**Using theories of action approach to measure impact in an intelligent way: a case study from Ontario Canada**

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**1. Overview**

Now more than ever before, there is an impetus for schools to be more effective for more students (Brown *et al.,* 2017). Likewise, in a world of reduced public funding, schools need to be more efficient in how they use their limited resource. In the face of these pressures, being able to meaningfully and effectively measure impact is vital. This means that researchers, practitioners and policy makers should be regularly investigating whether initiatives have met their intended outcomes; and if they haven't, assessing why this is the case. For the same reasons, educators should be constantly seeking to understand why innovations do or don't work in order that future iterations can be improved. At the same time, if innovations have been found to be effective then it is reasonable to expect that these new approaches should be scaled up and rolled out across other schools, school boards and school systems that might benefit. Again this requires educators to understand this success: what components of these innovations were key in enabling them to achieve their required impact? Why was this the case? And do these key components hold elsewhere?

It also seems clear that measuring impact and enabling the scale up of innovations represent two sides of the same coin. To understand the impact of a new approach in any meaningful way requires us to understand why it was effective. To understand why it was effective requires us to look at the thinking underpinning the approach, the activities used to operationalise this thinking as well as how these aspects combined within a given setting to create changes in knowledge and action. To understand how innovations might be scaled up, meanwhile, requires us to ascertain whether this combination of thinking, activity and context might apply elsewhere. And if it is not possible (as it so often isn't) to perfectly replicate an innovation in a new setting, then what adaptations might be required? And what implications might these adaptations have for the innovation as a result?

Given the twin moral and financial drivers for schools and school systems to identify what is effective and to ensure all schools are able to tap into what is known about effective practice; and in light of the similarities in the knowledge required to understand whether something was effective and how others can benefit from its use, it would seem that in networked and self-improving education systems we both can and should be linking together ways of measuring the impact of innovations with the means to enable their scale-up (Earl and Timperley, 2015; Greany, 2015; Munby and Fullan, 2016). Indeed, the aim of this paper is to do to do just that by presenting an intelligent framework designed to support both the assessment of impact and the scale-up of effective innovations: a key aim that should be both supported by and underpin any approach to intelligent accountability. The framework presented is the Dialogic Model of Impact (DMI). DMI was designed with the specific purpose of evaluating the impact of Renfrew County Catholic District School Board's roll-out and expansion of the *Through their Eyes: Documenting Literacy and Learning in Kindergarten* approach to teaching and learning; as well as identify the potential value of *Through their Eyes* for other Ontario school boards. This paper will present both the genesis of the model and detail its application, drawing on interview data from 10 district leaders, principals and focus groups of 20 teachers. At the same time the paper will illustrate how

DMI has general applicability and its potential use for measuring the impact of any innovation as well as identifying the components of innovations that are vital to their successful scale-up.

## 2. Context and study setting

In this section of the paper I provide detail on three Ontario schemes established to promote teacher-led professional development and the roll-out of effective pedagogic practices mediated by digital technology. These are the *Teacher Learning and Leadership Program*, the *Provincial Knowledge Exchange program* and the funding available through *CODE* Technology and Learning Fund. Detail on these schemes is required as, between them, they represent the wider context for the *Through their Eyes* evaluation.

**2.1 The Teacher Learning and Leadership Program:** Ontario's Teacher Learning and Leadership Program (TLLP) represents an approach to teacher development that centres on teachers leading their own professional learning (Campbell *et al* (2016). The TLLP began in 2007 as a joint initiative between the Ontario Ministry of Education and the Ontario Teachers' Federation, with aims to:

1. Create and support opportunities for teacher professional learning;
2. Foster teacher leadership; and
3. Facilitate the sharing of exemplary practices for the broader benefit of Ontario's students.
   (Ontario Ministry of Education, n.d., p. 3)

The origins of the TLLP reflect a shifting wider international discourse that spotlights teacher agency as fundamental to improving teacher quality: in particular that teachers should be central and instrumental to educational change rather than positioned as the recipients of externally mandated reforms. The result of this shift, Campbell *et al* (2016) argue, sees teachers leading changes in educational policy and practice in partnership with educators at all levels throughout the education system (i.e. at school, district, provincial, national, and potentially even international levels).

For their TLLP proposals, teachers self-identify an area of practice or an issue that they are interested in investigating, which also has the potential to benefit their students and/or school (Campbell *et al.,* 2016: 227). Project proposals are required to include: a description of the proposed project; how the project will contribute to student learning and Ontario's priorities for educational excellence, equity, well-being and public confidence; and a rationale for the proposed TLLP team's professional learning objectives (Campbell *et al.,* 2016: 223). Since the program began, over 4,000 teachers have been directly involved in TLLP; with some 100 TLLP teacher-led projects funded every year (Campbell *et al.,* 2016: 223). TLLP projects vary in size and budget; with the average TLLP project comprising a core team of two to four members and budget of $14,000 (CDN) (ibid).

**2.2 Provincial Knowledge Exchange:** At the end of their TLLP projects, TLLP teams attend the *Sharing the Learning Summit*, which enables them to showcase completed projects and to share their practices. In addition, to further spread learning from their projects, school districts can apply for Provincial Knowledge Exchange funding to provide resources for release time and travel to enable TLLP teacher leaders to share their knowledge and practices with other teachers, schools and school districts across Ontario (Campbell *et al.,*

2016: 223).

