research skills and experience is through their graduate studies (Stanovich & Stanovich, 2003).

The positive impact of actively involving teachers in research has emerged as a respectful, inclusive, and efficient way to make positive and sustainable changes in education (Martinovic & Horn-Olivito, 2020; Martinovic et al., 2012). According to DiLucchio and Leaman (2022), taking the research course as part of the Master's in Education program, helped classroom teachers, in a USA context, to understand the importance of reviewing the literature in relation to their research topic, and gain a deeper understanding of data collection and analysis. In addition, engaging in a semester-long research project has positively impacted their confidence and autonomy, as well as their practice. The participants felt that their teaching was improved through the research-induced self-reflection on how they thought about students, curriculum, instruction, and assessment. Similarly, the success of Finnish education is often partly attributed to a research-based preparation of teachers, all of whom complete at least a master's degree in education (Kansanen, 2014) before becoming certified. In the Philippines, the government requires that teachers, albeit as a small part (i.e., 5%) of their annual appraisal score, provide evidence of doing research (Ulla et al., 2017). According to Ulla et al., researching issues of practice encouraged teachers' critical self-reflection and enabled the development of knowledge and skills necessary for effective classroom teaching.

Simultaneously, the literature proposed various implementation challenges for teacher research. Most Philippine teachers in Ulla et al. (2017) avoided conducting research unless they were seeking promotion. The most frequent self-reported reasons for this reluctance to do research were the lack of skills, support, and incentives (e.g., research grants, release time from teaching, additional training). Ellis and Loughland (2016) compared the challenges faced by in-service teachers from Australia and Singapore when conducting research. Having limited time to cover the curriculum, meet with eventual collaborators, and complete the research, in addition to lacking adequate research training, were among the common deterrents. While teachers from Singapore communicated documenting the research as an additional challenge, their Australian peers proposed having the school leaders' support, persevering to complete the project, and finding collaborators among academics were indispensable to conduct high-quality research. For teachers with graduate degrees (i.e., master's and doctoral), finding academic collaborators may be a lesser issue because they can reach out to their former professors for guidance (Drill et al., 2013). Drill et al. also suggested that teachers consider academics involved in teacher preparation programs for research collaborations.

Overall, the studies from different geographical regions establish teacher research as

an important and positive element of the professionalism and practice. They also pointed out pertinent barriers and possible ways for overcoming them.

It is noteworthy that there has been an ongoing academic debate on whether teaching and researching are having conflicting or complementary roles (Hoong et al., 2007). For instance, Wong (1995a) described the conflicts he experienced when trying to simultaneously wear the teacher's and researcher's hats: "good research and good teaching are both characterized by inquiry and reflection. … however, …the primary goal of research is to understand [while] the primary goal of teaching is to help students learn" (p. 23). In "the action research movement" (p. 25), Wong saw an attempt to remove the distinction between the two roles, which for him raised an ethical question of considering one's own students as the research participants. In reaction, Wilson (1995) advanced that "placing research in competition with teaching is both limited and limiting" (p. 21). She added that the variety of research methods allow one to choose the best approach for researching while teaching. Although Wilson viewed teaching and research as being intentional rather than in tension, and that the two have much in common, she acknowledged their difference when describing her profound transformation (as a teacher) during the six years of completing doctoral studies. In his rebuttal, Wong (1995b), warned against the oversimplification of differences between the two practices, since this "eliminates much of what makes each a disciplined, professional practice" (p. 23).

Taking a more theoretical stance, McIntyre (2005) recognises that the gap between teaching and research exists but argues that there are ways to bridging it. For McIntyre, the knowledges that schoolteachers and educational researchers have are at the opposite ends of a continuum, with points of gradation in between (Fig. 1).
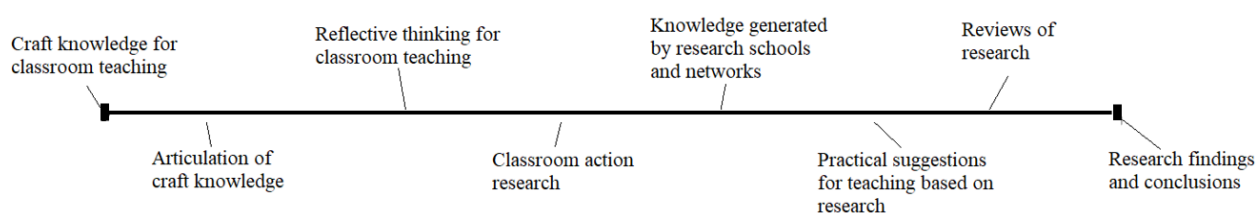

