Conventionality and Evidence: Two Elements of Professional Development that Could Matter to Teachers

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Abstract

Professional development (PD) is one way to maintain or increase teacher effectiveness in any number of domains. However, PD comes in many formats and with a wide range of evidence on its effectiveness – both of which can shape teachers' perspectives of the PD even before they participate. The purpose of this research was to examine how elementary and secondary teachers evaluate different types of professional development programs based on their content and delivery format and on their supporting evidence. Teachers were quasi-randomly assigned to read one of four vignettes describing a fictitious professional development program claiming to improve student motivation. There were four PD conditions resulting from crossing two programs (conventional vs. unconventional) and two types of evidence (experimental vs. qualitative). Teachers (n = 539) evaluated one of the four PD options in terms of its quality and how efficacious they thought it would be in helping them motivate students. On both outcomes, elementary teachers preferred PD supported by qualitative evidence over experimental; whereas, the opposite was found for secondary teachers. There were no preferences based on conventionality. We discuss the implications of these results in terms of making information accessible to teachers and in terms of addressing teachers' research literacy.

Key Words: teachers; student motivation; experimental design; vignettes; evidence-based

Conventionality and Evidence: Two Elements of Professional Development that Could Matter to Teachers

Every year principals, school boards, and education systems make huge financial and time investments into professional development (PD) for classroom teachers. However, the investment in PD may not guarantee a substantial return. The body of literature on the effectiveness of PD is somewhat conflicted (Fullan 2007, Guskey 2002). As such, researchers continue to work towards identifying the characteristics that distinguish effective from ineffective PD (Darling-Hammond, Hyler, and Gardner 2017). After reviewing 35 recent studies, Darling-Hammond and colleagues suggest that the following seven elements are part of effective PD: content focused, active learning, collaboration, modeling, coaching and expert support, feedback and reflection, and sustained duration. Although this list seems relatively comprehensive, it lacks consideration of what elements of PD prompt teachers to participate or help convince them about the effectiveness of the content or practices being promoted. In other words, because PD is one way to maintain and increase teacher effectiveness in numerous domains (Kennedy 2016), it is essential that the elements of PD that influence teacher's engagement with and uptake of PD content are better understood. Research that explores (1) how different PD content and delivery formats encourage teacher engagement and (2) the types of research evidence used in professional development that teachers find compelling would be particularly beneficial in this regard.

Professional development is often sought when curricular changes occur and teachers need new skills related to content, instruction, or assessment. Although student motivation is not a curricular area, it is one of the most important aspects of effective learning. Increases in students' levels of adaptive motivation can help them attain learning outcomes (Lin-Siegler, Dweck, and Cohen 2016), reduce negative-valence achievement emotions (Pekrun 2006), promote positive attitudes connected to the learning context (Gray and DiLoreto 2016), and augment academic performance (Deci and Ryan 2016). Unfortunately, teachers report student

disengagement and lack of interest as some of their top teaching concerns (Turner, Warzon, and Christensen 2011). Moreover, student motivation is also an area of responsibility for which teachers tend to feel low levels of personal responsibility paired with little preparation (Daniels, Poth and Goegan 2018, Turner *et al*. 2011).

Given these deficits, it seems that PD in the area of student motivation may be of great benefit to teachers. But what elements of motivation PD would best prompt teachers to participate and convince them of the benefits? The purpose of this research was to examine how elementary and secondary teachers evaluated fictitious motivation PD sessions based on their content and delivery format (conventional vs. unconventional) and its type of evidence (randomized experiment vs. qualitative interviews). We aimed to answer the question: "Do elementary and secondary school teachers' evaluation and sense of efficacy depend on the conventionality and type of supporting evidence associated with motivation PD?". This research can help researchers develop PD that resonates with teachers. To provide a background on this topic, we first provide an overview of PD principles, outline various types of evidence-based practices, and finally we tailor the discussion to motivation.

Professional development

Professional development can be broadly defined as "activities that aim to develop an individual's skills, knowledge, expertise and other characteristics as a teacher" (OECD 2009). Professional development as a means to improve teaching is widely accepted as standard practice (Borko 2004, Kennedy 2016) and internationally it is estimated that 88% of teachers participate in PD on an annual basis (OECD TALIS 2013 Database). Financial costs associated with PD vary widely and are sometimes covered by schools or boards, and at other times absorbed by teachers personally. Professional development comes in many formats including taking courses or workshops, attending seminars, observing other teachers, collaborative projects, or professional learning communities to name a few. Within this range of discrete activities, Borko (2004) also highlights that there are at least four components of a teacher's

professional learning experience: the teacher, the facilitator, the program itself, and the context. Additionally, scholars point to a shared set of attributes that may contribute to the effectiveness of the PD program itself. In addition to the list generated by Darling-Hammond and colleagues (2017), are components such as using a transformative approach that integrates school policies and curricular mandates, being inquiry-based, and promoting collaboration (e.g., Hill, Beisiegel, and Jacob 2013).