**2.3 CODE:** The Council of Ontario Directors of Education (CODE) is an advisory and consultative organization composed of the CEOs of each of the 72 District School Boards in Ontario.[1] CODE is responsible (in partnership with the Ontario Ministry of Education) for the implementation of Ontario's Technology and Learning Fund (TLF); the aim of which is to increase the use of technology-enabled pedagogical practices focused on key 21st century competencies (i.e. critical thinking, problem-solving collaboration, communication, creativity and entrepreneurship). In addition the fund seeks to work with teachers, principals, district level officials and professional associations to identify and share effective and innovative teaching practices grounded in the use of technology.[2] To meet these aims, each school board in Ontario receives funding through the TLF to enable technology-enhanced learning. The funding allocation provides supports to acquire digital technology and learning tools and the provision of related professional learning for educators on effective technology-enabled teaching and learning innovations.[3]

**2.4 The Renfrew County Catholic District School Board (RCCDSB):** RCCDSB is one of 29 publically funded Catholic school districts in Ontario, Canada. The school board comprises 22 schools (18 elementary schools, 2 secondary schools, and two alternative secondary school sites) and serves a student population of approximately 4,600 children; mostly within rural communities.[4] In 2014/15, RCCDSB fully implemented Ontario's Full Day Kindergarten Program leading to the school board offering kindergarten provision to approximately 350 junior kindergarten students and 386 senior kindergarten students; with the kindergarten workforce comprising 26 Early Childhood Educators and 35 kindergarten teachers. Several projects covering a range of topics have been funded by the TLLP in RCCDSB since 2010; however, the *Through their Eyes: Documenting Literacy and Learning in Kindergarten* project - shorthanded here to the 'pedagogic documentation' project - was the first of these to receive funding through the TLLP PKE (Lieberman *et al.,* 2017).

As is reported elsewhere (e.g. see Lieberman *et al.,* 2017; Teach Ontario 2015) the original TLLP funded *pedagogic documentation* project was focused on integrating technology into kindergarten classrooms with the purpose of documenting and supporting student learning. Specifically, the project sought to develop the capability of kindergarten staff at St Francis of Assisi Catholic Elementary school to use digital technology to curate student pedagogical documentation portfolios. Through encouraging students to use iPads to take photos, make videos and to capture audio recordings of the activities they had engaged in, staff at the school were able to ensure this documentation formed part of each student's portfolio. Because students were able to easily share their work with classmates in real time using 'smart' TV technology, these 'documentations' of student learning could then be used as part of each day's 'sharing/consolidation circle time' to enable students to: 1) reflect on their own work and learning; 2) take an active role in documenting their success; 3) examine their growth and learning over time; and, 4) make decisions about the future based on evidence and criteria (Lieberman *et al.,* 2017; Teach Ontario, 2015). The aim of the subsequent PKE grant application was to support the sharing of the learning gained from the

[1] See: http://www.ontariodirectors.ca/
 See: http://www.ontariodirectors.ca/CODE-TLF/index.html
[3] See: http://www.ontariodirectors.ca/CODE-TLF/reporting.html
[4] See: http://rccdsb.edu.on.ca/

pedagogic documentation project amongst both kindergartens and schools across the school board (Lieberman *et al.,* 2017). Alongside PKE funding, CODE funding was used to meet the digital technology-related costs associated with the wider roll-out of the project (e.g. 'smart' TVs, iPads etc.). In 2017, was asked by RCCDSB to examine the impact of the pedagogic documentation approach rolled out by RCCDSB across its schools. Specifically, the evaluation project sought to address the following question: **'**What impact did approaches to increase educators' professional capacity to use the pedagogical documentation have on teacher practice and children's learning outcomes?'

## 3. Measuring Impact: how the DMI was developed

To understand the most effective approaches for ascertaining impact, the evaluation began with an examination of extant impact measurement models. In doing so it became clear that common amongst these models is the idea that impact is typically conceived as occuring through a process of change that stretches across a number of 'levels'. Correspondingly, these levels can be used to assess the extent of positive change achieved by a given innovation. For example, the impact frame developed by Guskey (2000) suggests that the extent of positive change caused by an innovation can be assessed through examining the following five impact levels:

1. Participant's **reaction** to the activities used to introduce an innovation
2. Participant's **learning** that results from engaging in these activities
3. The **organisational support** that exists to help participants change their practice
4. Participant's **use** of the new knowledge and skills
5. Changes in **student learning outcomes** that result

Guskey (2000) makes the point however that audiences beyond the school (or schools) engaged in the innovation will most likely require data at level 5 before they will be willing to consider taking on and adapting the innovation for their own setting.