Figure 1. A continuum of kinds of knowledge (based on McIntyre, 2005, p. 361)

One way of bridging the gap, not only between these different forms of knowledge but also between the practice-oriented and research-oriented education communities, was proposed by Zeichner (1995). This could be done by taking seriously the results of the genuine teacher research and treating it as "educational knowledge to be analyzed and discussed" (p. 169) among academics and in the pre-service teacher education. To this end, for us, education research encompasses teacher research and is defined as:

> *a process of individual or collaborative inquiry to be conducted; a process that is characterized by ethical review, research questions and methods, data collection and analysis, dissemination and potential implementation of findings; a process that is open for critique by various communities of practice; a process that adds to our understanding of the issue and potentially improves teaching and learning. (Martinovic et al., 2012, p. 402, italics in the original)*

After situating teacher research within education research and introducing the idea of using it in teacher education, in the next part, we present the benefits and the challenges of such practices based on several studies involving pre-service and newly graduated teachers. In our selection, we were unsystematically looking for pertinent resources coming from several settings and adopting various research methodologies.

Benefits of Engaging Pre-Service and Newly Graduated Teachers in Research

A US-based mixed-methods study (Lattimer, 2012) compared the perceived readiness to teach of two groups of newly graduated pre-service teachers. The participants were enrolled in two different teacher education programs. The first involved students in action research, while the other program did not. Lattimer surveyed 25 pre-service teachers (12 from the first and 13 from the second program), and then conducted a focus group interview with 11 graduates from the first program. The survey findings yielded negligible differences vis-à-vis the newly graduated teachers' perceived degree of preparedness for classroom teaching (the results were slightly higher among the graduates of the research-enriched program). Still, the participants in the group interviews reported that engaging in action research benefited them in multiple ways. They (a) switched focus from their own performance to what would benefit the students, (b) genuinely reflected on the successes and challenges in the classrooms, (c) became more independent from their associate teachers during practice teaching, and (d) gained more confidence when dealing with other stakeholders (e.g., administrators, colleagues, and parents), advocating for students, and exposing issues. Although other factors likely contributed to the positive evaluation the graduates gave to their research-enriched program (i.e., the 12-month program offered a combined bachelor's and master's degree, some courses provided research training, and the practice teaching spanned the whole program), Lattimer concluded that introducing action research in the teacher education program can be conducive to effective classroom teaching.

In a comparable Canadian mixed-methods study, Kotsopoulos et al. (2012) investigated the perceptions of 69 pre-service teachers regarding the research component of a nine-month long Bachelor of Education (BEd) programme. The students were introduced to various research-related concepts, such as research paradigms, literature reviews, and ethical considerations. They then collaborated with their associate teachers to come up with research questions that were of interest for the school community. Kotsopoulos et al. collected responses to the weekly reflective questions and conducted a survey and a focus group (*N*=13) meeting at the end of the program. In the survey responses, the authors found the evidence of the students' perceived disconnect between teaching and research. However, despite some negative viewpoints regarding the research intervention, most of the focus group participants advanced that the research helped them acquire valuable knowledge and, consequently, alter the way they perceived classroom practice. They felt it made them critical thinkers and more reflective about teaching.

In Turkey, Tosun (2014) explored the opinions of 27 pre-service teachers, from the Elementary Science Education programme, about a course on the scientific research methods, and the levels of knowledge and skills they gained in this course. The course took place over 14 weeks with 2 hours per week. Data were collected using a questionnaire with open-ended and short answers. Results revealed that "the pre-service teachers have a medium-level attitude towards doing research" (p. 109) and that taking this course has decreased their anxiety towards doing scientific research. Also, taking this course appeared to have helped them to gain skills in writing literature reviews, preparing scientific research project proposals, and critiquing scientific papers. Based on that, Tosun advanced that it is advantageous for pre-service teachers to perceive teachers as researchers and develop appreciation toward educational research.

In a Norwegian study, Ulvik and Riese (2016) explored the perceptions towards action research of future secondary school teachers who were enrolled in a fourth year of the teacher education programme. This, five year-long, program offered a joint bachelor's and master's degree in education. The data were collected from pre- (six participants) and post- (three participants) action research focus groups and a questionnaire completed by 32

participants. The questionnaire's items were similar to the questions of the post-focus group. Some findings suggest that the students' initial scepticism towards action research was mostly alleviated after they had an opportunity to reflect on their practicum experience, and, through that process, start viewing action research as a way of linking theory and practice.

