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Professional development in schools: predictors of effectiveness and implications for statewide PBIS trainings

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ABSTRACT

Research has identified several factors that contribute to the effectiveness of professional development opportunities in schools including improvement of participants' knowledge, administrator support, incorporation of active learning activities, duration, fostering coherence, and timing. The current case study examined how these six factors contributed to the effectiveness of Positive Behavioral Interventions and Supports (PBIS) trainings conducted in Ohio, USA. More specifically, this case study (a) examined whether there was a relationship between each of these factors and the effectiveness of these training sessions and (b) identified the combination of factors that best predicted the effectiveness of these training sessions through multinomial regression analysis. Results revealed the effectiveness of the trainings was significantly related to incorporation of active learning, level of coherence between learning activities at the training and structures in place at participants' schools, increase in knowledge, and training date. Implications for future PBIS trainings and professional development events in general are discussed.

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Introduction

Purpose

Historically, discipline in schools has primarily been reactionary. However, research suggests implementing punishment-based strategies is ineffective (Positive Behavioral Interventions & Supports OSEP Technical Assistance Center 2016b). As a result, schools have been increasingly using Positive Behavioral Interventions and Supports (PBIS) as a more effective approach to preventing and addressing student behavioral issues. PBIS refers to a system of evidence-based supports designed to enhance all students' prosocial behaviors, academic outcomes, and school climate. This proactive framework involves systematically defining, teaching, modeling, and reinforcing expected behaviors in schools, rather than waiting for misbehavior to occur before responding, as was done with more traditional approaches (Sugai and Horner 2002). Although PBIS has been primarily implemented in the United States, this system is by no means limited to schools in this country. In fact, PBIS has been reviewed and implemented in other parts of the world such as Canada (Kelm, McIntosh, and Cooley 2014), Australia (De Jong 2005), the United Kingdom (Gore et al. 2013), and other

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European countries within the European School Network (i.e. Netherlands, Finland, Hungary, Portugal, and Turkey; Goei 2008).

Several studies have found PBIS to be an effective system within the schools (Positive Behavioral Interventions & Supports OSEP Technical Assistance Center 2016a). PBIS has been associated with several positive outcomes for students (e.g. Bradshaw, Mitchell, and Leaf 2010; Pas and Bradshaw 2012; Simonsen et al. 2012). Considering these positive outcomes, states have been increasing their implementation of PBIS within their schools. However, some states are significantly more active in implementing PBIS compared with other states. Ohio is one state that is strongly supporting PBIS initiatives, especially after the Ohio State Board of Education adopted rules and policy in 2013 that required schools to implement some form of PBIS (Ohio Department of Education 2016). Ohio's 16 State Support Teams (SSTs) or regional resource centers have trained staff members who provide PBIS trainings to school staff members in the state, which can help address inconsistencies and ensure proper implementation.

The SST trainers were similarly trained in six different broad types of trainings (i.e. Introductory, Tier II/III, Coaching, Classroom Management, Data Related Training, and Train the Trainer). Regardless of the type of training, the trainers administered identical feedback surveys to all of the attendees following all sessions, which were reviewed and served as guides to improve upon future sessions. This study used archival data generated from these existing surveys in order to examine the specific factors that predicted the effectiveness of these training sessions.

Professional development in schools

Most educators participate in professional development opportunities each year (NCES 1999), and significant resources are spent each year on these events (Desimone 2009). However, research suggests large numbers of professional development opportunities do not lead to significant positive changes (Yoon et al. 2007), many teachers do not find these experiences to be very useful (Darling-Hammond et al. 2009), and there is a general lack of knowledge regarding how to organize effective professional development events in schools (Mizell 2010). Moreover, these types of issues are noted in several areas around the world including Latin America (Castro 1991; Davini 1995), Western Europe (Vonk 1995), and India (Sharma 1992). Therefore, it is critical to examine the factors that are related to effective professional development to be able to address these issues that are facing educators internationally.

Factors influencing the effectiveness of professional development

Research studies have identified several factors that significantly contribute to positive outcomes following professional development opportunities in schools.