Explicit impact levels are also used by Diem (2004) who proposes seven; suggesting that judging impact requires the following aspects of any innovation to be considered:

1. Its **Inputs**—the time, funds, staff invested
2. Its **Activities**—the events, activities, programs, sessions offered
3. The number of **Participants Involved**
4. **Reactions**—what participants thought of the program, its organization, its leadership, etc.
5. Changes in **KASA** (Knowledge, Attitudes, Skills, Aspirations) that result from the program
6. **Practice Change**— whether improved methods of action are adopted
7. **End Results**—the broader outcomes, effects, and benefits resulting from changes in practices

Wenger *et al.,* (2011), meanwhile consider the 'value' innovations provide for a given network or community, with the concept of 'value' being measured in the following way:
1. The **activities and interactions** undertaken within a community as a result of the innovation (which have value in and of themselves)
2. The **knowledge capital** that is produced from members of the community engaging in activities and interactions. Such capital might comprise, for example, enhanced

learning in relation to a given issue or subject. The value of this capital lies in its potential to be used at a later date.

3. The **Changes in practice** that occur as a result of knowledge capital being used
4. **Improvements in performance:** whether any changes in practice have resulted n better student outcomes
5. **Reframing value:** finally, has the change in practice and improvements in performance altered perspectives on what is important in terms of effective teaching and learning?

Synthesising the above measures and other approaches to gauging impact (including, those outlined in Earl and Timperley, 2015; Earley and Porritt, 2013; and Harris and Jones, 2012) suggests that what these models have in common is the notion that impact occurs as a result of three key components or characteristics: 1) the content of an innovation; 2) the processes involved in actualising the innovation; and 3) the context in which the innovation is situated. The first of these, the 'content' characteristics, consider the new knowledge, skills or understanding that it is hoped the innovation will deliver. Second, 'processes' concern how will the innovation be planned, organized, delivered, continuously supported and so on. Finally context characteristics include factors such as those innovating, the recipients of the innovation, as well as the systems, cultures and wider environment into which the innovation will be introduced. At the same time, evaluations should also consider the 'quality' of the innovation: what happened as a result of 1)-3) and thus the extent to which an innovation has changed teacher knowledge and practice as well as affected student outcomes (Guskey, 2000).

Alongside these components it is also useful to consider how the recipients for a new innovation are engaging with it: in other words to examine scales or rubrics which examine the extent to which people feel involved in relation to any new approach; the extent to which they will employ the new approach or even the ways in which they do so; and, as a result, the likelihood that any new approach will impact on practice. Three examples of such scales are the *Levels of Use* scale and the *Stages of Concern* scale, which originate from the *Concerns Based Adoption Model* (CBAM) (e.g. see Hall, 2013; Hall and Hord, 1987). Here, the *Stages of Concern* scale addresses the personal side of change: e.g. whether people feel invested in or concerned in relation to the introduction of any new approach. The stages of concern used within CBAM range from individuals having no concern for the innovation (and being more worried about something else) to wanting to know more about it, being worried as to whether they can master it, understanding how it might make a difference, and then seeking to understand other facets of its operation (e.g. see Hall, 2013). The *Levels of Use scale,* meanwhile, considers the behaviours being exhibited in relation to the innovation: in other words, how people are engaging with the innovation. Levels of use range from the user doing nothing, to them behaving as a novice, to them behaving as an expert user and making major modifications to the initiative to improve its efficacy.

What these engagement indicators add to our understanding of impact assessment is that, as well as examining content, processes, context and quality, there is also a need to examine the reasons specific innovations were chosen or developed and reasons it is believed they might work. In particular these indicators show that innovators need to explicitly consider: 1) how recipients might come to learn about the innovation; 2) the ways in which recipients might engage with the innovation. This second point includes whether different interactions, engagement in different activities, or even different understandings of the problem or

context, might impact on learning and understanding, as well as the change in practice and student outcomes that are ultimately achieved. Altogether these factors spotlighting the need to focus on both the *why* and *how* of an innovation through the use of a range engagement indicators. In doing so the logic of the innovation and its operation is necessarily brought to the fore as well as an understanding of what might help or hinder its roll-out.

Bringing together the factors above resulted in the identification of the following eight domains of impact to be used for the pedagogic documentation evaluation:

1. The **context** in which the school or setting is situated
2. The **problem or driver** for innovation
3. Detail on **the innovation** and how it was intended to result in change
4. **Activities and interactions** related to the introduction and roll-out of the approach
5. **Learning** that results from engaging in these activities/results from interactions
6. **Changes in behaviour** (and the extent to which something is being used):
7. What **difference** have behavioural changes made?
8. **Reframing value**: reassessing what is possible in relation to the innovation

At the same time, as well as providing further impact measures, the *Levels of Use* and the *Stages of Concern* scales also highlight the very real possibility that there may be differences between how innovations were intended to be implemented and used, and how they actually are implemented and used. This spotlights the iterative nature of impact: that any measure of impact is only a snapshot in time. Correspondingly, that when seeking to understand the extent of positive change an impact has had, we also have the opportunity to examine how this change can be enhanced further.

That impact can and does change over time implies that measuring it using purely linear approaches (e.g. simply by measuring impact as a snapshot of change across impact levels) will be less effective than approaches that examine impact dynamically, and from a multitude of perspectives. For instance it is likely to be more fruitful to use impact domains to first explore what innovators hoped to achieve and how they hoped to achieve it; then to use these same domains to examine recipients' perspectives on the problem to be addressed, the innovation used to address it, their experience of its roll-out and how moving forward the implementation of the innovation could be improved; and finally, based on the impact data collected, to use the impact domains once again to help innovators determine key areas for improvement as well as what might be realistically expected from the innovation moving forward.

