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Reaching in-service primary teachers with research innovations: the role of dissemination events in stimulating download activity.

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Reaching in-service primary teachers with research innovations: the role of dissemination events in stimulating download activity.

ABSTRACT

Education researchers want to influence classroom practice, but in-service primary teachers are hard to reach. Thus, many researchers disseminate their innovations online. Dissemination by event may be a more effective means, but little is known about its relative value in a dissemination strategy, nor potential influence upon research innovation downloads.

This quantitative study analysed the influence of dissemination events on downloads of a research innovation called the TAPS Pyramid over one year. The location, size and date for dissemination events were mapped against location data for downloads during the same time period. Downloads were significantly higher in regions where dissemination events were held and positively correlated with dissemination event frequency. Event size was not found to be significant.

By demonstrating the value of dissemination events in stimulating downloads of educational research innovations online, these results also show the centrality of social learning opportunities to a successful bimodal dissemination strategy.

Key words

Dissemination, in-service, dissemination event, online dissemination.

Introduction

We know that the single biggest factor influencing learning outcomes in schools is the quality of the teaching (Hattie 2011). We also know that when teachers have access to timely, relevant and digestible insights from educational research they can use these to inform and improve their practice (BERA-RSA 2014). The in-service teachers whose practice we seek to influence, however, can be notoriously hard to reach. Effective dissemination of education research can thus be seen as the ultimate goal of researchers intent upon influencing pedagogy.

Southwell et al. (2010) identify three key modes for dissemination of educational research innovations: journal articles and scholarly publications; resource websites; and face-to-face events such as seminars and conferences. While dissemination by journal publication remains an important way for academics to share developments in understanding, it is a poor vehicle for communicating with teachers (MacLellan 2016), who prefer targeted and relevant innovations that meet an existing need (Vanderlinde and van Braak 2010). Online dissemination delivers a vast potential audience at a modest cost (Cooper 2014), but it provides limited scope for explication and discussion of the research innovation itself (Brindley, Blashcke and Walti 2009). Research innovations can also be presented to the target audience at a face to face event, with the aim of increasing their understanding of its existence and purpose. Although dissemination by event is recommended in institutional guidance as a means of reaching a target audience (World Health Organisation 2014, European Union Horizon 20/20 2014), it is not considered a sufficient dissemination strategy in and of itself, due to the smaller potential audiences and greater cost.

The interaction between these two modes of dissemination - by event and online – remains an under-explored area of inquiry. What relationship might exist between the presentation of a

research innovation a dissemination event, and downloads of that same innovation online? By studying dissemination event and innovation download data over the course of one year for a research innovation aimed at in-service primary teachers, we demonstrate the correlation between dissemination events and downloads of a research innovation in England.

Klein and Gwaltney's (1991) model of dissemination types for educational research is used as a theoretical framework to explore the possible influence of dissemination event size on the extent of social interaction between the teachers attending them, thereby influencing the effectiveness of the dissemination process. We conclude by recommending that research teams pursue a bimodal dissemination strategy of active outreach through targeted dissemination events and passive availability of their innovation online. As such, the results of this study are of interest to all researchers wishing to design an effective dissemination strategy which puts their innovation into the hands of their intended audience.

Literature review

Dissemination of educational research innovations

For the purposes of this study, dissemination of educational research outputs is understood as the process of “extracting the main messages or key implications derived from research results and communicating them to targeted groups of decision makers... in a way that encourages them to factor the research implications into their work”. (Canadian Foundation for Healthcare Improvement, 2016, p.2).

Dissemination theory for educational research is largely derived from the medical and social sciences (e.g.: National Center for the Dissemination of Disability Research 1996, CFHI 2016) and the effective dissemination and embedding of innovative practice in higher education institutions (Gannaway et al. 2013). Broad similarities exist, however, in successful

dissemination practice across all disciplines. They have been summarised by Kirst (2000) as: trust in the source; the appropriateness of the dissemination mode; the format of the innovation; the message conveyed; and the characteristics of the recipient.

Dissemination of research innovations is not a simple process of distribution, however; scholarly inquiry has previously indicated that a correctly targeted audience of in-service teachers might reject an innovation if it is poorly explained, received through an untrusted channel, or perceived to irrelevant (Moore, 2006; Shkedi, 1998; MacLellan, 2016). Of the three dissemination modes identified by Southwell et al (2010) the two modes which are most appropriate for reaching in-service teachers will be considered in this study: dissemination by event and dissemination online. A brief outline of the known benefits and disadvantages of each mode is given below.