Increasing knowledge

Although seemingly intuitive, professional development events must increase attendees' knowledge in order to lead to more lasting changes in the schools (Cohen and Hill 1998; Kennedy 1998). That is, school staff must first be provided with a thorough understanding of a particular concept in order to apply it after the training (Gulamhussein

2013). The content should not consist only of generic information. Rather, participants should also be provided with information that is specifically relevant to their work in order to deepen their knowledge and increase the likelihood that they will make appropriate future changes (Gulamhussein 2013; McConnell, Parker, and Eberhardt 2013).

Administrator support

Research also suggests administrator support significantly impacts the effectiveness of professional development events within the schools. Several studies have been completed that show changes in educators' behaviors and attitudes coincide with similar changes in their administrators' support for changes following professional development events (Bechtel and O'Sullivan 2007; Heck et al. 2008).

Active learning

Additionally, research suggests professional development is more effective when it incorporates active learning (Garet et al. 2001; Ingvarson, Meiers, and Beavis 2005). Active learning involves providing opportunities for attendees to be actively engaged during the professional development program through activities such as engaging in meaningful discussion, planning for future application of recently acquired knowledge, reviewing examples of student work, practicing newly acquired skills, and obtaining feedback (Garet et al. 2001). Active learning is necessary to initiate lasting changes following professional development events because it provides teachers and other school staff members with the practice that they need to implement these changes effectively in the future (Bush 1984; Joyce and Showers 2002).

Duration

The effectiveness of professional development is also related to the number of hours of the event along with the amount of time over which it occurs (French 1997; Garet et al. 2001; Gulamhussein 2013). Longer professional development programs that are spread out over time can lead to more positive changes in teacher practice and improvements in student learning compared with shorter programs or one-time workshops (Whitworth and Chiu 2015).

Longer programs provide school staff with additional time to learn the information and engage in active learning opportunities that further build their understanding (Gulamhussein 2013). In fact, some studies argue that teachers might need approximately 50 hours of instruction and practice before mastering a new teaching strategy and implementing it in their classrooms (French 1997). Further, having multiple professional development sessions allows trainers to better reinforce, elaborate upon, and follow up with information that was presented during a previous session to better support teachers as they transfer the new knowledge and skills into their classrooms (Lewis, Baker, and Helding 2015). Finally, short, one-time workshops can often be disconnected from teachers' concerns and unrelated to the context in which teachers work, which can prevent meaningful changes (Cobb et al. 2003).

Fostering coherence

Another factor that contributes to effective professional development programs is the degree to which the specific program fosters coherence among educators and their schools (Garet et al. 2001). Professional development opportunities are more effective in improving teachers' knowledge and skills when they perceive these activities to be a part of a coherent program of teacher learning. Coherence can involve building on what teachers have already learned, emphasizing content that is consistent with local standards and frameworks, and providing attendees with opportunities to have professional communication with colleagues who are trying to make similar changes in their practice (Garet et al. 2001).

Timing

One final factor to be considered is the time of year in which the professional development training occurs. Some research suggests summer is an effective time to conduct professional development events (Yoon et al. 2007). At the same time, other professionals express concerns about summer professional development opportunities because they are not 'job embedded' and do not allow teachers to immediately transfer knowledge and skills into practice (Croft et al. 2010). Thus, it is likely that summer professional development events are the most effective when they are conducted close to the beginning of the school year so that the information is relevant enough to teachers and can be properly implemented soon after the training. Although there were not any studies that were identified that directly compared professional development events occurring at different points of the academic year, there were studies that documented significant changes experienced by teachers over the course of the year, which can influence their receptiveness to professional development opportunities (e.g. burnout; Pas, Bradshaw, and Hershfeldt 2012).

Present study and hypotheses

Altogether, this literature review revealed that improvement of knowledge, staff support, active learning, duration, coherence, and timing are all important factors that contribute to the effectiveness of professional development opportunities in schools (e.g. Cohen and Hill 1998; Garet et al. 2001; Heck et al. 2008; Ingvarson, Meiers, and Beavis 2005; Whitworth and Chiu 2015). The current study examined how these factors contributed to the effectiveness of the PBIS trainings conducted in Ohio. For the purposes of this study, the effectiveness of these training sessions was defined as attendees' responses to a survey item that asked them to indicate their likelihood of using the information from the training session within the next four weeks on a scale from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Although several researchers have argued that the ultimate measure of effectiveness should be improved student learning outcomes (Guskey 2003; Hill 2007), without information regarding changes in student learning outcomes, this study defined effectiveness as anticipated attendee changes based on available information, which is an important first step that can lead to improved student learning outcomes.

