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Causal Modelling of the Relationship between Professional Development Needs and Practitioners' Effectiveness

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Abstract This study examined the causal relationship between early childhood practitioners' professional development needs and their teaching effectiveness in the Free State Province of South Africa. It investigated the direct, indirect, and total effects of the professional development needs of practitioners which included in-service training, professional learning communities, coaching, mentoring, conferencing, and workshops - all pertaining to practitioners' effectiveness when using the structural equation modelling approach. A purposive sample of 211 early childhood practitioners from rural Motheo District communities was selected. They were presented with a structured questionnaire to complete for data collection purposes. The generated data was subjected to enquiry by utilising the Analysis of Moment Structure (AMOS) in order to ascertain the direct, indirect, and total effects of the predictor criterion variables. The formulated hypothesis was tested at 0.05 level of significance. The results revealed that in-service training was the best indicator of practitioners' effectiveness. It was also found that practitioners' effectiveness decreased when they did not have the necessary professional development opportunities. The framework's robustness and parsimony are confirmed by the path model's 97% explanation of the variation in practitioners' effectiveness. The model showed a good fit (CFI = 0.96) which confirmed the relationships that were hypothesised, thus emphasising the significance of practitioners' ongoing professional development in the rural areas of the Motheo District. This study recommends, among others, that professional development programmes be prioritised and sustained as ongoing structured initiatives that integrate collaborative and reflective practices.

Keywords: causal modelling; early childhood; in-service training; practitioners' effectiveness; professional development

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1. Introduction

The level of teaching at rural schools remains as the most important determinant of a learner's educational progress, particularly in their academic achievement in class assessments such as tests and examinations (OECD, 2021). Since educational policies at all levels are prone to revision owing to technological advancements, curriculum changes, and new learner demands, there is an increasing necessity for practitioners to enhance their practices, professional growth, and competencies. Based on evidence provided by Darling-Hammond et al. (2017) and Kraft, Blazar and Hogan (2018), changes in educational policymaking rest largely in rolling-out professional development programmes for practitioners to promote their growth and increase motivation to enhance the quality of teaching-learning in classrooms to attain better academic outcomes. However, there remains a gap regarding the rationale connecting professional development initiatives and practitioners' professional developmental needs, including how these needs influence teaching-learning effectiveness in the classroom.

Although previous research provided insight into the positive correlation between professional development and practitioners' performance (Kraft, Blazar, & Hogan, 2018; Wei, Darling-Hammond, & Adamson, 2020), it has become increasingly apparent that not all professional development experiences engender significant benefits. A common cause of this disparity emanates from the misalignment between the quality of content and delivery of professional development programmes and the unique professional needs of practitioners (Wei et al., 2020). This may be affected by the fact that evaluations utilise correlational designs which limit the ability to draw reliable conclusions regarding the nature and direction of these associations.

Consequently, the limitations associated with mere correlation of predictor variables with the criterion, led to preferring causal modelling which offers a more incisive methodological approach to address this gap. Also, causal modelling offers a robust framework for exploring these mechanisms by enabling researchers to identify, quantify, and interpret directional relationships among complex variables (Pearl, 2009). Grounded in the logic of structural equation modelling, the causal models allow researchers to move beyond simple correlation to find pathways through which practitioners perceive their own professional development needs that may advance their effectiveness in the classroom (Pearl & Mackenzie, 2018).

These pathways suggest direct and indirect effects among and between variables that may be attributed to common causes. These variables are endogenous and known as dependent variables (in this case, practitioners' effectiveness), and exogenous known as independent variables (for this study they include in-service training, professional learning communities, coaching, mentoring, conferencing, and workshops). By employing a causal model, this study sought to deepen the understanding of how practitioners' professional development can lead to measurable improvements in teaching practice. Desimone (2009) maintains that understanding this causal relationship not only holds theoretical

significance for practitioners' professional development which leads to their effectiveness and competence but also has practical implications for designing more responsive and data-driven professional development programmes that enhance practitioners' overall performance.