Even with this set of guiding principles, many evaluations of PD produce inconsistent results in terms of changed practice (e.g., Arens *et al*. 2012, Bos *et al*. 2012, Avalos 2011, Guskey and Yoon 2009, Kennedy 2016). Moreover, these conclusions are based on results from a wide range of research designs including randomized trials, observations, or self-reflection to name just a few (e.g., Girvan, Conneely, and Tangney 2016, Gore, Llloyd, Smith, Bowe, Ellis, and Lubans 2017). Hill and colleagues (2013) suggest that one way to move forward is to "execute more rigorous comparisons of professional development design elements at the initial stages of program development" (p. 476). A complementary option is to test the types of PD content, format, and evidence that teachers find compelling. After all, if teachers are unconvinced by the content, delivery format, and evidence supporting the PD, administrators and researchers may be fighting a more difficult battle than necessary. In other words, teachers' opinions and preferences about PD may influence their openness to the PD in any content area and its subsequent effectiveness even before they participate. This notion would be supported by several social-cognitive theories including triadic reciprocal determinism (Bandura 1978) or the theory of planned behaviour (Ajzen 1991) – both of which highlight the influence of beliefs on behaviour. We were interested in the extent to which teachers were convinced by the type of evidence associated with fictitious motivation PD as well as its conventionality in terms of content and delivery format.

Types of evidence

Like many professions, the field of education has recently become keenly focused on developing and using evidence-based practices. In Canada, The Ontario Ministry of Education states it “is committed to developing and implementing policies, programs, and practices that are evidence-based [and] research-informed” (2017) and Alberta Education “supports and enhances collaboration, communication, implementation, and mobilization of evidence-based and research-informed policy and practice dedicated to the improvement of learning” (2018). Similar statements can be found by the US Department of Education (2016), the Department for Education in England (Coldwell *et al*. 2017), and the Australian Government (2016). Arguably, given these priorities, current PD opportunities should be drawing on robust bodies of evidence to support their recommended practices. An important consideration that may often be overlooked, however, is to examine what type of evidence teachers find convincing.

Evidence-based practice in education refers to employing teaching practices that have been shown to be effective by credible research (Slavin 2002). A practice is only deemed evidence-based when it is supported by multiple high-quality research studies demonstrating that the practice causes meaningful change in student outcomes (Odom *et al*. 2005). As such, although qualitative interview-based data can be part of support for evidence-based practices (World Health Organization 2014), more often than not, support for evidence-based practices is derived from quantitative experimental designs, of which a randomized trial is often considered the gold standard (Styles and Torgerson 2018).

While this standard is true for researchers and administrators, the evidence produced by randomized controlled trials may not necessarily convince teachers of the effectiveness of the practice. At a broad level, De Vries and Pieters (2007) suggest that both practical and fundamental gaps contribute to a disconnect between the evidence-based recommendations made by researchers and the instructional choices made by teachers. Practical gaps such as lack of time, resources, and collaboration make it difficult for teachers to adjust to new evidence. Fundamental gaps suggest that teachers do not use evidence-based practices because they

view the nature of knowledge and theory differently than scientists (De Vries and Pieters 2007). In this regard, teaching level may also be relevant. Some evidence suggests that elementary teachers are less likely than secondary teachers to use academic research to inform their choice of teaching styles (Nelson, Mehta, Sharples, and Davey 2017). Coldwell and colleagues (2016) state that teachers trust empirical research most when it meets a specific need and other teachers endorse it. In other words, on one side of the fundamental gap are researchers who are trained to produce knowledge according to traditional scientific standards while on the other side are teachers who often rely on subjective knowledge in their daily teaching (McIntyre 2005, Pomeroy 1993).

Motivation best-practices

The separation between researchers' evidence-based recommendations and teachers' practices is rampant in the area of achievement motivation. In terms of recommendations, Linnenbrink-Garcia, Patall, and Pekrun (2016) draw across the major theories of achievement motivation, decades of qualitative and quantitative research, systematic reviews, and meta-analyses to list the following "five central instructional design principles [that] support…beneficial forms of motivation and emotion" (p. 233):

(1) Support competence through well-designed instruction, challenging work, and informational and encouraging feedback.
(2) Support students' autonomy through opportunities for student decision-making and direction.
(3) Select personally relevant, interesting activities that provide opportunities for identification and active involvement.
(4) Emphasize learning and understanding and de-emphasize performance, competition, and social comparison.
(5) Support feelings of relatedness and belonging among students and with teachers.

While teachers pride themselves on creating interesting activities and building relationships with their students (e.g. Boynton and Boynton 2005, Vidourek, King, Bernard, Murnan, and Nabors 2011, Zahorik 1996), there are many decisions they make that run contrary to Linnenbrink and colleagues' (2016) recommendations. For example, in contrast to this list of recommended practices, teachers continue to use rewards to support student motivation (Radil 2017, Reeve 2009) and are rated as more effective for doing so than teachers who use rationales (Flink, Boggiano, and Barrett 1990). Moreover, it seems that pre-service teachers trade their strong commitment to the principles of mastery that underlie many of Linnenbrink and colleagues' recommendations, for performance focused practices when they start teaching (Daniels 2015). There are also differences in terms of the application of these recommendations across teaching levels: high school teachers report practices that are less aligned with these recommendations than middle school teachers, who are less aligned than elementary school teachers (Eccles and Midgley 1989, Retelsdorf, Butler, Streblow, and Schiefele 2010). Daniels and colleagues (2016) tested for concordance between teachers' responsibility for student motivation and practices that align or contrast with these recommendations. They found that teachers who felt responsible for motivation were less inclined to comparison practices, however, they did not choose practices that would be akin to Linnenbrink and colleagues' recommendations such as supporting competence.