This study first determined whether there was a relationship between each of these factors and the effectiveness of these training sessions. Second, the study analyzed and identified the combination of factors that best predicted the effectiveness of these training sessions. These two broad research foci guided the formation of several hypotheses along with the selection of survey items to examine in relation to the effectiveness of the PBIS

trainings. Again, this study used information provided from the feedback surveys that attendees completed following the training sessions. More specifically, the study examined select survey items that measured constructs related to effective professional development. Given previous research regarding the variables related to the effectiveness of professional development (e.g. Cohen and Hill 1998; Garet et al. 2001; Heck et al. 2008; Ingvarson, Meiers, and Beavis 2005; Whitworth and Chiu 2015), there were several survey items that were hypothesized to be significantly related to the attendees' likelihood of using information from the PBIS trainings in their own schools.

First, the information from the literature review revealed that professional development events must significantly increase attendees' knowledge (e.g. Cohen and Hill 1998; Kennedy 1998). Therefore, it was hypothesized that attendees who reported that the training more strongly improved their understanding of PBIS after the session will be more likely to indicate that they will use information from the training. Second, the information from the literature review indicated that administrator support significantly impacts the effectiveness of professional development within the schools (e.g. Bechtel and O'Sullivan 2007; Heck et al. 2008). Thus, it was hypothesized that attendees will be more likely to indicate that they will use the information from the training session when an administrator from their school or district is also present at the training. Third, the information from the literature review also highlighted the importance of active learning as an important component of effective professional development events (e.g. Garet et al. 2001; Ingvarson, Meiers, and Beavis 2005). The specific items on the feedback survey did not necessarily reveal the activities that were completed during the training session, which made it difficult to assess whether or not attendees engaged in active learning. However, the attendees were asked if the trainer provided feedback that helped them gain knowledge necessary to enhance their skills. Since providing feedback is one aspect of active learning, the third hypothesis was that attendees will report being more likely to use information from the session if they reported receiving feedback from the trainer.

Continuing, the information from the literature review suggested longer professional development programs that are spread out over longer periods of time can significantly contribute to their effectiveness (e.g. French 1997; Garet et al. 2001; Gulamhussein 2013). Although the vast majority of the PBIS training sessions were relatively short professional development workshops, some of them took place over multiple days. As a result, the fourth hypothesis was that attendees will be more likely to indicate that they will use the information if they attended a multi-day training session. Fifth, the literature review indicated that effective professional development events involve coherence between the learning activities and systems already in place at their schools (Garet et al. 2001). The surveys asked participants to indicate their schools' level of PBIS implementation, so it was hypothesized that attendees will be more likely to implement the information from the session if their school already started implementing PBIS. Finally, the review of the literature suggested professional development events during the summer or towards the beginning of the school year may lead to more significant changes in the classroom (Croft et al. 2010; Yoon et al. 2007). Thus, the final hypothesis was that attendees will report a greater willingness to use information from the session when it was offered in the summer or closer to the beginning of the school year compared with trainings conducted towards the end of the school year. These six hypotheses are summarized in Table 1.

Table 1. Hypotheses.

Hypotheses	
Hypothesis 1	Attendees who reported strong increase in knowledge of PBIS after the session will be more likely to indicate that they will use the information from the training
Hypothesis 2	Attendees will be more likely to indicate that they will use the information when an administrator from their school is also present (i.e. administrator support)
Hypothesis 3	Attendees will be more likely to use information if they engaged in active learning as measured by whether they indicated receiving feedback from the trainer
Hypothesis 4	Attendees will be more likely to indicate that they will use the information if they attended a multi-day training session (i.e. longer duration)
Hypothesis 5	Attendees will be more likely to implement information if their school has already started implementing PBIS (i.e. fostering coherence)
Hypothesis 6	Attendees will report a greater willingness to use information from the session when it occurred in the summer or closer to the beginning of the year

Methodology

Sample

This sample consisted of 2855 attendees who completed a survey following one of the Ohio PBIS trainings that occurred between the beginning of June 2015 and the end of May 2016. Participants represented different roles and grade levels among a diverse range of schools and school districts across Ohio. In fact, trainings were conducted in all 16 SST regions in the state, and training attendees represented urban, rural, and suburban schools. The majority of attendees were teachers (n = 1601), followed by administrators (n = 641), related service professionals (n = 533), and parent/community members (n = 10). Further, these attendees primarily worked in elementary school settings (n = 1149), followed by middle schools (n = 574), high schools (n = 418), multiple grade levels (n = 329), district level (n = 223), preschools (n = 73), and other/not applicable settings (n = 71).