To conclude, introducing a research component into a teacher education program appears to benefit pre-service teachers on many levels. First, engaging student teachers in research projects can help them to develop critical thinking skills and become more reflective regarding their teaching practice (Crawford-Garrett et al., 2015; Gordon, 2011; Kotsopoulos et al., 2012; Lattimer, 2012; Ulvik & Riese, 2016; van Katwijk et al., 2019). Second, some pre-service teachers who conducted research seemed to have taken ownership of their classroom practices by more independently modifying and adapting their instruction to fit the students' educational needs (Carboni et al., 2007; Crawford-Garrett et al., 2015; Lattimer, 2012). Third, performing research tasks helped prospective teachers to link theory with classroom practice (Bower, 2010; Kennedy-Clark et al., 2018; Kitchen & Stevens, 2008; Ulvik & Riese, 2016). Furthermore, getting involved in a research assignment appeared to assist future teachers to discover their own traits, such as personality, perseverance, and knowledge (Breidenstein, 2002; Ulvik & Riese, 2016). It also helped them learn about the different aspects of research (Gordon, 2011; Kitchen & Stevens, 2008; Tosun, 2014; Ulvik & Riese, 2016; van Katwijk et al., 2019) pertaining to methodologies, reviewing literature, developing a proposal, and collecting and analysing data.

Challenges of Engaging Pre-Service and Newly Graduated Teachers in Research

Hennessy and Lynch (2019) explored the perspectives of a group of the first year Master of Education students at an Irish University on reading and conducting educational research. Although they had initial degrees in their subjects, the participants were considered pre-service teachers, as they did not have any teaching experience. Data collection took place during two phases, first through a survey ($N = 56$) and then through three focus groups ($N = 52$). Study findings showed that while participants highly rated the statement "[t]eacher research holds value for the wider educational community," they less agreed on their ability to "function simultaneously as a teacher and researcher" (p. 602), which the authors interpreted to be partly related to the commitments of a full-time teaching position. In fact, the participants perceived several deterrents to conducting research, such as teaching workload, the lack of access to research literature and difficulty in interpreting it, the negative impact of a teacher shifting focus from student learning to researching, the discouraging school culture for teacher research practice, and the perceived teacher vulnerability associated with the additional role of a researcher.

Similar obstacles emerged from other resources. Participants in both Lattimer (2012) and Ulvik and Riese (2016) studies communicated that time pressure to complete the teacher education program and the lack of research support from some associate teachers or mentors during the placement were among the main challenges to engaging in the research project. Also, in Kotsopoulos et al. (2012) and Zambo and Zambo (2007), the participants found lack of school support (e.g., from associate teachers and principals) as a prominent challenge to conducting research during their teacher education programs.

Finally, teacher educators seem in agreement that "educational research is useful for [teachers'] professional learning" (Counsell et al., 2000, p. 468), but the approaches toward achieving this are different and bounded by various contextual factors, such as the length of the programs, the timing of the introduction of the research component as well as its form.

Methodology
The Context

The pilot and the follow-up study were each conducted over the 18 hours of class time. The pilot study was carried out among the second-year education students who were preparing to teach mathematics in the higher elementary and secondary Ontario schools. They were taking a *Field Experience Practicum* class—a year-long course that consisted of two parts: Advisory Group Instruction (e.g., weekly meetings, creation of teaching portfolio) and Field Experience (e.g., practice teaching in schools, teaching reflections). The first author was the instructor, while the second author was a graduate assistant for the course. The course expectations consisted of (a) completing two questionnaires (one in each semester) where participants provided their viewpoints vis-à-vis research and its connections to the teaching profession, (b) reflecting on their three teaching placements, and (c) reading and summarizing a collaborative inquiry (CI) research report of their choice written by in-service teachers and university collaborators and adapting this research to their own needs. At the end of the course, the pre-service teachers defended their teaching portfolios.

The following year, the same instructor taught a larger group of the first-year education students. This time, she designed a new course related to teacher-research and conducted a research study around it. Expanding on the pilot study and drawing upon theories of professional learning, the *Special Issues in Education: Teacher-as-Researcher* course intended to introduce pre-service teachers to key education research-related terms and concepts, such as collaborative inquiry, classroom data, diagnostic interviews, and evidence-based practice. The students examined the spiral approach to inquiry, which is iterative, adaptive, and reciprocal, and ways through which it could shape the teachers' identities and enhance the students' learning experiences. For assessment purposes, the students had to complete the same two questionnaires from the pilot study and submit two research assignments. Similar to the pilot study, in the first research assignment, students read and summarized a CI report of their choice. In the second research assignment, they reflected on the course readings in view of their first placement experience and proposed adaptations to the CI report from the first assignment. These adaptations mirrored specifics of their placement situations (e.g., adjusted the inquiry to their students' age, grade, and subject).