Researchers offer several explanations for why teachers continue to use motivational strategies that are contrary to evidence. Turner (2010) highlights that motivation research is "meant to be broad and generalizable, [whereas] educational practice must attend to individual and situational differences" (p. 110). Additionally, many motivation recommendations are not contextualized to the complexities and nuances of actual classrooms (Kaplan and Patrick 2016). As a result, some teachers believe that they know what works best in their classroom regardless of the evidence. Teachers themselves report student motivation as a domain in which they feel underprepared (Turner 2010) and not necessarily personally responsible (Daniels *et al*. 2018,

Lauermann and Karabenick 2013). In Alberta Canada, where this research was conducted, the only domain in which teachers scored below the international average on the Teaching and Learning International Survey for efficacy measures was in the domain of student engagement (Alberta Government 2014) – or in other words, student motivation. Perhaps not surprisingly then, Kennedy (2016) identified "student participation," arguably a sign of motivation, as one of four persistent challenges facing teachers and thereby often part of PD programs.

Motivation interventions: Types and evidence

When it comes to helping teachers learn evidence-based motivational practices, researchers and PD developers can pull on a wide range of content, formats, and evidence when deciding what to offer to teachers and how. In other words, there exists motivation interventions with conventional and unconventional content, that can be selected for in-person or online PD sessions, and accompanied by experimental or qualitative evidence.

Conventional motivation interventions tend to involve teachers making changes to course assignments, classroom structures, or their own behaviors to influence student motivation (e.g., Harackiewicz *et al*. 2016). For example, Reeve and Cheon's (2014) autonomy-supportive instructional program (ASIP) is a well-known conventional intervention supported by experimental evidence. In ASIP, teachers participate in a three-part program spanning 12 weeks that includes an initial instructional workshop followed by at least two opportunities for collaborative group discussions and personal reflection and integration into their own classroom. Compared to a delayed-treatment control group, teachers in the ASIP experimental group were able to teach in a more motivating manner and had students who displayed higher levels of task engagement. Other forms of autonomy-supportive interventions are also supported by experimental evidence (e.g., Hardré and Reeve 2009), but some researchers also use qualitative methods like focus groups to explain the effectiveness of the intervention (e.g., Sebire *et al*. 2016). Many school boards continue to rely on conventional PD content and

delivery such as specialized instruction brought into the school or district-wide PD conferences and sessions. Thus, teachers may find this PD familiar and effective.

Unconventional motivation interventions target students' beliefs related to motivation rather than teachers' practices and are often delivered online (e.g., Yeager and Walton 2011). The most well-known of interventions as such is built on Dweck's mindset theory, and tends to be evaluated by randomized control trials (e.g., Donohoe, Topping, and Hannah 2012, Yeager *et al*. 2014; Yeager *et al.* 2019). For instance, in one study, teachers had their students engage in web-based activities on a control-website that taught study skills or on an experimental-website that taught growth mindsets (Sriram 2014). Students assigned to the experimental group showed increased academic effort relative to those in the control group. Other experimental or meta-analytic evidence on mindsets is conflicted. For example, the results of Burnette and colleagues' (2017) randomized controlled trial with rural adolescent girls showed evidence of changed mindset but not attitudes or grades. And a recent meta-analysis revealing small effects, at best, for mindsets and grades has further called these associations based on experimental data into question (Sisk, Burgoyne, Sun, Butler, and Macnamara 2018). Despite this, teachers and schools appear to "like" mindset interventions, suggesting that online brief formats with less conventional content may be a welcome change to longer PD sessions and that perhaps teachers are less impressed by experimental evidence than researchers who greatly prize such designs and evidence.

The current study

Because PD is a central vehicle for increasing teachers' exposure to evidence-based practices, it is important to understand how they value different types of PD based on content and delivery and their associated types of evidence. This is an especially important undertaking in the field of motivation due to the misalignment between teachers' concerns with student motivation and their capability to intervene effectively. Moreover, differences in perceptions of PD may exist for elementary and secondary school teachers. As such, the purpose of this research was to

examine how elementary and secondary teachers evaluated fictitious motivation PD based on its content and delivery format (conventional vs. unconventional) and its type evidence (randomized experiment vs. qualitative interviews).

Atzmüller and Steiner (2010) define a vignette as "a short, carefully constructed description of a person, object, or situation, representing a systematic combination of characteristics'' (p. 128). We used a pilot study to design four PD vignettes followed by a 2 x 2 x 2 quasi-experimental design to answer the following research question: Do elementary and secondary school teachers' evaluation and sense of efficacy depend on conventionality and type of supporting evidence associated with a fictitious motivation PD? We deemed that using vignettes of fictitious PD was the most efficient way of answering our research question because it is conducive to reaching a high volume of teachers, but also allowed us to create four different conditions through the manipulation of our variables of interest (Aguinis and Bradley 2014).

Method: Pilot study of vignettes

Procedure

We created and piloted four vignettes that described fictitious professional development (PD) programs aimed to improve student motivation. Each condition addressed the conventionality of the program, including its content and delivery format, and the type of evidence resulting in a 2 x 2 design: *conventional* vs. *unconventional* and *experimental* vs. *qualitative* evidence. We recruited pre-service teachers from a university participant pool in Educational Psychology and randomly assigned them to one of the four vignette conditions. After reading their assigned vignette and completing a comprehension question, participants responded to the following open-ended question: "What part of the PD program was most appealing?". Participants also responded to items about academic success, mindsets, and achievement goals for part of a different project not reported on herein. In exchange for their participation, students received 5% course credit. The purpose of this pilot was to ensure that all vignettes were equally compelling

and that no condition was more attractive than another. The University Ethics Board approved the pilot study.