This type dynamic approach can be achieved by employing multiple research conversations, by comparing the findings that emerge from these conversations and then by employing this data as part of the process of improvement. The focus of these research conversations should therefore be to explore:

1. What was supposed to happen (determined by using the impact domains to elicit information from innovators);
2. What happened (ascertained by using the impact domains to elicit information from the recipients of the innovation);
3. How can the approach be improved (ascertained by using the impact domains to

frame conversations with the recipients of the innovation);

4. Longer terms aspirations and growth (determined by both playing back impact data collected thus far to the innovators as well as using the impact domains to frame conversations on future approaches and goals)

By comparing what emerges from them, it is possible first to explore the gap between what it was hoped would happen and what did happen: this is the difference between research conversation 2) and research conversation 1). Both research conversations 3) and 4), meanwhile, discuss where the intervention needs to go next, but together they create a dialogue for improvement. In other words using the data from research conversation 3), as well as the gap data between 1) and 2) as part of research conversation 4), makes it possible to use ideas on how an intervention might be improved to feed into plans for future approaches and performance. Because of its iterative use of conversations to both explore current impact as well as to guide future impact, the approach that emerged became referred to as the 'dialogic model of impact' (DMI),

At the same time, for any evaluation of impact to be sound it must be based on appropriate and reliable information. For an impact evaluation to be useful it must provide information that can be acted on. The data collected as part of any assessment of impact must therefore be able to meet both these requirements (Guskey, 2000). Wenger *et al.,* (2011) suggest that the most effective way to gather both reliable and actionable data is to glean it from a variety of sources. In particular, they suggest that the 'usefulness' of data derives from its ability to pinpoint why something was effective or how it could be improved: this requires the collection of narratives or stories from both innovators and the recipients of an approach. At the same time, to overcome issues of perceptional bias and to introduce rigour and reliability into the impact assessment, independently produced data (e.g. observation data or externally assessed teacher performance or student outcome data) will provide a measure of effectiveness that can act as a concrete measure of change.

To operationalise the eight impact domains set out above, a set of informational requirements were produced for each. These are set out in table 1, below. Derived from the work of Earl and Timperley (2015); Earley and Porritt (2013) Guskey (2000); Hall (2013); Hall and Hord (1987) and Wenger *et al,* (2011), these requirements are worded as the questions that need to be asked and addressed in order that we might fully understand what the innovation was designed to achieve, any reaction and use by its recipients, any change that occurred in practice or student outcomes, as well as how the current situation might be improved. While asked as questions, it is intended that the data collected to satisfy these requirements should comprise a mixture of qualitative 'understanding' data as well as quantitative affirmation of the stories provided. This highlights that interviews are the most effective way to gather this data, since these enable the use of probing questions that can link narrative understanding to other forms of data (e.g. through asking questions such as 'and how do you know [that this is the case]'); but it also flags the need for effective pre-preparation and planning: ensuring that before innovators or recipients are interviewed they are briefed to bring along with them quantitative or observational data that might be pertinent. The follow up collection of data may also be required in order to securely establish particular claims.

**Table 1: informational requirements for each of the eight impact domains**

| Impact domain | Types of information required |
|---|---|
| 1) Context | − What is the context of the school, group of schools, alliance or district in which the innovation is situated? This should include data and information on aspects such as:<br>  o The percentage of pupils using English as an additional language<br>  o The percentage of pupils entitled to free school meals or other measures of poverty. Also valuable is other narrative on the socio economic environment in which the school is set (e.g. whether the school is situated in an area of industrial decline)<br>  o The percentage of pupils with special educational needs<br>  o Relevant accountability measures or scores<br>  o Relationships between the school or setting and the wider community<br>  o Issues with staff recruitment or retention<br>  o Any specific policy issues or drivers faced by the school(s) or district concerned and that need to be responded to |
| 2) Problem or driver for innovation | − What was the problem you were facing?<br>− Who did it affect?<br>− How long had it being going on for?<br>− What do you know about any underlying causes?<br>− Conversely, what was the motivation to innovate?<br>− What can the driver for innovation be attributed to?<br>− Were these internal or external drivers? |
| 3) The innovation | − Provide an overarching summary of the innovation, what did it aim to do and how was it supposed to work (what needs was it hoping to address or levers was it trying to tap into: i.e. what was the theory of action for the intervention).<br>− Where did the intervention originate from and why?<br>− Why was it believed it might be effective (e.g. research suggests successful)?<br>− Who was involved (who intended to receive it and who rolled it out)? |
| 4) Activities and interactions | − What were the activities involved (including detail on length, number of sessions, where activities were held etc.).<br>− What encouragement, support or resource was offered or provided?<br>− How did participants become aware of the activities, support or resource (who/what was involved)?<br>− How it was envisaged participants should engage with them? What was the value to them of doing so?<br>− Relevance – how was this introduced/how was it perceived?<br>− Reaction to the activity – how was it hoped participants would respond/how did they respond [might replace engagement]<br>− How was it hoped that respondent's attitudes might change? |
| 5) Learning | − What learning it was hoped would result/what participants learned from the activities? How? |