While the assignments in both courses were compulsory and related to teacher-as-researcher role, the students could opt out from the research study. The research design is described in the next section.

The Study Design

This project was designed as a mixed-methods case study. Following Creswell and Plano Clarke (2018), both the qualitative and quantitative data were collected and integrated. A case study was appropriate for the analysis of a teacher-as researcher phenomenon within the boundaries of the pre-service program. Each of the two cohorts was considered a case. The intention was to inform change at the organizational or community level (Robinson et al., 2019).

The same research procedure was replicated during the two consecutive academic years (i.e., the pilot and the follow-up study). The research component of the course consisted of a graded research assignment which consisted of the following:
(1)   The students had to choose one of 13 CI reports developed in the previous three years by a group of in-service teachers from a local school board in partnership with the university researchers (Martinovic et al., 2015). These reports covered inquires related

(2)   to mathematics, literacy, music, ecology, inquiry-based learning, risk-taking skills, and well-being, conducted at various K-12 grades.
(2)   Each pre-service teacher had to thoroughly investigate one CI report, identify its main components (e.g., the research question, the participants, and the findings) and submit its summary.
(3)   After completing their teaching placement (the second placement in the pilot study and the first placement in the follow-up study), the pre-service teachers were asked to (a) reflect on the previously submitted CI report summary in view of their placement, (b) ponder what they would change in the set-up of the CI study to adapt it to their placement (e.g., to adjust it to their students' age and grade), and (c) write a proposal in which they would include their suggestions and adaptations to the CI study.

Ethical Considerations

Both studies were approved by the university Research Ethics Board. While the assignments were compulsory, the participation in the research was not. To ensure that the students' decision toward taking part in the instructor's research would not affect the course grade, the sealed envelopes with consent forms were opened after the final course marks were submitted. Finally, a code was assigned for each participant to reinforce the anonymity of the data.

Data Collection

The data for the study were collected using the pre- and post-research intervention questionnaires. Baseline data were obtained through Questionnaire 1 at the start of the course. Toward the end of the course, after finishing the research assignment and the teaching placement, the participants completed Questionnaire 2. The two questionnaires helped us to explore whether, and if so, in what ways the participants' understanding of and disposition toward teacher research might have changed.

Questionnaire 1 encompassed a total of 11 items. The first three items collected demographic data, including the teaching experience and the academic qualifications of the participants. Then, they were asked about their previous experience with research and, if any, their role in and the nature of that research. Furthermore, the questionnaire inquired whether they believe that classroom teachers should get involved in research while justifying their selection. On a five-point Likert-scale ranging from "Not at all" to "Extremely," participants had to report their confidence towards (1) interpreting a research report, including the identification of its main components and (2) conducting a research study in their classroom. Finally, the pre-service teachers were asked to (a) write about the challenges that they anticipate facing if they were to conduct a research study in their classroom and (b) list three professional skills that they expect to acquire by the end of the course.

In turn, the first two items of the second questionnaire explored whether the associate teachers who mentored them during the placement were engaged in any sort of classroom research. The third question asked the participants to draw on their placements to elaborate on some cases, ideas, or questions that they would have wished to research. Other items were similar to those in the first questionnaire.

The same pre- and post-intervention questionnaires of the pilot study were used in the follow-up study for two reasons. First, administering the same questionnaires in both studies gave us the opportunity to look for convergence and divergence in the narratives of the two

cohorts. Also, the participants in the pilot study did not face any problems when completing the pre- and post- intervention questionnaires which was indicative of the clarity of their contents.

Research Participants

All seven pre-service teachers provided consent to participate in the pilot study whereas 37 out of 79 consented to participate in the follow-up study. The incomplete data of one participant from the latter group were disregarded. Thus, in both cohorts combined, there were 43 participants.

Study Outcomes

Demographic data showed some differences and similarities between the two groups. For instance, all seven participants from the pilot study had some teaching experience (i.e., as a second-year students, they already completed the first year placement), while 35% (N=13) of the follow-up study participants did not have any. About a half of each group had some experience with research. From the pilot study group, one pre-service teacher had experience as a participant, one as a researcher, and one as both, while in the follow-up study group, 12 had research experience as participants, two as researchers, and three as both.

Qualitative Findings

In this part, we analyse the participants' responses to the open-ended questions of the pre- and post-intervention questionnaires for both the pilot and the follow-up studies.