Participants

The pilot sample consisted of 196 pre-service teachers enrolled in a research participant pool. Participants ranged in age from 18-55 years (M = 25.08, SD = 6.67), with the majority falling between the ages of 19-26 (75%). More women (79%) than men (21%) participated, one participant indicated a non-binary gender, and the sample was mainly Caucasian (76%). Participants planned on being either elementary school teachers (47%) or secondary school teachers (53%). Participants selected the study through an online system that then randomly assigned them to one of the four vignette conditions: 55 students were assigned to the conventional-experimental vignette, 47 to conventional-qualitative, 53 to unconventional-experimental, and 41 to unconventional-qualitative. One hundred and 47 participants responded to the open-ended question (ns = 38, 35, 39, 35 from each condition, respectively).

Measures

Vignettes

The four vignettes described a fictitious PD program called “Motivation Matters”, which was designed to help teachers better support student motivation. Each vignette varied on two dimensions: *conventional* vs. *unconventional* and *experimental* vs. *qualitative* evidence. Although fictitious, the motivation PD descriptions were modeled after pre-existing programs. We described the conventional PD as focusing on classroom motivation practices delivered during a two-day in-person PD session much like the teacher convention that is required by the district. The cost was $250 per teacher/participant. We described the unconventional PD as focusing on teacher beliefs about motivation delivered during a one-hour online PD session much like common motivation interventions such as Attributional Retraining (Hamm, Pery, Chipperfield, Murayama, and Weiner 2017) or Mindsets (Yeager *et al*. 2016). The cost was $20 per participant. For evidence, we provided experimental or qualitative sources of information.

We described the experimental evidence as based on multi-site randomized trials with 3.5 year follow up sessions supporting the effectiveness of the PD. We described the qualitative evidence as involving teacher interviews and personal attestations 6 months after participating in the PD. The vignettes served as the independent variable. Copies of the vignettes can be found in Appendix A.

Appeal of PD

To make sure that no details of any vignette were intuitively more appealing than others, we asked pre-service teachers to respond to the following question: What were the most appealing components of the Motivation Matters program?

Plan for analyses

We performed a content analysis (Hsieh and Shannon 2018) of the open-ended responses. Two research assistants separately coded the responses. After this open coding, they met to finalize a codebook and identify higher-order themes. Inter-rater reliability was consistently high. Finally, the research assistants discussed if any code or theme suggested a preference for one condition relative to the others.

Results

Irrespective of the vignette assigned, participants' reports of the program's appeal did not differ and overall, three themes emerged in their responses: (1) program structure, (2) program content, and (3) evidence of program effectiveness. Each of these themes is reviewed below.

First, pre-service teachers described components of the PD program's structure as what they found most appealing such as who the program facilitators were, the program format, cost of the program and the resources associated with the program. Participants appreciated that the PD facilitators were current and former teachers with experience in the area of interest. For example, one individual commented: "access to knowledgeable consultants". Participants also referred to the price of the program as appealing, both at a $20 and $250 cost, commenting: "I think it was a reasonably priced program" or "the low price certainly makes it appealing". The

program's format was identified relatively equally as appealing by pre-service teachers referring to both the two-day in-person format and one-hour online format. This can be seen in the comments: "I liked that it was an online aspect. Teachers can work on it whenever they have time" and "it has both lecture and discussion: a chance to listen as well as a chance to engage afterwards". Similarly, participants reported liking the on-going information provided after the program's completion for teachers' reference and support, in terms of both hand-outs and an online chatroom as the type of resource.

Second, regardless of what program they had been randomly assigned to, pre-service teachers described aspects of the program's content as what they found most appealing. For instance, they referred to the PD's overarching goal, for example, "the aim to equip teachers to support student motivation" or commented more generally about goals such as, "there was a specific problem within the classroom that the program was targeting." Participants also commented on learning new motivational strategies as an appeal: "the ability to learn how to motivate the students." Moreover, teachers talked about the possible benefits for both teacher and student, for example, "building teacher confidence" and "getting kids excited to learn."

Third, regardless of vignette assigned, pre-service teachers described the evidence supporting the program's effectiveness as what most appealed to them. Respondents made an equal reference to both qualitative and experimental evidence. Those who read a PD vignette supported by qualitative evidence commented: "how the teachers who took part in this program said that they grew in confidence when motivating their students" and "how much teachers enjoyed it and how helpful they said it was for their students". Participants who evaluated a program supported by experimental evidence also commented on the evidence: "the 10-20 percent increase showing students are doing better" and "the results seen in the students, even 3.5 years later."

These results instill confidence that the vignettes are relatively equivalent in terms of their appeal to teachers in training. Therefore, in their subsequent use with practicing teachers,

any findings should reflect true differences rather than a preference for some element of the vignettes themselves.

Method: Main study

We used a quasi-experimental post-test only design to determine teachers' responses to fictitious PD vignettes.