Materials

Most of the variables analyzed in this study were assessed using the survey completed by attendees following the training. This survey was created in 2015 by the second author and several collaborators as part of a broader and ongoing training evaluation project. After the initial items were drafted, feedback was obtained and incorporated from a range of educational professionals with expertise on either PBIS or survey design. Furthermore, the wording on a few survey items was modified slightly based on feedback obtained after the first year of survey implementation. The survey version used in this study consisted of 18 items, including demographic items along with questions that ask attendees about their perceptions of the training session and trainers, likelihood of using the information from the session within the next four weeks, their school's level of PBIS implementation, challenges and benefits of implementing PBIS, and suggestions regarding how to improve future training sessions. Other information that was relevant to the study was assessed using a cover sheet that was completed by the trainer following each session. The survey items and cover sheet are available from the second author on request.

Procedures

The study used archival data that were collected following PBIS training sessions that occurred between the beginning of June 2015 and the end of May 2016 across the state. Attendees consisted of school staff and other community members who attended one of the trainings. At the end of each session, attendees were given a feedback survey to complete and told that their completion was completely voluntary. The trainers also completed a cover sheet that asked about more specific information regarding the training. The trainers then collected and sent the surveys and cover sheet to the authors' university because of its involvement with evaluating the effectiveness of these trainings as part of a five-year School Climate Transformation grant awarded by the US Department of Education to the Ohio Department of Education. The Institutional Review Board at the authors' university previously approved the access and analysis of this data as part of the ongoing evaluation project, and the primary researcher was on the list of approved project personnel who then coded the data for analysis.

Data analysis

An exploratory case study design was used to analyze the data and explore the various factors that relate and contribute to the effectiveness of this specific type of professional development training. First, initial correlations and individual predictors were identified in order to understand the individual relationships between the six factors related to professional development and attendees' reported likelihood of using information from the training sessions within the next four weeks. These analyses were conducted using either a chi-square test, Spearman rank-order correlation, or Kruskal Wallis H test depending on the nature of the variables. Nonparametric procedures were used because the distribution of the outcome variable (i.e. likelihood of implementing information from session) was significantly different from normal. Following these initial analyses, an ordinal regression was originally going to be conducted to develop a model for predicting attendees' likelihood of using the information in the next four weeks. However, the data did not meet the assumption for proportional odds that is necessary for this analysis. Therefore, a multinomial regression was recommended and used to identify the combination of factors that best predict the attendees' reported likelihood of using information from the training within the next four weeks.

Results

Preliminary analyses included examining the study variables for normality. The data were first examined for skew and kurtosis to determine if all variables were within acceptable ranges of normality (i.e. skewness < 3 and kurtosis < 10; see Kline 1998). Again, the distribution of the outcome variable (i.e. likelihood of implementing information from session) was significantly different from normal. Thus, nonparametric procedures were used to analyze the data.

Next, initial correlations and individual predictors were identified in order to understand the individual relationships between the six factors related to professional development and attendees' reported likelihood of using information from training sessions within the next four weeks. These results are reviewed next.

Table 2. Cross-tabulation of improvement of knowledge and likelihood of using information.

	Improved Knowledge		
Likely to Use Information	No	Yes	χ^2
Strongly Disagree	8	42	74.7**
Disagree	19	30	
Neutral	65	115	
Agree	284	804	
Strongly Agree	213	1157	

Note. ** = $p < .01$. Numbers reflect group frequencies.