Challenges for Conducting In-Class Research

While addressing this question in both questionnaires, the 43 participants (i.e., seven in the pilot study and 36 in the follow-up study) suggested similar challenges for conducting in-class research.

The Pilot Study Group.
In the pre-intervention questionnaire, mitigating teacher bias was proposed by three of the seven participants as a potential challenge to conduct an in-class research study. Other types of challenges pertained to the potential reluctance of school students to take part in a teacher-led study as well as the participants' uncertainty vis-à-vis research-related tasks, such as writing a research report, and collecting, organizing, and maintaining the anonymity/confidentiality of the collected data. Comparable challenges were suggested in the post-intervention questionnaire, such as the school students' cooperation, parents' approval, and the teacher-researcher's objectivity. However, the anticipated challenges shifted to become more focused on the research design including, determining the research questions, developing the appropriate data collection methods for the study (e.g., survey questions), analyzing the data, and writing about the findings.

The Follow-up Study Group.

At the pre-intervention phase, the most frequently suggested challenge for conducting in-class research was time constraint, especially for new teachers, as the time spent on research might conflict with covering curriculum contents. Additional challenges included having the necessary research skills to effectively design and conduct in-class research, in addition to obtaining necessary funding and getting the support/approval of the different stakeholders, such as the school administration, school board, peers, parents, and students. Post-intervention data revealed similar themes to those in the pre-intervention, such as time restrictions, getting the support/approval of different stakeholders and funding. The participants also proposed a set of challenges related to research design, including identifying the research problem, coming up with the appropriate research question, using the suitable methodology and data collection methods, and observing ethical aspects.

Perceptions Toward Conducting In-Class Research

In total, 42 out of the 43 pre-service teacher participants stated that classroom teachers should get involved in research.

The Pilot Study Group.

Pre-intervention, the seven pre-service teachers reported that classroom teachers should get involved in research, including in-class research, for various reasons. One participant asserted that: "Even once we've become teachers we are still learners and can always benefit through such things as research to make new discoveries and enhance our knowledge" (EK-32). Another participant advanced: "In education research, if teachers didn't participate then how could classroom strategies evolve? It is necessary we deliver as good education to students as possible and research is one way we can develop improved strategies" (UG-57). Towards the end of the course and after having the chance to experience classroom teaching through their three placements, the pre-service teachers appeared to have held their perspective. This was mirrored by the array of the proposed research studies that they would have wanted to conduct in their classrooms if they had had the chance (addressed later in this section).

The Follow-up Study Group.

All but one participant in the pre-intervention phase believed that classroom teachers should get involved in research.

One pre-service teacher asserted,

I think teachers should absolutely get more involved in research because that is one of the only ways to ensure that the research being conducted is current enough and relevant enough to the contemporary issues that teachers face every day. Teachers as researchers will have first-hand experience and access to resources that others may not, making their research the most relevant and precise. (Participant 7)

The one participant who thought that classroom teachers should not get involved in research stated that the teachers' "focus should be on the classroom" and that despite the importance of research, nevertheless,

it should be done by trained individuals who devote their time to research. Maybe there could be a development of teacher researchers who teach for a few years in the classroom, but then move outside that scope of practice to focus on research (Participant 13).

The same pre-service teacher proposed, post-intervention, that the course helped them to "understand the benefits of using research in the classroom [,…] better interpret research studies [, and] have a better understanding of the components involved in the research."

The Perceived Post-Intervention Improved Skills

While addressing this question, the 43 participants reported various skills that they believe the course(s) helped them to improve or gain. For the purpose of this paper, the focus is placed on the skills related to research.

The Pilot Study Group.

Two out of seven participants provided their insights regarding the research-related knowledge they gained by the end of the course:

> *This course opened my eyes to the idea that education is constantly changing, and that teachers should research in order to be doing the best service they can to their students. (UG-57)*
> *This course has helped me acquire skills that I can use if I choose to conduct a research study in my classroom. I feel I have the necessary supports in place [to] help me in any research project I choose to conduct, supports such as faculty available at the university. (ZR-31)*

The Follow-up Study Group.

Many participants thought that the course enabled them to locate and access relevant resources. Others believed that they gained skills pertaining to interpreting the different components of research reports. One participant stated, "I was involved in research in my undergrad but do feel that this course helped me further develop my ability to interpret different research projects" (Participant 5).

Additional emerging themes from this question suggested that the pre-service teachers have developed a better understanding of the way research is conducted, which includes (a) formulating research questions that address the topic of interest, (b) the many ways through which data could be collected, and (c) the ethical measures to be implemented.