Procedure

The main study took place during a two-day mandatory teacher convention. Research assistants approached teachers to participate. Those who agreed were given a clipboard containing one of the four vignettes in a quasi-random fashion. After completing a comprehension check, teachers completed several related likert questions measuring their response to the PD program. All participants were entered into a draw for one of three $100 gift cards from a vendor of their choosing. Consent was implied by the completion of the questionnaire. The University Research Ethics Board approved the main study.

Participants

Research assistants gave the survey to 539 teachers. However, we reduced the sample to 460 full or part-time teachers who passed a comprehension check related to the vignette. Of the 460, 117 were assigned to the conventional-experimental vignette condition, 131 to conventional-qualitative, 106 to unconventional-experimental, and 106 to unconventional-qualitative. Participants ranged in age from 20-69 years (M = 37.18, SD = 11.44), were mostly female (73%), and largely identified as Caucasian (80%). Participants had 0-42 years teaching experience (M = 11.16, SD = 9.87) and were relatively evenly divided between elementary (n = 225) and secondary school (n = 235).

Measures

Independent variable

We used the same four vignettes as in the pilot study to create the two 2-level independent variables. We also included teaching level as a naturally occurring independent variable with two levels, elementary or secondary.

Manipulation check

To ensure that participants had fully read the vignette we used a simple comprehension question: Specifically, we asked participants "How will the PD program be delivered?" and gave them three options: (a) in person, (b) online, or (c) during teacher convention. Participants who received a conventional vignette needed to select (a) and those who received an unconventional vignette needed to select (b) to pass the comprehension check.

Dependent variables

We created five questions to evaluate the PD program (see Table 1 for items). We also included the same four items measuring sense of teaching efficacy for student engagement/motivation as used on the 2013 OECD TALIS survey in which Alberta teachers participated. Participants indicated how much they felt the program would increase their confidence to (1) help students think critically; (2) get students to believe they can do well; (3) help students value learning; and (4) motivate students who show low interest. All items were on a 1 = not at all, to 9 = very much so, rating scale.

Plan for analyses

First, we used principal component factor analysis to determine if the five evaluation items could be combined into a single scale. Second, we ran reliability statistics and correlated the two dependent variables. For the main analyses, we used a 2 teaching level (elementary versus secondary) x 2 conventionality (conventional vs unconventional) x 2 evidence (experimental x qualitative) ANOVA to analyze the effects on each dependent variable.

Results

Preliminary analyses

The principal component analysis with the five evaluation items resulted in a one-factor solution explaining 72.67% of the variance with an eigenvalue = 3.63 and all items loading above .75 (Table 1). As such, we chose to sum the evaluation items into a single scale (M = 30.45, SD = 7.12) with a reliability coefficient α = .91. The reliability coefficient for the teaching efficacy scale for student engagement was α = .91 (M = 25.09, SD = 6.79). The two dependent variables were positively and significantly correlated r = .73, p < .001.

Main analyses

For evaluation of the program, a significant teaching level x evidence interaction emerged, F (1, 425) = 8.38, p < .01, η^2 = .02 (Figure 1). No other main or interaction effects were statistically significant. The interaction revealed that, regardless of the conventionality of the PD opportunity, elementary teachers gave higher evaluations to the PD supported by qualitative evidence (M = 31.41, SE = .66, CIs [30.10, 32.72]) than experimental (M = 29.89, SE = .70, CIs [28.51, 31.26]). The opposite effect characterized secondary teachers who gave stronger evaluations to the PD supported by experimental evidence (M = 31.26, SE = .68, CIs [29.93, 32.59]) compared to qualitative (M = 28.83, SE = .69, CIs [27.48, 30.18]).

For teachers' assessment of how efficacious they would feel after participating in the PD, the same pattern of results emerged: significant teaching level x evidence interaction, F (1, 442) = 4.69, p < .05, η^2 = .01 (Figure 2). No other main or interaction effects were statistically significant. Again, regardless of the conventionality of the PD opportunity, elementary teachers gave higher evaluations to the PD supported by qualitative evidence (M = 25.86, SE = .62, CIs [24.63, 27.09]) than experimental (M = 24.60, SE = .67, CIs [23.28, 25.92]) and secondary teachers gave stronger evaluations to the PD supported by experimental evidence (M = 25.61, SE = .63, CIs [24.37, 26.84]) compared to qualitative (M = 24.08, SE = .64, CIs [22.83, 25.34]).

Discussion

The purpose of this research was to examine how elementary and secondary teachers evaluated fictitious motivation PD based on its conventionality (i.e., content and delivery format)

and its type of evidence (randomized experiment vs. qualitative interviews). We focus our discussion on two main points: First, elementary and secondary teachers differed on how they evaluated experimental compared to qualitative evidence. Second, teachers showed no preference for conventional or unconventional PD targeting student motivation. Finally, we turn our discussion to the implications of these results in terms of recommendations for PD developers and administrators and in terms of addressing teachers' research literacy. Although the fictitious PD targeted student motivation specifically, we discuss the implications more generically.

Types of evidence

We found that elementary and secondary school teachers appeared to appreciate different types of evidence both when evaluating the effectiveness of professional development opportunities and speculating on how effectively the PD would increase their efficacy to support student motivation. For both outcomes, elementary teachers responded more favorably to the qualitative evidence than the experimental. In contrast, secondary teachers responded more favorably to the experimental evidence than the qualitative. Previous research has highlighted that elementary teachers are more closely affiliated with non-traditional views of science compared to secondary teachers who are more traditional (Pomeroy 1993). Indeed, extant research shows that academic research has a smaller impact generally on teaching practices than teacher-generated ideas and this effect is most prominent for elementary teachers (Nelson, Mehta, Sharples, and Davey 2017), and this seems to be the case for student motivation. These findings are contrary to other research studies that indicate elementary teachers to have the highest engagement in data use practices, compared to their middle school and high school colleagues (Borgmeier, Loman, and Hara 2016, Reeves 2017).