First, the association between attendees' increase in knowledge about PBIS and their likelihood of using the information from the session within the next four weeks was determined by running a chi-square test. To do so, a chi-square test was run to determine any differences in effectiveness between attendees who reported an increase in knowledge and those that did not. The relation between these variables was significant, χ^2 (4) = 74.7, $p < .01$. That is, attendees who experienced an increase in knowledge reported a greater likelihood to use the information within the next four weeks (see Table 2).

Next, the researcher examined whether administrator support was positively related to attendees' likelihood of using information from the session within the next four weeks. In order to conduct this analysis, the researcher added a variable and coded for whether or not an administrator from the attendee's own building or district level was present at the training. Then a chi-square test was conducted to examine the relationship between administrator presence at the training and the likelihood that the attendees will use the information. The relationship was not significant. Attendees with and without an administrator present were equally likely to report using the information. As a follow-up analysis, the researcher looked at the relationship between participants' reported likelihood of using the information from the session and their administrators' reported likelihood of using the information from the session. This analysis was completed using a Spearman's rank-order correlation, and the relationship was found to be positive and significant ($r_s = .49$, $p < .01$). Participants were reportedly more willing to use the information when administrators in their building or district were also willing to use the information (see Table 3).

Continuing, the researcher assessed the relationship between the effectiveness of the trainings and the use of active learning as measured by whether or not the attendees reported receiving feedback from the trainers. A chi-square test was run to determine any differences in effectiveness between attendees who reported receiving feedback and those that did not. The relation between these variables was significant, χ^2 (4) = 99.26, $p < .01$. Attendees who received feedback reported a greater willingness to use the information from the session (see Table 4).

Table 3. Spearman's rank order correlation between participant likelihood to use information and administrator likelihood to use information.

Variables	1
1. Participant Likelihood to Use Information	–
2. Administrator Likelihood to Use Information	.49**

** = $p < .01$.

Table 4. Cross-tabulation of presence of active learning and likelihood of using information.

	Active Learning		
Likely to Use Information	No	Yes	χ^2
Strongly Disagree	9	41	99.26**
Disagree	22	27	
Neutral	55	125	
Agree	249	840	
Strongly Agree	159	1216	

** = $p < .01$. Numbers reflect group frequencies.

Next, the researcher determined the relationship between the duration of trainings and attendees' likelihood of using the information from the session within the next four weeks by running a Spearman's rank-order correlation. The researcher found the correlation between the duration of trainings as measured by the number of days of each training and the attendees' reported likelihood of using the information. The correlation was positive but not significant ($r_s = .003$, $p = .89$).

The researcher then analyzed the relationship between the attendees' likelihood of using the information in the next four weeks and the coherence between the learning activities at the training and structures currently in place at their schools. The researcher measured coherence by analyzing the attendees' responses regarding their schools' current level of implementation of PBIS. A chi-square test was run to determine if attendees' likelihood of using the information is related to their schools' current level of implementation. The relation between these variables was significant, $.^2$ (12) = 53.9, $p < .01$. Attendees who worked in schools already implementing PBIS were more likely to plan on using information from the session within the next four weeks compared with attendees working in schools that only had plans to implement or no plans to implement at all (see Table 5).

Finally, a Kruskal Wallis H test was used to determine any group differences in effectiveness between the months in which the training occurs. Since the researcher was primarily interested in differences between general time periods during the year, rather than month-by-month differences, training dates were coded into four separate groups that reflect four general points throughout the year. The first group consisted of trainings that occurred during the summer months (i.e. June, July, and August); the second group consisted of trainings that occurred during the beginning of the school year (i.e. September, October, and November); the third group consisted of trainings that occurred during the middle of the school year (i.e. December, January, and February); and the fourth group consisted of trainings that occurred towards the

Table 5. Cross-tabulation of coherence and likelihood of using information.

	Is District Implementing PBIS				
Likely to Use Information	Yes	No but will this year	No but will next year	No plans to implement	χ^2
Strongly Disagree	30	5	7	2	53.9**
Disagree	23	4	18	2	
Neutral	66	17	64	13	
Agree	567	133	240	63	
Strongly Agree	779	193	283	42	

** = $p < .01$. Numbers reflect group frequencies.

Table 6. Pairwise comparisons between dates of training.