Dissemination online

When a research innovation is disseminated online as a download, it is instantly available to a global audience. Furthermore, it can be discovered at the convenience of the person searching for it (Wulf 1996). Placing an innovation online does not mean that it has reached its target audience by mere dint of being available, however (Cooper 2014); nor does it guarantee that the end-user will be able to comprehend it sufficiently to implement its ideas (Dede 1996). In offering limited scope for explication (Brindley, Blaschke and Walti 2009) online dissemination also limits the scope for researchers to tackle the motivational dimensions behind a teacher's decision to attempt to change their practice (Korthagen 2017). And while online dissemination appears in the guidance offered by many large organisations (Beacham et al. 2003), it has been argued by some that "passive availability of research is not an effective dissemination strategy compared with active outreach" (Edelstein, Shah and Levin 2012, 9). We can therefore conclude that while online dissemination is a useful tool to the

academic research team, its limited potential should be borne in mind when attempting to reach and influence the practice of in-service teachers.

Dissemination by event

Dissemination by event solves the problem of explication by providing a forum within which the research innovation can be presented and explained to its target audience. According to Hutchinson and Huberman (1994), this is the most effective approach for disseminating research outputs to in-services teachers, as it is ‘a “constructivist” one, whereby research and other kinds of specialised knowledge are exchanged between researchers and professionals in a mutually constructed social context’ (ibid., 27). This complements the view, expressed elsewhere in the literature, that a teacher’s preferred information-gathering format is through face-to-face interaction with their peers (Gassenheimer 2013, Pareja-Roblin 2014).

Dissemination of research innovations by event can allow the teachers attending to benefit from interaction with the ‘linking agent’ (Louis 1980) who can explain the innovation and its intended application in detail. Asking questions and reflecting upon its possible application to their setting allows the audience to consider its use against their own values and beliefs (Creemers 1986) thus fulfilling some of the motivational dimensions involved in teachers changing practice (Korthagen 2017).

Drawbacks to dissemination by event primarily include the greater cost and a lower potential audience. Smaller audiences permit a greater level of interactivity between the presenter and the delegates, possibly resulting in increased understanding of the innovation, but can only accommodate a fraction of the potential audience of online dissemination. And larger dissemination events that are merely showcases of research activity have been derided in the literature as ‘dog and pony shows’ that ‘seldom promote substantial change’ (Stevens 2004,

34). Thus, while personal interaction with the end-user of an innovation is recommended for effective dissemination (NCDDR 2001), the size of the audience at a dissemination event might inhibit or even preclude this (Klein and Gwaltney 1991).

It therefore seems that, while dissemination events may provide an enhanced opportunity for teachers to learn about a research innovation and reflect upon how they might use it in their setting, the event's effectiveness might be influenced by audience size and the interactivity of the presentation. The potential audience reached by the research team might also be considerably smaller. When the limitations of online dissemination as a standalone strategy are taken into account, a study which examines the relative effectiveness of each strategy, and their possible interaction, would be a welcome addition to the literature.

The Teacher Assessment in Primary Science (TAPS) Pyramid

The output for dissemination featured in this report is the TAPS Pyramid (Earle et al. 2016), developed as part of the TAPS project at the Institute for Education at Bath Spa University. It takes the form of a framework for using teacher judgment as the basis for assessing pupils both formatively and summatively, moving from the teacher's assessment practice in the classroom to the school's reporting practice. Its intended audience is primary school teachers, subject specialists and school leaders.

The TAPS Pyramid was designed in collaboration with in-service teachers (Davies et al. 2017), through an iterative process to ensure a deep connection between educational theory and recommendations for classroom practice (Rey and Gausset 2016). Unlike more theoretical research outputs, the end-user was the focus of the research and the output was designed with distribution in mind. It was disseminated via a bimodal strategy of online

availability as a downloadable resource, and through dissemination events (Hopwood-Stephens 2018a). These events ranged in size from national conference key-notes with audiences of over one hundred to regional gatherings of several teachers with a special curriculum interest in primary science.

Theoretical framework

Klein and Gwaltney (1991) specified four levels of dissemination for education research innovations: *spread* for broad coverage; *choice* for providing information about an innovation to an audience; *exchange* for a more interactive presentation and discussion; and *implementation* for ongoing, personalised support to individuals. Hutchinson and Huberman (1994) exemplified these dissemination types with activities typically associated with them (see Table 1). The increase in interactivity at each level of dissemination between the research team and the target audience is apparent, as is the decreasing size of the potential audience.