Of special interest were the narratives of several participants who communicated how the course had enabled them to perceive the connection between teaching and researching that they previously were not aware of. This was the case of one participant who advanced, "[b]efore this class, I never knew how much work and time went into teacher research. I did not even know that teachers did research" (Participant 22). Another participant asserted gaining a "perspective into the world of teachers as researchers that I didn't know existed before taking this course" (Participant 7), while a third reported that the course helped her "to consider research as an aspect of teaching" (Participant 2). Finally, many pre-service teachers communicated that the course had improved their inquiry, reflective, and critical thinking skills.

Suggested Research Topics Based on the Practicum Experience

When asked about potential topics that they would have liked to explore, most of the participants' proposed research studies seemed to be very specific, feasible, and based on their school practice experience.

The Pilot Study Group.

The preservice teachers expressed the interest in investigating the impact of extracurricular activities on the students' grades when compared to a control group; examining the effects of technology on the overall student achievement; finding how the extra OSSLT (the Ontario Secondary School Literacy Test) preparation would have helped grade 10 students who already failed grade 9 practice OSSLT test; and identifying the effectiveness of the flipped class pedagogy.

The Follow-up Study Group.

Many pre-service teachers in this group were interested in researching the use of electronic devices in their classrooms. One participant, for instance, wanted to study the influence of cellphones on students' learning after she noticed that "when [the students] were allowed to have [the cellphones] out, students were less distracted by them" (Participant 7). Others would have aspired to investigate the use of technology, including cellphones and iPads, in ways that are meaningful and beneficial for students' learning. Several participants would have liked to study the effect of students' 'home life' on their school performance, such as, "how one's background influences the way s/he learns [..., and] dig deeper to see how I could help all of my students succeed, no matter their background" (Participant 11). The latter topic reflects an advanced understanding of first, the cultural diversity that distinguishes the Canadian classroom student population, and second, the usefulness of research as a reliable and effective tool that could enable teachers to implement the most appropriate and successful pedagogical strategies to attend to the students' different educational needs.

Using Research-Related Terms

One course outcome that emerged from the qualitative data analysis was the participants' prevalent use of research-related terms in the post-intervention questionnaire.

The Pilot Study Group.

A comparison of the participants' narratives between the pre- and post-intervention indicated that pre-service teachers tended to employ more research-relevant terms in the second questionnaire. More specifically, when asked to elaborate on potential research challenges, they used the terms such as 'designing research', 'control groups', 'analyze the data', 'stay objective', 'time constraints in the research process', 'developing the survey questions', and 'selecting appropriate research question.'

The Follow-up Study Group.

When responding to the pre-intervention questionnaire the participants used general terms when talking about potential challenges for conducting in-class research. In contrast, they tended to use more technical terms in the post-intervention questionnaire, such as 'funding' and 'grants', 'consent', 'research question', 'methodology', 'data' and 'data collection', 'sample size', and 'ethics.'

The Quantitative Outcomes in the Follow-up Study

In this section, we exclusively highlight the results of the quantitative analysis of the data collected from the participants in the follow-up study (*N=36*) because of the small

sample size in the pilot study ($N=7$).

First, we investigated whether there is an association between the pre-service teachers' previous involvement in research and their decision to participate in the follow-up study. According to the anecdotal course information, the students with some research experience (i.e., as participants, researchers, or both) were more likely to participate in the study (Fig. 2). Yet, a Chi-square test of the association between the two categorical variables: (a) having a previous research experience (i.e., "yes" or "no") and (b) consenting to participate in the study (i.e., "yes" or "no"), yielded statistically insignificant results (X^2 (1, $N=77$) = 2.082, $p = .149$).
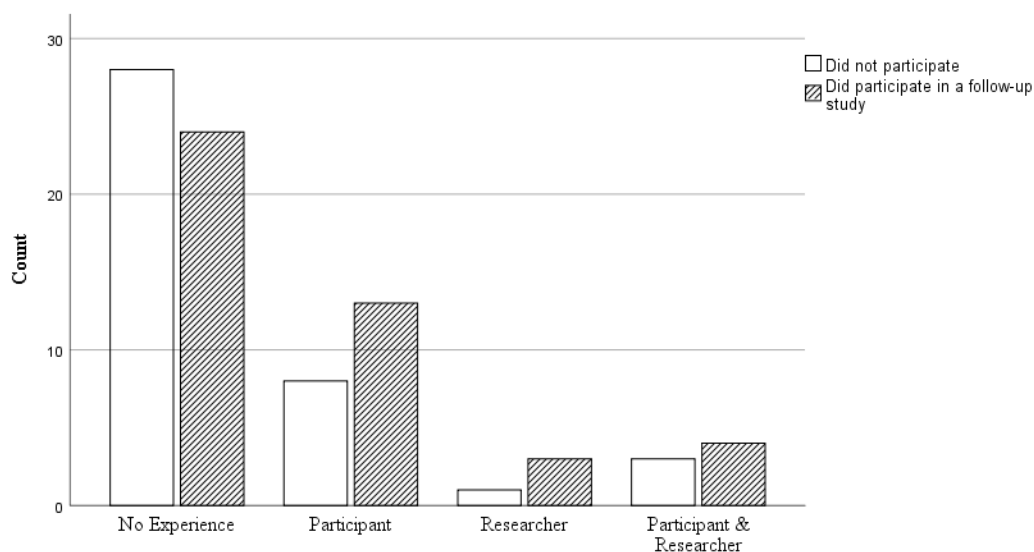