| | |
|---|---|
| | − Have participants gained new knowledge or skills? <br> − Has understanding of the domain changed/have perspectives changed? <br> − What access to new people has been gained and how do these help with learning? <br> − What access to new resources has been gained (e.g. new tools, methods, processes)? <br> − Do participants have access to new sources of information? What? <br> − Do participants feel confident to do what is required? |
| 6) Changes in behaviour | − How was it intended that participants use the intervention? Does this differ from how participants are actually using the intervention? <br> − What support was provided to facilitate changes to their behaviour? <br> − Has it successfully replaced any previous activity? <br> − Has it unintentionally replaced other activities? <br> − In what situations are they using it most frequently? <br> − How might their use be enhanced |
| 7) Difference | − What effect did the implementation have? <br> − Are teachers more successful, how? <br> − Are pupils more successful, how? (e.g. improvements in attainment, wellbeing, confidence, attendance etc.) <br> − Did any of this affect metrics that are used to evaluate performance? <br> − What has participant's organization been able to achieve as a direct result of their engaging with the implementation? |
| 8) Reframing value | − Has the roll-out of the intervention changed perspectives on what is important in terms of effective teaching and learning? <br> − Are there new success criteria or evaluation metrics that emerge as a result of this changed perspective? <br> − Has this new understanding translated into institutional changes, frameworks or systems? |

## 4. Methodology

Having outlined the dialogic model of impact (DMI), this next section of the paper examines how the dialogic approach was used to meet the aims of the project. As noted above the research question being addressed was: 'What impact did approaches to increase educators' professional capacity to use the pedagogical documentation have on teacher practice and children's learning outcomes?' By 2015/16 a total of 86 educators had been involved in projects that explored the use of pedagogical documentation in their kindergarten classroom or school (i.e. were its recipients), while four school board staff were responsible for its development (i.e. were the innovators responsible for the model). In keeping with the requirements of the DMI four research conversations were held. Research conversation one ('what was supposed to happen') was held with the innovators of the project. Research conversations two and three ('what happened' and 'how can the approach be improved') were held with the recipients of the project. A report was then written to provides the basis upon which to have research conversation four (longer term aspirations and growth) with the project's innovators. To ensure the research conversations involved were

representative, all four innovators were interviewed using in-depth semi-structured interviews; 10 recipient principals were interviewed (using the same approach) and two focus groups were held with 20 teachers.

While suggested questions for each of the eight impact levels are set out above, these simply act to provide indications of the type of information required to assess impact at each level. For this specific application of DMI, while these questions were used with the project innovators, for the recipients (i.e. teachers and principals) context and project relevant questions were developed in conjunction with colleagues from Renfrew County Catholic District School Board. Using the suggested questions as a baseline, we worked through the types of information required and the most effective way to word questions to elicit this information. Interviews and focus groups were recorded and these recordings transcribed. Data from the recordings were analysed thematically within each of the domains set out in table 1: the purpose of the thematic analysis being to identify all germane perceptions or perspectives from the interviews/focus groups that related to each specific domain. As noted above, as well as narrative data, independently produced data (e.g. student outcome data; evidence of the creation of artifacts used for student portfolios etc.) was also sought from recipients in order to help introduce rigour and reliability into the impact assessment. In addition, a reflective journal had been kept by one of the innovators, this was also thematically analysed, with findings used to add additional triangulation.To preserve the anonymity of the respondents, code numbers have been allocated to each principal and innovation team interviewee and these are used to identify verbatim responses throughout (e.g. principal #1 suggested that…, innovator #4 gave the following example). Likewise teacher focus group respondents are simply described as focus group respondents.

## 5. Findings

Key findings emerging from the evaluation are set out below. For brevity I have simply provided a small selection of responses related to domains four, six and seven which look at how the pedagogic documentation approach was rolled out and the impact it had for teachers and students (readers wishing to examine the full set of data for all domains should consult *[reference removed for peer review]*. This selection  data can be found in Table 2. What is examined in more detail however is the result of research conversation 4 and: how innovators have been able to respond to these findings and subsequently how DMI is can be employed to foster iterative improvement to innovations and new ways of working.