Sample 1–Sample 2	Test statistic	Significance
Summer Trainings – End of the Year Trainings	−98.39	.09
Summer Trainings – Mid Year Trainings	−168.26	.005
Summer Trainings – Beginning of the Year Trainings	−195.59	.001
End of the Year Trainings – Mid Year Trainings	69.87	.051
End of the Year Trainings – Beginning of the Year Trainings	97.2	.004
Mid Year Trainings – Beginning of the Year Trainings	27.33	.47

end of the school year (i.e. March, April, and May). Results from the Kruskal Wallis H test revealed significant group differences (H = 16.28, $p < .01$). Follow-up pairwise comparisons indicated significant differences between summer trainings ($M = 4.13$, $SD = 1.03$) and mid-year trainings ($M = 4.41$, $SD = .71$), summer trainings ($M = 4.13$, $SD = 1.03$) and beginning of the year trainings ($M = 4.4$, $SD = .82$), and end of the year trainings ($M = 4.31$, $SD = .84$) and beginning of the year trainings ($M = 4.4$, $SD = .82$). Altogether, the most consistent finding from these follow-up comparisons indicated that trainings were most effective when they were offered at the beginning of the academic year (see Table 6).

Multinomial regression

Next, a multinomial regression was used to identify the combination of factors that best predicted attendees' reported likelihood of using information from the training within the next four weeks. It is important to note that when interpreting the results from this analysis, a corrected significance value of .01 was used as the critical value. Due to the large number of statistical tests that were run during this analysis and the subsequent increased Type I error, it was recommended that a corrected value be used that involved dividing .05 by the total number of predictor variables (Tabachnick and Fidell 2007). Administrator support and duration were variables that were excluded from this analysis because they were not significantly correlated with the effectiveness of the trainings. After excluding these variables, the predictor variables in the multinomial regression included knowledge increase, training date, coherence, and feedback.

Overall, the model was significantly different from the intercept-only model, $\chi^2(24) = 243.09$, $p < .01$. The likelihood ratio test determined the contribution of each of the predictor variables to the outcome variable, and the training date ($\chi^2 = 61.71$, $p < .01$), coherence ($\chi^2 = 37.32$, $p < .01$), feedback ($\chi^2 = 74.97$, $p < .01$), and knowledge increase ($\chi^2 = 64.16$, $p < .01$) all were found to make significant contributions to the model (see Table 7). In addition, the model had adequate accuracy as it predicted responses in 55.4% of cases, which exceeded the proportional-by-chance accuracy rate for this data.

Table 7. Results from multinomial regression.

Predictor variables	χ^2	p
Improved Knowledge	64.16	.000
Coherence	37.32	.000
Active Learning	74.97	.000
Date of Training	61.71	.000

Discussion

Overall, most of the findings aligned with this study's hypotheses and the professional development literature (e.g. Cohen and Hill 1998; Garet et al. 2001; Heck et al. 2008; Ingvarson, Meiers, and Beavis 2005; Whitworth and Chiu 2015). As predicted, the effectiveness of the trainings was significantly related to the incorporation of feedback, level of coherence between learning activities at the training and structures currently in place at attendees' schools, attendees' increase in knowledge, and training date. Interestingly, the presence of an administrator from an attendee's building or district did not have a significant relationship with their likelihood of using the information from the session within the next four weeks. However, in a follow-up analysis, the administrators' likelihood of using the information was significantly related to the attendees' likelihood of using the information from within their building or district.

Finally, contrary to one of the initial hypotheses, the other variable that did not have a significant relationship with the effectiveness of the sessions was duration as measured by the number of days each training occurred. However, this finding was likely due to the fact that the measure of duration was really a proxy measure of duration given the varying lengths of single- and multi-day trainings. For example, multi-day trainings did not necessarily last longer than single-day trainings in terms of the total number of hours. In other words, multi-day trainings could have actually been shorter sessions even though they were spread out over more days compared with a single-day training that lasted an entire day. Unfortunately, given the limited amount of information provided on the feedback surveys, there was no way to code for the number of hours and capture the true length of each training session. Again, research suggests that longer programs provide teachers and other school staff members with additional time to learn the information and engage in active learning opportunities that further build their understanding of the content (Gulamhussein 2013). Altogether it is likely that the findings related to duration were impacted given the variable used to measure this construct might not have adequately captured the true length of sessions.