Figure 2. Participation in the follow-up study according to the previous research experience. The chart represents all students in the cohort.

Interpreting a Research Paper

One of the aspects of the *Teacher-as-Researcher* course was to help pre-service teachers interpret the CI reports and identify the research problem, methods, and findings. To measure the impact of the research intervention, the study participants were asked to rate their confidence in interpreting a research paper on a five-point Likert scale (i.e., 1 = "Not at all confident" to 5 = "Extremely confident").

Results showed that the mean score of their confidence to interpret a research paper has increased from 4.06 ($SD = .674$) in the pre-intervention phase to 4.39 ($SD = .599$) in the post-intervention phase, with the same medians and modes of 4 = "Confident."

A Wilcoxon signed-rank test showed that an intervention consisting of lectures and activities in the course did elicit a statistically significant increase in the pre-service teachers' confidence to interpret research papers/reports ($Z = -2.828$, $p = 0.005$).

The Confidence of Conducting Research in their Classrooms

Pre- and post-intervention, the participants were asked to report their confidence vis-à-vis conducting a research study in their prospective classrooms on a 5-point Likert-scale (i.e., 1 = "Not at all confident" to 5 = "Extremely confident").

After the intervention, the participants' average level of confidence to conduct a research study in their classrooms slightly dropped from a mean of 3.53 (SD = .774) to a mean of 3.47 (SD = .845). In both cases their level of confidence was between "Neutral" and "Confident", while the medians and modes were the same, 4 = "Confident."

As for the level of confidence for conducting an in-class research study, the Wilcoxon signed-rank test showed no statistically significant difference between pre- and post-intervention (Z = -.406, p = .685).

Discussion and Conclusion

Most pre-service teachers reported that the research component had improved their inquiry, reflective, and critical thinking skills. This outcome mirrors what is found in the literature in terms of how engaging student teachers in research can positively impact the development of their critical thinking skills to become more reflective as educators (Crawford-Garrett et al., 2015; Gordon, 2011; Kotsopoulos et al., 2012; Lattimer, 2012; Ulvik & Riese, 2016; van Katwijk et al., 2019).

Furthermore, the literature (e.g., Gordon, 2011; Kitchen & Stevens, 2008; Tosun, 2014; Ulvik & Riese, 2016; van Katwijk et al., 2019) proposed that partaking in research-related courses could enable pre-service teachers to learn about the different aspects of the research related to research methodologies, reviewing literature, developing a proposal, and collecting and analysing data. Comparable quantitative and qualitative outcomes emerged from the present research study. This was, for instance, shown in the notable increase of the participants' reported level of confidence to interpret research reports/papers following the research intervention compared to the baseline data. It was also noticed through their proposals of feasible and practice-driven research projects following the research intervention and practicum. This finding was specifically reflected in a participant's statement, "I was involved in research in my undergrad but do feel that this course helped me further develop my ability to interpret different research projects" (Participant 5). Furthermore, the enhanced research knowledge was echoed in the participants' increased use of technical research-related terms following the intervention.

On another note, there was a slight decrease in the pre-service teachers' confidence to conduct research in their classroom after the intervention and their practicum placement. This could stem, in part, from the reality they faced during the teaching placements; the participants could have felt overwhelmed by all the teaching duties (e.g., the creation and delivery of lesson plans and assessments), that the classroom teachers must fulfil. This interpretation echoes findings from Hennessy and Lynch (2019), whose pre-service teacher participants highly rated the statement "[t]eacher research holds value for the wider educational community," but agreed less with their ability to "function simultaneously as a teacher and researcher" (p. 602). Such an outcome was attributed, in part, to the high intensity of the full-time teaching obligations.