Dissemination type (Klein and Gwaltney 1991)	Dissemination activity (Hutchinson and Huberman 1994)
Spread	Posters, fliers, mail
Choice	Conference key note speeches, large events
Exchange	Workshops or seminars
Implementation	One-to-one tailored support, mentoring

Table 1: table to show dissemination types and associated activities for educational research innovations

While the authors acknowledge the more recent efforts of King (2003) in simplifying the levels of dissemination to three, we have nevertheless chosen the Klein and Gwaltney model for its consideration of a qualitative difference between the interactivity of smaller and larger events. The four levels of dissemination specified by Klein and Gwaltney have thus been used to probe the possible difference between the larger dissemination events in this study, where dissemination for *choice* is possible, and small or medium events, where dissemination for *exchange* might take place.

Working on the assumption that teachers' knowledge is socially constructed through discussion of practice with peers (Mercer and Howe 2012) and that dissemination events are a potential forum for this type of social learning opportunity (Hutchinson and Huberman 1994), we contend that teachers attending dissemination events where the TAPS Pyramid was presented are more likely to have reached a deeper level of understanding of its possible application to their practice than those who found it online. Such enhanced understanding could manifest as downloading the research innovation for use in their setting. As such, we would expect to see an increase in download activity linked to dissemination events held to promote the TAPS pyramid.

Research Questions

This study therefore seeks to answer the following research questions about the possible interaction between online and event modes in the bimodal dissemination strategy pursued by the TAPS project team:

- What relationship might exist between the presence of dissemination events in a geographical region and the number of downloads in the same region?

- What relationship might exist between the audience size at the dissemination events held in a geographical region and the number of downloads in the same region?
- What is the relative value of dissemination online and dissemination by event within a bimodal dissemination strategy?

Methods

Data Sources

This study uses quantitative data for the period 1st August 2015 to 31st July 2016 collected from two sources:

- frequency and location data for TAPS Pyramid downloads from the hosting website
- location, date and audience data for known TAPS Pyramid dissemination events held within the UK

The methods of data collection and analysis for these data sets is described below.

Data collection

Download data

Evaluating the influence of dissemination events upon internet downloads of a research innovation is a hitherto unexplored area in the field of research. But researchers in the fields of economics and science have noted that creating public interest in research outputs increases internet views and downloads (Winkelman et al. 2006; McKenzie and Özler 2011). Download counts have recently been used successfully to represent the impact of research on a case by case basis (Plume and Kamalski 2014; Ball and Duke 2015), and Thelwall (2017) has used downloads as a useful indication of the potential user-base for a research innovation.

For this reason, a count of TAPS pyramid downloads has been used to measure the potential user base for the resource. By counting the downloads for the TAPS Pyramid in different administrative regions of the UK (henceforth referred to as *counties*) over a specified time period, a figure for the potential user base in different parts of the UK was generated, and compared to the frequency and size of known dissemination events in the counties comprising those UK countries.

Third party software was used to collect spatial and temporal data for each download of the TAPS Pyramid. A reporting procedure that removed duplicate IP addresses for concurrent downloads was used to give a more accurate figure for individuals accessing and downloading the resource (Sullivan 2016). No identification of the person downloading the resource was possible from these data, so participant consent was not sought.

Accuracy of the data download was established by running the data collection and preparation procedure twice. Downloads with no defined location were removed from the data before coding. Downloads with non-UK locations were coded by country and classified as International. All downloads made in the UK were then coded by country and county (administrative region) using the ceremonial counties list in the Lieutenancies Act (1997).

Dissemination event data

Dissemination event data was requested from a population comprising the TAPS project team, individuals within the Primary Science Teaching Trust who funded the research and who were known by the TAPS project lead to have disseminated the innovation, and other primary science specialists known to the project lead. In total, twelve people were contacted. Recipients were asked to supply the date, location and audience size of any event where they had presented the TAPS Pyramid to an audience of teachers. Participation was voluntary and

those who chose to submit their data did so using a prepared spreadsheet.

Each dissemination event was manually coded by county, date and audience size; these were defined as: small=1-25 attending; medium = 26- 50 attending, and large = 51 or more attending. The dissemination event data was compiled and checked twice to ensure accuracy.