This finding represents an important advancement in the area of PD effectiveness for student motivation specifically and more generally. Although Darling-Hammond and colleagues (2017) list "content focused" as a characteristic of effective PD, they make no mention of the

presence or type of evidence used to support the content of the PD. Insomuch as teachers are being encouraged to use evidence-based practices, arguably both the type and quality of evidence supporting any specific PD should be made known to the participating teachers. Moreover, presenting a wide range of evidence that considers both qualitative and experimental evidence, in a form of triangulation (Heale and Forbes 2013), may perhaps make the strongest case to both elementary and secondary school teachers. This is an empirical question that could be addressed in future research.

Implications

The effects of type of evidence leads to at least two important implications for those designing or selecting PD on student motivation for teachers. First, although there is a push for evidence from randomized-controlled trials in educational research and administration (Torgerson and Torgerson 2001), such priority may not be shared by elementary teachers. Thus, researchers may want to consider collecting multiple forms of evidence to make convincing cases for teachers at all levels (Wellington 2015). Like Cooper and colleagues (2017), PD developers may want to provide teacher-generated suggestions to increase their uptake of evidence-based practices, including interactive websites, research briefs, teacher discussion, and videos. This would be true for either conventional or unconventional types of PD.

Second, although different types of evidence may be appealing to elementary compared to secondary school teachers, insomuch as the types of inferences that can be made from experimental compared to qualitative data are different, there is a need to help teachers understand different types of evidence (Morrison, Raab, and Ingram 2009). Arguably the experimental data should have allowed teachers to be more confident in the program outcomes for themselves and ~~for~~ their students. Increasing teachers research literacy should be a focus of pre-service and in-service education, especially at the elementary level, and has been found to be critical to increasing the uptake of evidence-based practices in other professions (e.g., Stander *et al*. 2018). Strengthening the relationship and collaboration between schools and

universities is one way to help develop research literate teachers (Evans, Waring, and Christodoulou 2017). In having partnerships as such, teachers will be able to see the utility and value of the research recommendations as they would not only be made more accessible but also more tailored to the needs of the specific school's circumstances. Likewise, researchers could evaluate the effect of a culture of scholarly activity on support for experimental designs.

Conventionality

Interestingly, the conventionality of PD – that is, whether it offered conventional content about teaching practices in an on-site two-day format or unconventional content about motivation beliefs in an online brief format – had no effect on the evaluation of the PD or its expected impact on efficacy. Although we measured perceptions of effectiveness, our conventionality results are somewhat contrary to Darling-Hammond and colleagues' position that effective PD is focused on a specific content and of a sustained duration. This would imply that only our conventional vignette should have been viewed as effective, and that was not the case. This may be good news for researchers and administrators who are seeking novel ways for teachers to engage in PD, particularly related to student motivation, in a shorter time frame (Martell 2016, Tondeur, Forkosh-Baruch, Prestridge, Albion, and Edirisinghe 2016).

The conventional PD described sessions that targeted teachers' instructional practices related to motivation; whereas, the unconventional PD described a session that targeted teachers' beliefs about student motivation. While we expected teachers to possibly favour the content-based conventional PD because it may be more typical or familiar, it did not seem to influence teachers' perceptions of the PD or its effectiveness. Perhaps this reflects a push for teachers to become aware of how their beliefs influence their practice (Pajares 1992, Staats 2016) and to engage in reflective practice (Larrivee 2000).

In terms of the delivery format as part of conventionality, although our sample captured a wide range of years of experience and ages, most participants were relatively young and thus may be accustomed to learning online. Although the term "digital native" may be somewhat

contested (Helsper and Eynon 2010), the reality that most young people in Canada have been brought up surrounded by a digitally rich environment holds for several decades now. For example, graduates within the last 5-10 years may have taken online or blended delivery courses, searched Wikipedia, and handed in their assignments in an online learning management system (Greenhow, Robelia, and Hughes 2009, Ross, Morrison, and Lowther 2010). Moreover, now teachers may search Pinterest or listen to podcasts to access the information they need to support their teaching (Peterson-Ahmad, Stepp, and Somerville 2018). Extending into other domains of their life, they may choose highly accessible apps to support everything from weight loss to mental health (Donker *et al*. 2013, Mateo, Granado-Font, Ferré-Grau, and Montaña-Carreras 2015). In other words, the online delivery of our hypothetical motivation PD may be welcomed by teachers.

Implications

As an application of these results, developers and school administrators should be willing to entertain the use of unconventional content and delivery formats for PD, particularly related to student motivation, especially if the cost and time frame can be reduced (Yeager *et al*. 2016). Teachers report difficulties in finding the time to keep up with new research in conjunction with the many other daily demands they encounter (Van Veelen, Sleegers, and Endedijk 2017). Teachers also note issues of research accessibility and comprehensibility of research-based strategies (Cooper, Klinger, and Mcadie 2017). Unconventional content, brief, online PD may help increase the amount of PD, increase familiarity with topics, at a decreased demand for teachers. However, it is important to note that unconventional content and delivery was not rated more favorably than conventional content and delivery making both valid options.