Furthermore, there is some research to suggest that simply extending the length of a training or spreading a series of trainings out over a period of time is not necessarily going to be effective without careful consideration of such decisions (e.g. Landesman Ramey et al. 2011). In other words, although spaced practice has consistently been found to improve learning more than massed practice (Donovan and Radosevich 1999), trainers still must be strategic when making decisions regarding the length and frequency of trainings. For example, Landesman Ramey et al. (2011) manipulated the spacing of professional development coaching provided to teachers while holding the overall amount of training constant. These researchers found significant classroom gains following 20 full days of coaching over the span of five weeks compared with one full day of coaching per week over the span of 20 weeks (Landesman Ramey et al. 2011). Therefore, defining and measuring effective duration for professional development events is difficult to do, and it is likely that the current study did not adequately capture this variable.

Implications for professional development in education

Given the various criticisms noted worldwide regarding the effectiveness of professional development for educators (e.g. Castro 1991; Vonk 1995; Yoon et al. 2007), this study has several important implications for those responsible for planning these types of events. That is, although this study focused on one particular type of professional development within a single state in the US, the findings that emerged about predictors of professional development effectiveness can serve as a model that highlights the specific needs that must be considered when providing professional development opportunities for educators around the world. Trainers can apply this model in other settings and with different types of trainings as they prepare for future sessions. The following considerations and recommendations are organized by each variable that was found to be individually related to the effectiveness of the trainings. Trainers can address each variable individually while also considering the specific combination of factors that best fit the regression model (i.e. increase in knowledge, coherence, feedback, and date of training).

Increasing knowledge

Attendees reported being more willing to use the information from each training when they also experienced an increase in their knowledge following the session. Therefore, it is critical for trainers to help attendees learn and acquire new knowledge. One practical way trainers can ensure that this increase in knowledge happens is by providing a needs assessment prior to a training where attendees can share ideas about what they know and what they are interested in learning more about at the training. The trainers can then use this information to fine-tune their presentations in order to best fit the needs of the audience and address topics that attendees want to know more about. Conducting a needs assessment is one technique that has been successfully incorporated into other professional development programs (Lee 2005) and can help trainers better understand how to most effectively increase attendees' knowledge.

Administrator support

The mere presence of a building or district administrator was not significantly related to attendees' reported willingness to use the information from the session within the next four weeks. However, consistent with research regarding administrator buy-in (e.g. Turnbull 2002), administrators' willingness to use the information from the session was significantly related to attendees' willingness to use the information. Therefore, it could be helpful for trainers to specifically encourage administrator commitment to the particular professional development topic. For example, the trainer might meet with all of the administrators as a group to communicate the significant impact their attitudes can have on the actions and attitudes of the other staff members in their buildings. In addition, the trainer could provide some time for the administrators to work together as a group to brainstorm specific actions they can take as leaders to support educators as they implement the given change within a school. Finally, it could also be beneficial for trainers to specifically meet with administrators to discuss any resistance they might be experiencing because overcoming resistance at the administration level may have positive ripple effects for other staff members who are impacted by their administrator's attitudes and actions.

Active learning

Again, given the limited information provided on the feedback surveys, active learning had to be measured in a very specific way. Although active learning can encompass a wide variety of activities (Garet et al. 2001), this study defined it as receiving feedback from the trainer. As predicted, attendees reported a greater willingness to use information from the session when they also received feedback from the trainer. Therefore, trainers should make an effort to regularly provide feedback to attendees during professional development events. More specifically, research suggests effective feedback is goal-referenced, actionable, user-friendly, and timely (Wiggins 2012).

Providing feedback is clearly an important aspect of active learning, but active learning can be incorporated in other ways as well. For example, job-embedded coaching can increase educators' perceived skills (Castillio et al. 2016). Although it might not be feasible for trainers to provide such intensive coaching to attendees, it is still something that can be considered and developed using school staff with more extensive knowledge and training in PBIS (e.g. school psychologist, school counselor, etc.). Additional active learning activities can include engaging attendees in meaningful discussions about planning for future application of recently acquired knowledge (Garet et al. 2001). Therefore, it could be helpful to provide time at the end of a training session for individuals from the same building to meet and talk about how to successfully apply information from the training at their school specifically.