Analysis of the data

Downloads

134 international downloads of the TAPS pyramid were made in 45 different countries, comprising 4.8% of the total. By country, the most downloads were made in Spain (n=10), followed by Singapore (n=9) and the United Arab Emirates (n=9). In twenty of the forty-three countries, only one download was made. A table of the International results can be found in Appendix 2. Once downloads with undefined locations (n=96) and those made outside of the UK (n=134) were removed, the total unique downloads for the TAPS pyramid during the year 1st August 2015 to 31st July 2016 was **2,764**.

Of the 2,764 downloads made in the UK during the specified time period, 97% took place in England (n=2675), with download activity in all but two of the 48 English counties. In Wales (n=37), download activity occurred in just over half of the Welsh counties, and in Scotland (n=37), download activity took place in less than one third of the Scottish counties. In Northern Ireland (n=15), download activity was found in less than half of the Northern Irish counties. Given that 97% of the downloads occurred in England, the rest of the analysis concentrates on the interaction between downloads and dissemination events in this UK territory.

Dissemination events

51 dissemination events were recorded for this study. The vast majority (n=50) were held in England; the one remaining event was held in Northern Ireland. Dissemination events were held in 21 of the 48 possible English counties. The county where most dissemination events were held was Greater London where eight events were held, followed by Dorset, Wiltshire, Somerset, Gloucestershire and Devon, where four were held in each county.

Small dissemination events were held most often (n=28, mean attendance=12.2), followed by medium sized events (n=15, mean attendance=32.8) and large events (n=7, mean attendance=140). The mean attendance for large events was significantly higher than for either of the other size of events, due in part to two of those events having estimated audiences of 300 each. A table showing dissemination event location, date and audience size can be found in Appendix 3.

If the total audience figures are combined, 1817 people are known to have attended dissemination events for the TAPS Pyramid during the time period studied. Even if a one to one relationship between attending an event and making a download is assumed, this still does not explain the additional downloads recorded during the time period, suggesting that other factors are influencing download activity.

Statistical analysis

The following hypotheses were generated to test whether some patterns identified in the data were of statistical significance:

- Hypothesis 1: Distribution of downloads increases when dissemination events are held in a county
- Hypothesis 2: Distribution of downloads is positively affected by the frequency of dissemination events held in a county

- Hypothesis 3: Distribution of downloads is different across small-medium sized and large events

All statistical analyses were carried out using IBM SPSS version 22. Non-parametric tests were used in each instance, due to groups in the data containing less than thirty, thereby breaking the assumptions inherent in parametric testing (Field 2015). Although non-parametric tests can be slightly less sensitive, this should be balanced against a reduced likelihood of committing a type 1 error when interpreting the results (Sheskin 2004).

For hypothesis 1, the Mann-Whitney U test for independent samples was used to investigate the hypothesis that there would be a statistically significant increase in downloads in counties where dissemination events had also been held. This would be expected if dissemination events are a more effective way of communicating the value of research outputs to a target audience than online availability alone.

For hypothesis 2, the Kruskal-Wallis test for independent samples was used to investigate the hypothesis that there was a positive relationship between the number of dissemination events held in a county and the number of downloads made. This would be expected if Hypothesis 1 were true. The fact that there were more than two groups in the data made the Kruskal-Wallis test appropriate.

For hypothesis 3, the Mann-Whitney U Test for independent samples was used to investigate whether there was a significant increase in the number of downloads made in counties which held dissemination events with large audiences. This would be the case if there were no qualitative difference between smaller and larger events, the effectiveness of the

dissemination event thereby being a function of the audience size, rather than the interactivity and discussion made possible by smaller sized events.

The median score was reported to indicate the central tendency as it is relatively unaffected by skewed distributions and extreme scores at either end of the data set. It is also considered more appropriate than reporting the mean for non-parametric tests (Field 2015).

Preparation of the data

In order to prevent outliers in the data from affecting the accuracy of the statistical models used for analysis, a winsorising procedure was used to substitute outlying values with the next highest value from the data set (Zimmerman 1995). This was used in the case of download data for Greater London (n=574). At almost four times the size of the next highest value (n=144 for Hampshire), it would have biased the statistical models used, providing erroneous support for the hypotheses being tested. For this reason, the value for London was corrected to n=145 in accordance with Zimmerman's recommendations (ibid.) The download values for all of the counties can be found in Table 1 in the Appendices.

A winsorising procedure was also used to correct the value of dissemination events for Greater London from 8 to 5 (the next value after n=4 for Devon, Dorset, Somerset, Wiltshire and Gloucestershire).

Results

The results are summarised below.