Relatedly, participants from both groups communicated challenges, including designing a research study and writing about its findings in addition to time constraints, getting the support/approval of different stakeholders, and funding. Similar challenges emerged from pertinent literature (e.g., Hennessy & Lynch, 2019; Kotsopoulos et al., 2012; Lattimer, 2012; Ulvik & Riese, 2016; Zambo & Zambo, 2007).

Finally, findings from the current study showcased how the introduction of the research component to the pre-service teachers has helped them to realize the key connection between teaching and research to improve their practice. Here, teachers transcend consuming knowledge and engage in producing it. The latter outcome aligns with the recent urge to

involve teachers in research (Hemsley-Brown & Sharp, 2003) as a way to turn schools into centres of inquiry and support collaborations that would result in positive and sustainable changes in education (Martinovic & Horn-Olivito, 2020; Martinovic et al., 2012).

Based on the study outcomes and reviewed literature, we recommend a further incorporation of research components in the pre-service education courses. For instance, in a two-year BEd program such as offered in Ontario, Canada, an introductory first year course could aim to present the main research components (e.g., research problem, research question, literature review, collecting and analyzing data) to pre-service teachers. The same cohort could take a more comprehensive research course during their second year through which they would put theory into practice by conducting a small-scale study (i.e., action research or a collaborative inquiry with the associate teacher) during their last teaching placement. The research course component may include identification of a research problem, and collection and analysis of data that would be elaborated on in a brief research report. The specific course requirements regarding the length and complexity of the project and the report would depend on the instructor's and teacher program's intentions.

We believe that the pre-service research experience would motivate teachers to be more open to participating in research in some form whether as participants, partners, or leaders. Despite perceiving obstacles in conducting their own research, some of them may be inspired to continue with graduate studies, especially if their workplace is supportive (Hennessy & Lynch, 2019), or if they see how conducting research can shape their future and answer some inquiries they have about educational theory and practice (Crawford-Garrett et al., 2015).

Such interventions would help bridge the gap between the knowledges that (typically) teachers and researchers have (McIntyre, 2005). We saw evidence that the pre-service teachers in both courses have moved a couple of notches on the continuum (Fig. 1), passing through "the articulation of craft knowledge" and "the reflective thinking for classroom teaching." Although their "craft knowledge for classroom teaching" (p. 361) was still nascent, they have obtained a valuable understanding of a teacher-as-researcher role that may inspire them to pursue some form of research, when ready. Collaborations of researchers with teachers would help move the traditional research community closer to the other end of the McIntyre's continuum and inform the academics of the efficiency of their educational endeavours, like it did in our case. One outcome of this study was that a described, largely experimental, Teacher-as-Researcher course was shared with several Ontario BEd programs and became integrated in their curriculum.

One possible framework for inducting teachers into the role of a researcher is described in Martinovic (2016) and Martinovic and Horn-Olivito (2020). The long-term collaboration between the university and a local public school board resulted in a two-pronged implementation of the idea of teacher-as-researcher. On one side, the faculty members and Graduate students supported different teams of in-service teachers to conduct CIs. On the other side, a research component was introduced in the pre-service program, and future teachers were encouraged to take part in the CIs conducted in their schools. The results of this initiative were encouraging, supporting the notion that all involved educators will engage in the 21st century type of schooling, described by Harste (2001) as "education is inquiry and inquiry is education" (p. 2). Building on their own project which showcased a successful research collaboration between pre-service and in-service teachers, Lemisko et al. (2014) advanced that "[t]he internship is a site for teacher education where collaborative inquiry becomes an effective approach to partnering for transformative practice" (p. 137).

To conclude, although the participating pre-service teachers reported a certain (albeit reasonable) fixation on potential obstacles for conducting in-class research, study outcomes demonstrated how the introduction of research in a BEd program could be enlightening for

these future teachers on many levels. First, it helped them grow as professionals by improving their reflective, critical thinking, and research-related skills. Also, it made them realize that conducting in-class research is not only feasible, but also valuable in informing their teaching practice. Once employed, it would be beneficial for them to accompany school research teams and obtain more confidence in conducting research as a part of their teaching profession. Since one of the key obstacles for teachers to conduct research is the lack of time (Martinovic et al., 2012), in-service teachers should be, as highlighted in Martinovic (2016), provided some release time to engage in collaborative research projects. Furthermore, we propose that giving teachers the opportunities to participate in research events to either attend or present their work would further motivate them to get involved in research.

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