**Table 2: Summarised responses related to DMI domains four six and seven**

| Impact domain | Types of information required |
|---|---|
| 4) Activities and interactions | – To roll out the project the innovation team organized four full-day, **face-to-face professional development workshops** to support their colleagues' learning. Findings from the reflective journal show that the design of these workshops was fully grounded in the notion of Networked Learning Communities as a professional learning model. NLCs it was felt, would: 'help our educators build a larger platform on which to discuss the latest research, share new knowledge, create new resources and generally support each other as they begin to create the conditions for 21$^{st}$ Century teaching and learning' (*reflective journal entry*).<br>– The benefits of the NLC approach were recognized by school leaders. Teacher focus group respondents also noted the benefits of learning from peers (e.g. 'I honestly don't think there's any - this is my personal opinion, but I don't think there's any better way to learn anything than through your colleagues').<br>– The design of the NLC sessions incorporated a combination of the *why* behind what the innovators were attempting to do, the *how* of doing it as well as the research and theory are telling them about the most effective ways to tackle the changes. Additionally, those facilitating the sessions would 'discuss and show many real life examples of what successful implementation looks like in the different grade levels (making it real and relevant)' (*reflective journal entry*).<br>– One perceived benefits of the PKE NLC model was that it provided teachers with dedicated time in which to experiment and learn. Teacher focus group respondents suggested that: 'time is always at a premium for teachers and [and so] having that time to play around… [rather than] doing it in front of your students and trying to learn in front of them… or even in your own time'; 'I could practice it in the safe space so that if I did anything really stupid or couldn't figure out how to hook this up or do that, I didn't have an audience' was incredibly valuable.<br>– Supplying technology at a point when teachers would both need it and be motivated and able to use it (i.e. directly after training) was also vital: 'because that was part of it, every teacher was given flat screen TVs, iPads, laptops etc [in time for their training] (innovator #1). Again there was recognition of this: principal #1, for example, argued that the PKE approach meant that participating teachers received ongoing support and follow up in terms of both training/support and resource. |
| 6) Changes in behaviour | – Behavioural change was regarded as fundamentally rooted in a **new enthusiasm** to experiment and try out what had been learnt (principal #10). Almost every respondent used the word 'excitement' to describe how the project had left them, their staff or their colleagues feeling. Teacher focus group respondents also noted a feeling of being 'overwhelmed', that 'you want to try everything', that 'I was always excited and feel "I want to go and try this"….' and |

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| | that 'the first day I was feeling quite overwhelmed, not that I wasn't excited, I was just like, "Where do I begin?" And I've got all of this information and…I don't want to forget'. |
| | − After the feelings of being overwhelmed, excitement and enthusiasm came '**confidence** and starting to be able to use [the technology] effectively as a teaching tool and a learning tool and [understanding] how to do that' (principal #8). As part of this, every teacher then 'had their own first step, depending on their comfort level and their expertise…' (principal #3). |
| | − Because of all the narrative ways of documentation that teachers now have available to them, interview data suggested they were engaging in **new forms of assessment**. This too was reflected on by teacher focus group respondents who made comments such as: 'I feel like I'm better at understanding how they learn and where each student is at and maybe what they're thinking is and… okay, what's the next step for that student? What can we help them with next? And then I feel like I understand them when I'm assessing them more clearly and better'. |
| | − Principals #1, #5, #6 and #7 noted that the use of technology meant that teachers were more **regularly passing back information on student progress to parents**, as a result, rather than a one off progress report to parents at the end of each semester. |
| | − In addition there were additional beneficial changes in behaviour that went beyond what was originally anticipated by the innovation team. For instance, Principal #9 argued that as a result of the PKE roll out, teachers were now collaborating more effectively leading to a **deprivatisation of practice**: '[the PKE roll out] opened up the doors to the classroom - that whole deprivatisation piece. We had come from a long history of everybody does what they want in their own classroom and this type of engagement in collaborative professional development really opened up the conversation to, "What are you doing and can I try it?" and working with other people, sharing of ideas'. |
| 7) Difference | − When principals were asked how they knew their teachers were using digital technology effectively they reflected a difficulty in judging since: 'everybody is not necessarily doing the same thing at one time' (principal #4). What was clear is that there were **no defined principal 'look-fors':** no standard guidance or support to help school leaders judge whether or not their teachers were using digital technology in a meaningful way (i.e. to support effective learning). Correspondingly school leaders had no way to ascertain the support teachers might need to develop 21st teaching skills and 21st century learning behaviours. |
| | − **Increased student engagement:** teacher and school leader respondents too were not able to quantify changes in student outcomes. They did however reflect the notion of excitement and engagement. Principal #4, for instance, suggested that the introduction of digital technology impacts on achievement by increasing engagement: it 'creates a more engaging, rich environment for the students. One teacher focus group respondent, meanwhile argued that: 'the |

| | students attend to lessons better a lot of times when technology is involved'. Student engagement was also highlighted as a benefit by principal #6: 'I would say one of the things would be engagement, because they're actually using a tool that they are familiar with, that they're comfortable with, that they like'. |
| | − **Increased metacognition**: It was also felt that the introduction of digital technology was leading to increases in children's metacognitive ability as they begin to think about how to synthesise the vast amounts of knowledge they now have access to. As principal #5 noted: 'the basic knowledge is all out there, it is what to do with it. The kids need to learn what to choose. What part are you going to choose about John Cabot that is going to be important? There are a million hits right now on John Cabot, so what are you going to use? I think it is far higher order, I think there is a lot more evaluation synthesis and in our board a lot more higher order thinking going on I think'. |

**5.1 Reframing value: innovators responding to research conversation 4.**
A key aspect of the DMI approach is that findings are reported back to innovators who are able to reflect on what they now know about a given issue and approaches to tackle that issue. Innovators are also able to determine ways forward to further improve the effectiveness of the innovation. As can be seen below, After engaging in this process, a number of areas were identified as ways of increasing the impact of the pedagogic documentation roll out:

**5.2 Measuring student impact:** It was acknowledged by innovators that 'although we do spend a large portion of our professional learning session diving deeply into assessment practices… if improved student engagement, learning and achievement are the ultimate goals of the professional learning then as a system we need to help our educators develop the skill sets required to effectively measure the impact' (*reflective journal entry*). Measuring student impact as a result of pedagogic documentation was also seen as problematic by school leaders since, as the approach is centred on assessment any impact observed will 'depend what the success criteria of the lesson is. It just depends what expectations and the goals of the lesson and the success criteria that they've co-created with the students' (principal #4). It could be digital fluency, digital literacy or something along those lines, maybe not deep learning in that sense but some kind of outcome measure that you want to achieve for a reason. Teacher focus group respondents, when asked how they might measure the difference the project is making also related responses back to individual tasks or lessons: 'That's our job as teachers to relate whatever activity we have them doing with the technology that it has to be in some way linked to the curriculum, that's up to us'; 'We'd link the curriculum expectations to exactly what we saw happening and documented happening'.

Playing back the findings to the innovators it was suggested by them that what was needed was more work on developing a theory of action linking action to intermediate student outcomes and then to final student outcomes. As such the argument could be made that 'we know improved student metacognitive ability leads to improved student outcomes (e.g. Hattie, 2011), and while we can't definitively measure whether the ped doc approach leads to improved student outcomes we can measure student's metacognitive ability. As such, if this increases for students involved in the pedagogic documentation approach more than for those who are not, we can assume that student attainment outcomes (as measured by standardized test scores) are likely to benefit as a result'.

**5.3 More effective involvement of school leaders:** it was noted in the reflective journal that: 'it is clear based on numerous studies that involve system scale up that school leaders are required to *actively* engage in the professional learning by both supporting the new learning and by creating the conditions for the new learning to spread within their schools. However, from our observations and experience, we feel there is a disconnect between research and reality. Research dictates that school leaders benefit from attending the professional learning by taking a co-learning stance with their educators and by being actively and authentically involved in the implementation and the monitoring of the new learning. However, reality generates a number of other actualities that limit their involvement to the degree that research suggests is necessary'. As a result, 'it has become evident that some principals feel they are not equipped with the knowledge and the skills to support the learning their teachers are engaged in relation to technology-enhanced teaching and

learning. So, the big question becomes; how do we bridge the gap between what research is telling us is necessary with the reality of the role of the principal in today's educational climate? What steps can we take at the system-level to ensure that our principals are prepared to support the ongoing system-level professional learning that is vital for transforming our educational system to meet the needs of our students?' (*reflective journal entry*)

In response to this issue, a key discussion emerging from research conversation 4 was the notion of 'principal look-fors': the kinds of changes in teacher practice school leaders might expect to see as a result of their teachers participating in the program, as well as and how could these changes should be assessed by school leaders. The provision of 'look-fors' and the process of assessment thus helping school leaders not only assess impact but also determine how best to support teachers to develop 21$^{st}$ century skills. As one innovator noted, 'we've never taken that angle with the principals to say, "you know, once your teachers have started going through the program, what should you be looking for? And if you're not seeing it, how could you support that learning?"' (innovator #1).

Piecing together findings from both teacher and innovator interviews it was suggested that teachers go through a continual process of 'maturing' in terms of their use of digital technology. This lead innovators to the notion of a *maturity matrix*: the suggested creation of a set of 'principal look-fors' that would enable school leaders to assess how their educators are using pedagogical documentation and how this use changes over time as their experience grows. As innovator #2 remarked: 'so if they're a novice, what kind of behaviours would you expect when they're coming straight out? Yes, two years, three years in, how would you expect to see them responding?' As can be seen in Table 2, PKE NLC participants were on a journey that started off with the excitement of confidence of being able to use the digital technology, which 'ended' with them being reflective 21st Century practitioners who are good at teaching, but are now good at teaching with a greater repertoire of tools. As such the matrix would most likely begin with some of the adjectives reflected from the interviews: e.g., *Knowledge*, *Excitement*, *Confidence* before reflecting concrete behavioural changes (i.e. using technology to capture, document, store and share evidence of learning, using the learning artefacts to analyze and interpret where a student is in their learning and where they need to go next go next (assessment *for, as* and *of* learning). Innovators agreed that the actual matrix need to be co constructed with teachers and principals so that it reflected a realistic journey. This co-construction would also then mean that exemplars and rubrics could be developed providing school leaders with ideas for what great practice at each level might entail. Nonetheless amongst innovators there was a general agreement that this approach would help both teachers and school leaders better understand what was required of them following their involvement in the CODE and PKE NLC activity.

What's more, observable moves along a matrix were also felt possible. For instance innovators picked up on the following vignette provided by one teacher focus group respondent which showed a definite shift could happen: 'we have a few teachers on our staff who are very seasoned teachers who are very anti-technology, anti-change, not me. They're, "This is the way I do it, I've taught this grade for a very long time and I'm not interested." Their students need to write everything down on paper all the time. Yes, so the teachers got sent last year to the PKE project, and one teacher in particular who's very, "I don't want that," last night she did an iMovie for open house, all on her own. She's finally getting comfortable now with these tools, she's still frustrated with them but it worked, and

she was like, "This is a new tool that I'm using, check it out."'.