Hypothesis 1: Distribution of downloads increases when dissemination events are held in a county

Total downloads in counties where events were held ($Mdn = 49.00$) were significantly higher than in counties where no events were held ($Mdn = 27.00$), $U = 403.00$, $z = 2.48$, $p = .013$, $r = .36$. This demonstrates that dissemination events positively influence downloads of the TAPS pyramid, resulting in higher downloads in the counties where they were held.

Hypothesis 2: Distribution of downloads is positively affected by the frequency of dissemination events held in a county

In counties where dissemination events were held, a significant positive relationship was found between the frequency of dissemination events, and the total number of downloads made $H(2) = 9.26, p = .010$. Pairwise comparison with adjusted p-values showed there were no significant differences between event frequencies of 1-2 events and 3-4 events ($p=.24$). This indicates that the significant differences are found between holding no events and some events, or no events and many events.

Hypothesis 3: Distribution of downloads is different across small-medium sized and large events

There was no significant difference in total downloads between counties where only small to medium sized events were held ($Mdn = 41.00$), compared to counties where large events were also held ($Mdn = 96.00$), $U = 59.5, z = 1.61, p = .10, r = .35$.

This finding indicates that larger events are not more effective in stimulating download activity.

The results are also summarised in Table 4.

Hypotheses	Test statistic	p	ES	Notes
Distribution of downloads increases when dissemination events are held in a county	403.000	.013*	.36	
Distribution of downloads is positively affected the frequency of events in a county	9.266	.010*	.21, .51, .38	0 events and 1-2 events; 0 and 3or more events; 1-2 events and 3-4
Distribution of downloads is different across small-medium and large events	59.500	.10	.35	

Footnotes:

N=2,764

† N=51

* $p \leq .05$ (two-tailed)

ES: effect size. Small ES .1 - .29, Medium ES .3 - .49, Large .5 and above.

Table 4: summary of test results for statistical significance of Stage 1 download and dissemination event data

Discussion

This study set out to answer the following research questions:

- What relationship might exist between the presence of dissemination events in a geographical region and the number of downloads in the same region?
- What relationship might exist between the audience size at the dissemination events held in a geographical region and the number of downloads in the same region?
- What is the relative value of dissemination online and dissemination by event within a bimodal dissemination strategy?

These are answered below, with reference to the study results and the wider literature.

The presence of dissemination events positively influences downloads

Statistical analysis of these data showed a significant link between dissemination events and higher levels of downloads of the TAPS pyramid in the same county. There was also a positive relationship between the frequency of dissemination events and downloads of the resource.

While the precise content, duration and structure of these events will have varied, they shared the aim of introducing the TAPS Pyramid to an audience of primary teachers and science specialists. Teachers who attended these events had the innovation presented to them by a knowledgeable linking agent (Louis 1980). This in turn let them consider its value and potential application to their setting. This process of adaptation is a key concept in sociocultural theories of learning, and also considered a vital part of the dissemination process for education research outputs (Klein and Gwaltney 1991, Gravestock 2002, King 2003) that makes it more likely that the resource will be used by teachers to change their practice. These data therefore provide support for the theory that increased understanding of

the TAPS pyramid, generated through dissemination events, resulted in a greater interest in downloading a copy for subsequent use than in areas where no such events were held. These results therefore show that dissemination events, while reaching a far smaller potential audience of in-service teachers than online dissemination, can nevertheless play an important part in a dissemination strategy by providing a forum for education professionals to learn about a research output in detail.

Larger dissemination events are not shown to have a greater influence on downloads

When the size of the audience at the dissemination event was taken into account, no significant difference was found between counties where large events were held, when compared to counties where only small or medium events were held. To interpret this result, we should return to Klein and Gwaltney's (1994) four levels of dissemination, which is the theoretical framework for this study. They postulated two levels of dissemination through events, based on the size of the audience. According to this model, an event with a larger audience, such as a conference keynote speech, would result in dissemination for *choice*, in that the audience was made aware of the innovation. On the other hand, an event with a smaller audience, such as a seminar or workshop talk, would result in dissemination for *exchange* due to the increased opportunity for the audience to ask clarifying questions and engage in dialogue about the innovation being presented (Hutchinson and Huberman 1994).