Fostering coherence

Again, attendees reported a greater willingness to use the information from the session within the next four weeks when there was stronger coherence between the training content and movements already taking place within their buildings, as measured by whether or not the school is currently implementing PBIS. Although a trainer has very little control over what is currently taking place in the attendees' schools, there are other ways trainers can foster coherence. Again, needs assessments have been successfully incorporated into other professional development programs (Lee 2005), and they can provide trainers with information regarding how attendees are currently implementing a given practice within their buildings. Trainers can then meet attendees where they are and include information about how to make these practices more effective.

Timing

There were several significant differences between trainings taking place at different points throughout the year. However, the most consistent pattern involved attendees reporting a greater willingness to use information from a session following trainings that took place at the beginning of the academic year during September, October, or November. For instance, attendees reported being significantly more likely to use the information following beginning of the academic year trainings compared with trainings that took place during the summer and at the end of the year. Therefore, it seems trainings could be particularly effective if they occur at the beginning of the school year. This is not to say that trainings cannot be effective at other points during the year (Yoon et al. 2007), but trainers

should just be aware of potential barriers that exist at these times and consider ways to most effectively overcome them. For example, given the increase in teacher burnout towards the end of the school year (Pas, Bradshaw, and Hershfeldt 2012), if trainings are conducted near the end of the academic year, it may be helpful for trainers to encourage attendees to set specific goals for the following year instead of making immediate changes, which may be overwhelming at that time of the year. Trainers can then follow up during the first month of school to support putting that plan into action.

Limitations

This study provided general information regarding professional development along with specific insight about how educators can be effectively trained in PBIS. However, there were several limitations that need to be considered. First, the outcome variable only assessed attendees' reported likelihood of using information from the session within the next four weeks. Without any follow-up work with these attendees, it was impossible to determine if educators actually implemented such changes. Therefore, future studies should measure actual changes and student outcomes following a session in order to better understand the effectiveness of these trainings. Second, due to the nature of the variables of interest, causal relationships could not be assessed. Again, the predictor and outcome variables were measured simultaneously on the survey, so it was impossible to determine if the predictors caused changes in attendees' willingness to use information from the session within the next four weeks. Third, there was a limitation with the specific regression analysis that was used in this study. Specifically, assessing model fit is not as well developed for multinomial regressions as in linear regression methods (Petrucci 2009). However, due to the nature of the data, this was the best analysis to use as explained previously. Finally, this study only reviewed a specific type of training that was done in Ohio. Although it is quite possible that these findings can be generalized to other settings worldwide, more research is needed to understand how this unique model fits with professional development taking place in other countries, especially as PBIS continues to become more common around the world.

Future directions

In addition to the ideas already presented in the previous section, there are other future directions to consider. First, given there are six different broad types of trainings offered in Ohio, future studies can examine whether the relationships between effectiveness and the professional development variables vary by training type. If meaningful differences exist, this differentiation can help trainers more effectively plan a session based on the type of training. Second, future research will benefit from gathering more data after training sessions occur and examining the specific conditions and structures that are necessary for lasting changes to occur, especially given large numbers of professional development opportunities do not lead to significant positive changes (Yoon et al. 2007).

Altogether, this study specifically focused on how to effectively train educators in PBIS, which can be helpful for both trainers in Ohio as they prepare for future PBIS trainings and also school psychologists and other professionals who are often responsible for organizing and leading training in PBIS. Given all of the positive outcomes

associated with PBIS (e.g. Bradshaw, Mitchell, and Leaf 2010; Pas and Bradshaw 2012; Simonsen et al. 2012) and the increasing number of schools using it around the world (e.g. De Jong 2005; Goei 2008; Kelm, McIntosh, and Cooley 2014) it is critical that educators understand how to effectively implement PBIS with integrity. By carefully considering some of the variables explored in this study, PBIS trainings will hopefully lead to more meaningful changes in the schools that contribute to positive academic and behavioral outcomes for all students.

In addition, and perhaps even more importantly, this case study also provided a model of specific factors that can be considered when planning professional development events in general. This model is not limited to PBIS training and can be applied in many settings. That is, although it has been challenging to provide effective professional development in education around the world, this model can help provide training that will lead to positive and meaningful changes for teachers and students alike.

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