Linking this matrix to student metacognition would then show the levels of teacher maturity, which have the greatest impact on student's metacognitive skills (and so, by assumption their attainment). In turn this led innovators to consider whether the metacognitive outcomes aspect of the pedagogic documentation approach was being sufficiently highlighted as a key output of the program: 'to focus on metacognition as an impact, I love the idea. But then do all of our teachers really know and value- because they have to value the impact of or the importance of metacognition and really understand it, how do they teach metacognition, model metacognition within their own- like as a practitioner, and also for their students? So that's almost like- it would be another scale-up piece to it, right? Because although we know that our teachers know what metacognition is, but how much do they value it? How much are they displaying it explicitly?... So that would have to become an explicit piece to our project' (innovator #1).

## 6. Discussion
This paper reports on how the Dialogic Model of Impact (DMI) was used to evaluate the impact of Renfrew County Catholic District School Board's roll-out and expansion of the *Through their Eyes: Documenting Literacy and Learning in Kindergarten* approach to teaching and learning. Using DMI it has been possible to identify a number of positive impacts associated with the roll out. To begin with it is clear that teachers participating in the program came away with an enthusiasm to experiment, which was quickly followed by the confidence to use digital technology as a teaching and learning tool. In addition, because it has placed digital technology directly into classrooms and in the hands of students, the use of CODE funding has fundamentally helped teachers integrate digital technology into their teaching and learning activity. Collaboration too has improved leading to a deprivatisation of practice; and alongside collaboration more teachers are now engaging in new forms of assessment with concrete changes in relation to data driven instruction. Finally more teachers were more regularly passing back information on student progress to parents helping ensure learning and progress continues at home.

At the same time it is clear the findings from research conversation 4 show that there is there is room for improvement in terms of the roll out of the program. In particular that there is a need to find ways to help principals understand whether *Through their Eyes* is making a difference to their teacher's practice and what help or support could be provided when it isn't. This need stems from principals currently being unable to identify if their teachers are using digital technology effectively; the need was born from the program intentionally not placing any formal expectation or desired outcomes for the teacher learning that might result from the roll out (essentially because RCCDSB wanted, in the spirit of the TLLP, professional learning from the program to develop in a *bottom up* rather than a *top down* way). As a result, no guidance was provided to school leaders and participating teachers stating that, as a result of the PKE roll out, specific behaviours and outcomes would be expected.

Moving forward, innovators decided, on the basis of reviewing the impact findings, that the introduction of a *Maturity Matrix* should remedy this situation, since it will enable principals both to see where impact is being made and also the areas of practice where support is required when impact is less than expected. This means, moving forward, that RCCDSB will have a greater understanding of how effectively technology has been embedded within

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teachers practice, whether 21st Century teaching is occurring across the board and, through developing a theory of action linking 21st Century teaching to student outcomes, likely impacts on student learning that should result. It was also agreed by innovators that, in the spirit of the TLLP that the matrix is used for support rather than any form of performativity measure, thus ensuring impact is achieved on the investment made via PKE/CODE, whilst also ensuring that the excitement and energy generated by the roll out is not lost.

But as well as improve impact, the DMI approach has also been designed to facilitate the scale up of successful innovations. Here DMI works by providing data – a snap shot of which is provided above - that enables educators in different sites/settings to differentiate between the *why* and *how* of an intervention. In other words between the logical operation of the intervention and the operationalisation of the intervention. In doing so the data collected as part of DMI and should provide both 1) the intended cause and effect that should result in a desired outcome or form of impact; and 2) a detailed descriptions of the activities, resources, interactions, supporting structures, processes, policies and routines used to roll-out the intervention to ensure that this desired effect materialises. Distinguishing between *how* and *why* is vital if new interventions are to be employed effectively across a variety of contexts (Koutsouris and Norwich, 2018). This is because, considering the notion of *adaptive translation* (Brown and Flood, 2018), the scale up of interventions requires us to copy interventions in *essence*, rather than replicate them exactly; and in doing so consider how they might best fit with the characteristics of where we are copying them to (i.e take into contextual factors that serve to help or hinder such replication: Koutsouris and Norwich, 2018). But if we are to achieve impact we must be able to understand how to translate – or more pertinently we must focus on translating the *how* in order to achieve the *why* (the driver of cause and effect) in any new setting.

There is ample evidence that supporting teachers to engage in adaptive translation is more effective at achieving positive outcomes than seeking strict fidelity to a particular approach that has been proven successful in a specific context (Bradford and Braaten, 2017; Bryk, 2016; Garner *et al.,* 2017). The aim of DMI therefore is to help educators identify a given interventions' *why* (or theory of action: broadly domain 3 as well as domains 5-7) and *how* (or toolkit: domain 4) and relate these back to their setting in order to ascertain the most effective way to make use of them. Although there are, to date, only a small number studies that have examined the effectiveness of the DMI approach (e.g. Brown and Flood, 2018) we hope moving forward to be able to fully and empirically test its effectiveness for both impact measurement and the scale up of new approaches to teaching and learning. The aim is to begin in jurisdictions such as England where there is now a strong requirement for schools to 'self-improve' (Greany, 2015).

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