These results seem to confirm Klein and Gwaltney's view about the relative effectiveness of larger and smaller events, both through statistical testing for significance and from examples from the raw data. For example, a large dissemination event with an audience of 300 was hosted in May 2016 in the county of South Yorkshire. There was no significant peak in downloads in the month when the event was held, nor was there evidence of "overspill" of downloads into the following month (McKenzie and Özler 2011). The TAPS pyramid was

downloaded 29 times in this county during the specified time period, or 0.09 copies for every person attending a dissemination event. In the county of Devon, three small and one medium sized dissemination events were known to have been held during the same time period. The total estimated audience for these events was only 74, but the TAPS pyramid was downloaded 75 times in this county, or 1.01 times for every person attending.

These findings therefore provide evidence for a qualitative difference between dissemination events of different sizes. It can be argued that those attending the smaller events benefited from dissemination for *exchange*, and the opportunity to consider the TAPS pyramid with their peers, engaging in authentic learning and drawing examples from their everyday practice (Van der Linden et al. 2012).

The role of online dissemination in a bimodal dissemination strategy to in-service teachers

The discussion so far has largely focused upon the influence of dissemination events and face-to-face networks for spreading innovations. But education is a global concern, and innovations have a potential use beyond country borders, so what happens when it is not possible to hold dissemination events?

The finding that the TAPS pyramid was downloaded 134 times in 45 non-UK countries demonstrates that online dissemination is a highly effective strategy for achieving dissemination for spread at an international level. The internet also played a crucial role for dissemination for awareness within the UK, where 2764 copies were downloaded during the specified time period. In countries such as Scotland and Wales, with widely dispersed populations and no known dissemination activity, online dissemination was the only dissemination mode used, and can therefore be assumed crucial to its penetration of those territories. Equally, in UK counties where there were no known dissemination events, there is

evidence, through download activity, of the TAPS pyramid being found online nevertheless by potential users. This study therefore provides clear evidence that online dissemination is an effective strategy for reaching a wide potential audience with research innovations in the field of primary science, at both the national and international level.

These findings chime with Duffy's (2000) view that the internet has democratised the availability of new ideas; anyone with a browser and search engine is free to find them. It also contradicts the view that resources that are issued online can be lost amongst the endless proliferation of innovations and ideas being published (Siemens, 2005). It is worth noting, however, that the TAPS pyramid was hosted on the Primary Science Teaching Trust's website. This organisation is recognised for its advocacy and expertise in the curriculum area of primary science, so a potential user who found the TAPS pyramid in a list of search results might have been persuaded to pursue it by their trust in the dissemination channel (Kirst, 2000).

The lower overall download figures in areas where there were no dissemination events, however, confirm the view that dissemination online is not a complete dissemination strategy (Cooper, 2014) and that the effectiveness of a dissemination strategy is enhanced by the use of dissemination events alongside online availability (Edelstein, Levin and Shah, 2012).

Taken as a whole, these findings underscore the value of a bimodal dissemination strategy for reaching in-service primary teachers, whereby the innovation is made passively available online but also actively promoted to a carefully targeted audience through dissemination events that, ideally, permit some interaction between the presenter and the audience.

Directions for future research

This study used an innovative approach to measuring resource dissemination through

downloads. More studies of this nature are needed to validate and refine this approach. We have also suggested that the format and function of a larger dissemination event might be qualitatively different to that of a smaller event. More data is needed to further probe this theory, and to explore the nature of the interaction and co-construction of knowledge which is possible at dissemination events of different sizes.

The design-based approach of the research being disseminated is also significant. As researchers are increasingly being encouraged to build in strategies for knowledge exchange and impact into their project design, the relationship between the research approach and form of dissemination warrants further exploration.

Conclusion

Through an innovative approach to mapping dissemination events against innovation downloads over time, this study has demonstrated the potential benefits to research teams of pursuing a bimodal dissemination strategy to reach in-service primary teachers.

Based on the results of this study, it is recommended that a bimodal dissemination strategy of active outreach to the target audience of in-service teachers through face-to-face events is considered to enable dissemination for *choice* or *exchange*, alongside the passive availability of the innovation online to enable dissemination for *spread*. This is because the data from this study have shown that the internet plays a crucial role in dissemination for spread, both nationally and internationally, but it cannot fulfil the social and interactional requirements of dissemination for *choice* or *exchange* to busy classroom practitioners. Face to face dissemination events can stimulate interest in, and understanding of, a research innovation. Furthermore, the increased interactivity and opportunity to ask questions at small to medium sized dissemination events permits dissemination for *exchange*, facilitating the in-service

teacher's reflection upon how they might best use the innovation, thereby stimulating download activity. For this reason, we would recommend dissemination events of a small to medium size as optimal.

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