2. Problem Statement

The South African Government recognised early childhood care and education (ECCE) as a crucial sector to transform various communities. Consequently, various ECCE policies were formulated to enact Government's vision of achieving equity in communities where both the practitioners and the learners were anticipated to reach their full potential. Despite these policy initiatives which emphasised the importance of increasing the skills capacity of the ECCE workforce, empirical evidence regarding how these initiatives would translate into an understanding of the professional development needs and experiences of ECCE practitioners in disadvantaged communities is still lacking. Therefore, the necessity for a strong causal model that can identify, quantify, and explain the relationship between professional development needs and how they influence practitioners' effectiveness is crucial in order to inform more focused and effective capacity-building strategies.

This was because, despite the growing emphasis on the professional development of early childhood practitioners as a tool for improving their effectiveness across South Africa (especially in rural communities), there is still a lack of clarity on the causal relationship between professional development needs and the actual practitioner performance outcomes. Many existing studies rely on correlational analysis which failed to capture the dynamic and potentially bi-directional influences between what practitioners need to learn and how effectively they execute their roles. Educational stakeholders may invest huge funding in professional development initiatives without knowing whether they address the specific needs that most significantly impact effectiveness. Hence, this study was conducted to investigate the direct and indirect relationship between practitioners' professional development needs and their effectiveness in the rural communities of the Motheo District in the Free State province of South Africa.

3. Research Questions

The following research questions were posed to guide the study:

- What are the direct, indirect, and total effects of the causal relationship between practitioners' professional development needs and their effectiveness?
- To what extent do specific professional development needs (i.e. in-service training, professional learning communities, coaching, mentoring, conferencing, and workshops) predict practitioner effectiveness?
- What is the most parsimonious model that adequately explains the causal relationship between professional development needs and practitioners' effectiveness?

4. Hypothesis

H_0: There is no significant causal relationship between professional development needs and practitioners' effectiveness.

5. Liiterature Review

5.1 Professional Development

Professional development, as described by Russell (2021), is a constant learning process that assists teachers to sustain and support existing knowledge as the foundation for acquiring new knowledge and skills that will keep them up to date with the latest developments within their profession. Professional development is also defined as the various learning activities that educators engage themselves in to improve their skills and knowledge about their professional fields (National Childhood Network, 2021).

In this context, practitioners' professional development refers to any kind of ongoing training or education for their improvement such as lesson delivery and classroom management practices which lead to the better learner academic achievement. It is one method that educational practitioners can exploit to advance their careers and raise their quality of teaching. This professional development can occur in both formal and informal environments to promote teaching-learning which can be rolled-out in the form of workshops, mentoring, in-service training, retreats, seminars, conferences, and peer-coaching.

2.2 Forms of Professional Development

In literature it is evident that there are different forms of professional development that can enhance practitioners' effectiveness. These include, among others, in-service training, professional learning communities, individualised or group coaching, mentoring, conferencing, and workshops which are outlined below (Andrasyan-Van Pletzen, 2018; Visković & Jevtić, 2018; Maier & Kou, 2019; Havea & Mohanty, 2020; Yurtseven-Yılmaz & Sever, 2021):

2.2.1 In-service Training

In-service training involves all thoroughly planned and executed relevant learning activities that the teacher undertakes with the aim of upgrading his or her professional knowledge and skills to become competent in the delivery of core duties (Adika & Mung'ala, 2018). However, in-service training appears in various forms ranging from conferences, workshops, seminars, correspondence courses, professional readings, and presentations (Michael, 2017). If effectively planned and managed, in-service training can be a powerful source of professional development (PD) for practitioners which could uplift the image of the teaching profession in general, in addition to enhancing learners' academic performance.

2.2.2 Professional Learning Communities (PLCs)

Professional Learning Communities (PLCs) according to Steyn (2015), refers to the deliberate sharing of learning that occurs within an organised group of practitioners who focus on the group's collective skills and knowledge within a culture of a caring school setting or community-based learning centre that influences the lives of the teaching workforce, the learners in their care, and the

entire school management that aims to eventually promote learners' learning. Evidence demonstrates that collaborations among members of a particular teaching workforce through professional learning communities (PLCs), can be a dominant source of professional development with implications for the practice of teachers or practitioners (Mahimuang, 2018; Chua et al., 2020; Luştrea et al., 2020; Zulu & Mukeredzi, 2021; Ndunda, 2022).