Limitations and future research

The results of this research need to be considered in light of the following three limitations. First, this research used hypothetical vignettes to examine how teachers respond to different types of PD conventionality, in terms of both content and delivery formats, and evidence as it pertains to

student motivation. In future research, it will be important to clearly delineate content from delivery in vignettes since the two things do not necessarily indicate equivalent levels of conventionality. Moreover, while vignettes are an easy and effective way to place people into conditions, they may lack ecological validity (Hughes and Huby 2012) and seem too far removed from teachers' actual PD options to elicit valid responses. Although the vignettes were designed to mimic existing PD options in the area of motivation, we have no idea if the participating teachers view student motivation as an important area that they would desire PD. Thus, the topical nature of the vignettes may also have shaped the results and future research could use other content area to see if, for example, PD on pedagogical issues may produce different results.

Second, research assistants noticed that participants were not fully engaged in reading the vignettes and at times would jump to the questions. As evidence of shallow reading, 79 participants were excluded because they did not respond correctly to the comprehension question. Thus, vignettes, or any type of heavy reading, may not be suitable for data collection at a teacher convention. The effect of participants' lack of detailed reading on our results is unknown. Nonetheless, the differences between elementary and secondary teachers were striking and point to several directions for future research. For example, it is important to increase teachers' access to empirical research as well as their awareness of different types of evidence and the types of inferences that can be made from them. These increases should also take into account elementary and secondary teachers' interest in and roles around applying evidence-based practice in their classrooms (Tripney, Gough, Sharples, Lester, and Bristow 2018). It may be that secondary teachers are more familiar with scholarly activity due to having specialized in one subject and therefore believe their teaching practices should similarly be supported by evidence-based research.

Third, although this research involved practicing teachers from a variety of school districts, the teachers were largely from urban centres and from one Canadian province.

Insomuch as the value of evidence-based practice may vary across provinces or even countries, future research should seek a broader sample to confirm the preference of elementary school teachers for qualitative data and secondary school teachers for experimental data. In the same vein, it is also not lost on us that we used an experimental method to collect evidence from teachers, some of whom reported finding experimental evidence less convincing than qualitative evidence. Thus, future research in this area also needs to utilize a wider range of research methodologies to capture teachers' perspectives.

Conclusion

Administrators rely on PD to give teachers a wide range of learning experiences and ensure their skills remain current. Our results suggest that elementary and secondary school teachers are equally receptive to conventional and unconventional content and delivery of PD but are convinced by different types of evidence, at least as it pertains to influencing student motivation. Specifically, elementary school teachers found the motivation PD more compelling when it was supported by qualitative evidence rather than experimental. As such, PD developers may want to bring a wide range of evidence to bear on their programs to make them more appealing to teachers at all levels. However, we would be remiss if we did not also call on pre-service teacher education programs to increase elementary school teachers' understanding of the causal mechanisms that can only be argued through experimental evidence.

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Table 1

Principle Component Analysis of Evaluation Items

Item Wording	Component Loading
To what extent do you think this program would help you feel better equipped to motivate students?	.84
To what extent do you think the program delivery method is appropriate for teachers?	.76
To what extent are you convinced by the evidence supporting this program?	.85
To what extent do you think the Board should choose this program?	.91
Would you recommend this program to your Principal?	.90