Also, according to Spencer-Johnson (2018), professional learning communities can be very supportive by providing opportunities for shared vision among the teachers who facilitate learning to achieve quality outcomes. Within the context of this study, professional learning communities offer the environment and assistance required for teams of subject advisors, school administrators, and classroom teachers to collaborate to identify their own developmental paths and to organise activities that will promote their growth.

2.2.3 Coaching

The concept of coaching in teaching and learning refers to a job-specific professional development process when the coach supports an individual teacher or group of teachers in their classrooms to provide research-informed best practice pedagogical strategies to enhance learners' performance (Daniels, 2020). Coaching has been used interchangeably with other strategies such as learning-centred supervision, peer-mentoring, cognitive coaching, and peer-supervision (Abbasian & Esmailee, 2018). Other studies by Piper and Zuilkowski (2015), Abbasian and Esmailee (2018) and Bennett (2019) identified various forms of coaching: cognitive, instructional, literacy, and content coaching.

Coaching is a commonly used professional development strategy to improve the quality of teaching and learning. Evidence in literature reveals that coaching, whether individualised or group, has become a popular professional development tool used to develop the teaching workforce (Abbasian & Esmailee, 2018; Bennett, 2019; Block, 2019; Lofthouse et al., 2019). These studies found that coaching can positively impact teachers' pedagogical practices which lead to quality learning outcomes.

2.2.4 Mentoring

According to Harrison (2019), mentoring is generally perceived as an expert-novice relationship where the mentor is considered as an expert in possession of knowledge to enter a reciprocal relationship with the mentee who is a novice teacher. This relationship often begins during the initial training programmes and is expected to continue throughout the formative years of the mentee-teacher. Harrison (2019) adds that this process is enacted during the induction of a new staff member of the school, college, or university.

Harrison (2019) maintains that mentoring requires a context-specific professional to utilise his or her expertise and communication skills to provide support such that mentees are thoroughly capacitated to assume new roles within their specific job-description. Mentoring, therefore, is a secure relationship which aims at developing innate or potential skills that would lead to the acquisition of relevant competencies to enable mentees to perform at the highest level. It is

therefore seen as an essential professional development model for capacitating practitioners (Li, 2018). Astute practitioners consistently develop their teaching skills and knowledge to uplift theirs and learners' overall academic performance. If practitioners remain in the profession but fail to upskill and expand their knowledge through available opportunities such as seminars, conferences and workshops, such practitioners will lose their professional focus.

2.2.5 Conferencing

Conferences are significant platforms for promoting the professional development of educational practitioners. Regular attendance at conferences leads to knowledge-sharing, teamwork among practitioners and researchers, and quality work among novice teachers. According to Thatcher et al. (2011), conferences are perceived as academic communities organising themselves to contribute to teachers' professional development on an ongoing basis. Conferences may be organised for different purposes which include, among others, educational purposes which focus on sharing and discussing research findings, innovation in the field, and theoretical frameworks in the various areas of education.

Further, professional development initiatives which aim to enhance practitioners' skills and knowledge, often present workshops which provide hands-on experience and practical skills mainly small-group settings designed to foster activities that are interactive, engaging, and relevant to apply in real-life situations. In addition, training sessions, keynote speeches, the operation of modern technology to explore the use of digital tools and platforms to facilitate learning, collaboration, and knowledge-sharing are significant in upgrading teachers' competencies. While conferences provide a platform for practitioners and researchers to share their experiences, findings, and best practices, they also encourage attendees to socially network with colleagues, establish collaborations, and build professional relationships. Lastly, it offers opportunities for educators to develop creative and innovative skills, increase their bank of knowledge, and enhance the quality of their teaching practice (Thatcher et al., 2011).

2.3 Practitioners' Effectiveness

Shah et al. (2022) explain that early childhood practitioners' ability to effectively apply innovative and interactive teaching strategies that promote learners' holistic development, is critical for their job-effectiveness. Shah et al. (2022) also note that teachers use evidence-based techniques, educational strategies, and relevant assessment tools to track learners' progress to tailor training to their (teachers') specific needs. Tayler et al. (2016) elaborate on the effectiveness of early childhood practitioners in terms of pedagogical practices, child development and learning, inclusive practices, family and community engagement, socio-emotional support, and technology integration. Regarding child development and learning, effective teachers establish a supportive and stimulating atmosphere, personalise instruction to individual requirements, and foster strong relationships with children and families (Warnasuriya et al., 2020).