Figure 1

Interaction between teaching level and evidence on evaluation

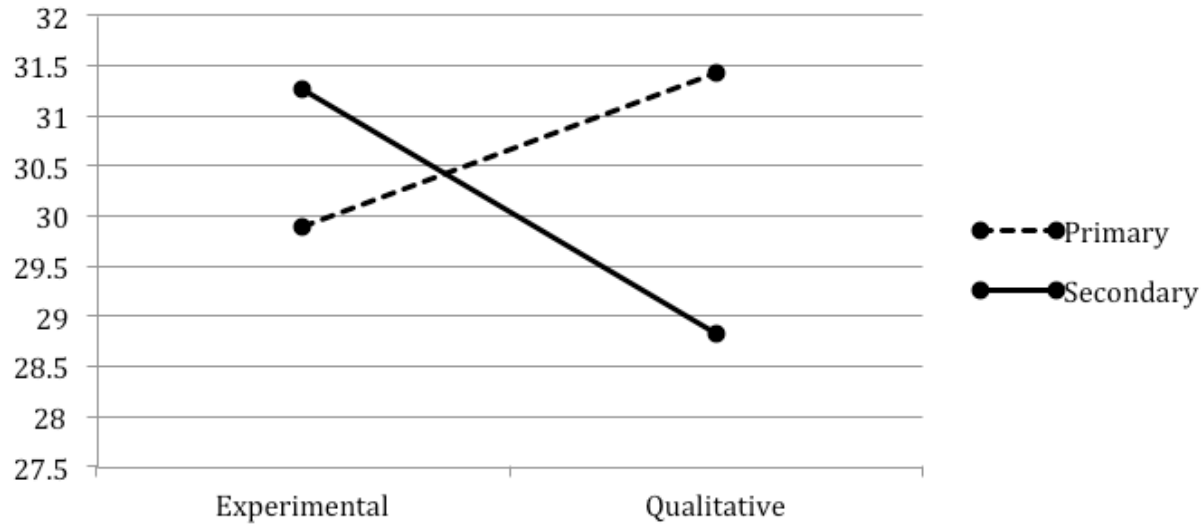
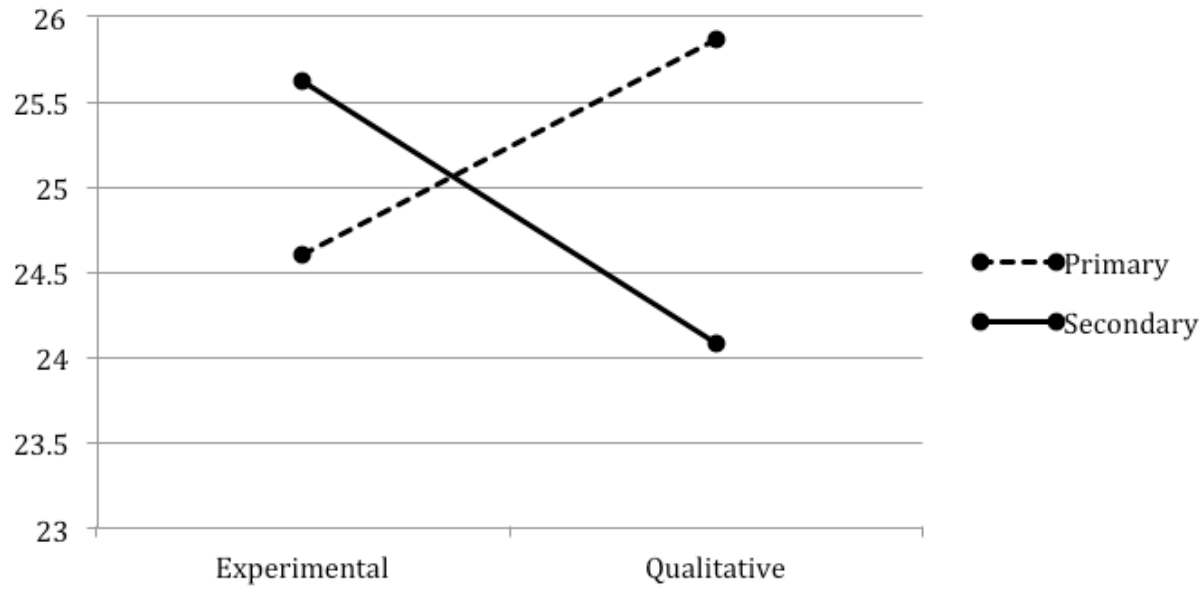


Figure 2

Interaction between teaching level and evidence on efficacy for student engagement



Appendix A

Information from the four cells was crossed to result in the 2 levels of delivery x 2 levels of evidence vignettes.

<table>
<tr><td colspan="2">Opening statement for all four vignettes: Motivation Matters is a comprehensive professional development program that is aimed to better equip teachers to support student motivation by addressing the school environment and educational experiences of students. The program is grounded in substantial research on factors that contribute to teachers' motivational strategies as well the organizational change literature as it relates to schools.</td></tr>
<tr><td>Conventional Program Description: The program is expected to benefit all teachers and students.
Key program elements include:
• The program consists of a two-day in person professional development session that is run by expert consultants who are current and former teachers.
• The session consists of three parts: (a) lecture where teachers are taught about supporting student motivation (b) discussion where teachers discuss how such practices could be implemented in their classrooms and (c) reflection where teachers consider how their own teaching can be modified</td><td>Experimental Evidence: The Board is interested in this program because, after an initial promising pilot study, a larger multi-site randomized experiment was used to evaluate the impact of the program in British Columbia. Teachers were followed for 3.5 years from the time of their participation in the program. Compared to the control group of teachers who did not participate in the program, teachers who participated in the program implemented more motivational strategies in</td></tr>
</table>

• Teachers are also provided with resources such as websites and handouts for future reference. • Professional development activities are also provided throughout the year geared toward classroom instruction and school environment. • The total cost to the school to deliver the program is $250 per teacher.	their classroom. There was roughly a 35% increase in motivational strategies used by teachers who were part of the program. Moreover, the program led to a 10-20 percent point increase in the number of students who were engaged in the classroom based on observational data.
Unconventional Program Description: Key program elements include: • The program consists of a one-hour online professional development session designed by expert researchers and teachers • The session consists of three parts (a) personal priming: where teachers think about their subjective beliefs regarding student motivation. (b) educational information: where teachers learn about the impact of beliefs and are presented with motivation	**Qualitative Evidence:** The Board is interested in this program because open-ended qualitative interviews with teachers were used to evaluate the impact of the program in British Columbia. A convenience sample of teachers were interviewed 6 months after the program was completed. Teachers commented that their students were “more motivated’ and that they themselves

skills (c) consolidation where teachers applying the information to their experiences. • Teachers are also provided with resources such as websites and handouts for future reference • An online chatroom will exist for the year so that teachers can continue to discuss the material presented with other teachers and researchers. • The total cost to the school to deliver the program is $20 per teacher.	were “definitely doing better” at implementing motivation practices in their classroom. Early analyses of achievement scores of students seem positive. Although more rigorous evaluations are still being awaited, teacher said that they “loved” the program and that it was “absolutely effective” in refining their motivational practices in their classrooms.