According to Kyriazopoulou et al. (2017), effective early childhood practitioners seek to comprehend and meet the individual needs of every learner, provide specialised assistance when required, and promote positive peer relationships. Proficient professionals also recognise the importance of working with communities and families as partners in learners' education (Chan & Ritchie, 2016). By communicating effectively, sharing information about learners' progress, and including families and communities in decision-making, practitioners can create a welcoming and inclusive learning environment. Additionally, they provide guidance and support, model positive behaviour, and encourage learners to hone their social and emotional competencies (Khusnidakhon, 2021).

2.4 Causal Modelling

Causal modelling is a statistical approach to identify and estimate the effectiveness of cause-and-effect relationships between variables, rather than just associations. According to Rohrer (2018), a causal relationship exists when a change in one variable (the cause) leads to a change in another variable (the effect). By utilising various methods and techniques, researchers gain insights into cause-and-effect relationships to inform decision-making in various fields (Kossakowski et al., 2021).

For this study, practitioners' professional development needs were considered the causative agents, while the practitioners' effectiveness was considered the outcome. This paper was limited to testing the six professional development needs indices which included in-service training, professional learning community, coaching, mentoring, conferences, and workshops. These variables were considered as being exogenous (independent), while the practitioners' effectiveness was considered as being endogenous (dependent). The direct and indirect effects of these variables were determined by using path analysis. The input path model is shown in Figure 1 below:

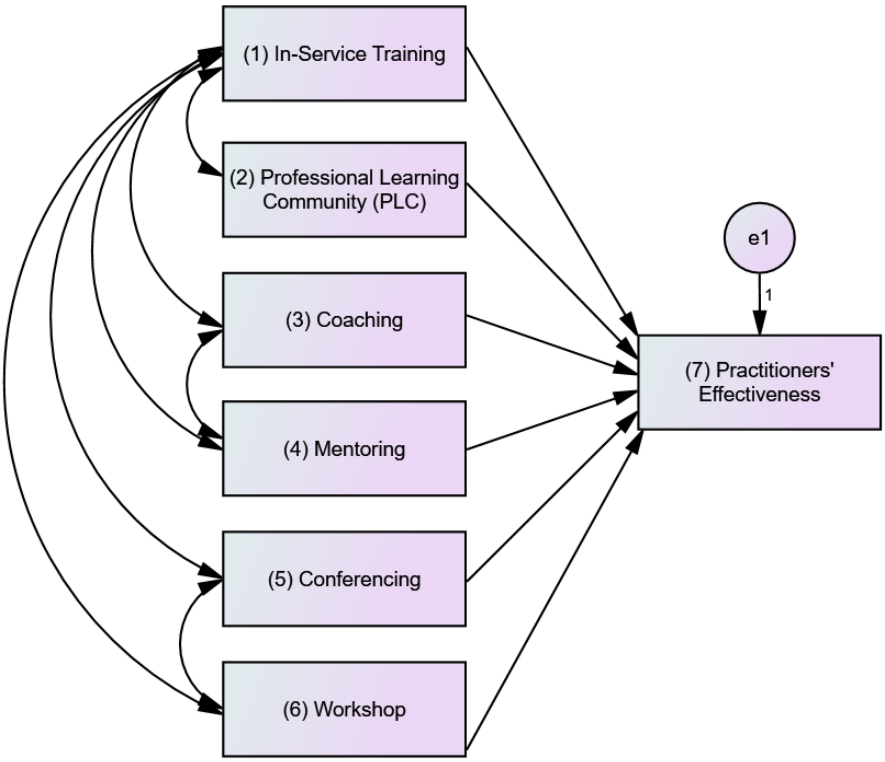

Figure 1: Input path of the hypothesised causal relationship between practitioners' professional development needs and their effectiveness

From observing the input path (figure 1 above), in-service training has a direct effect on practitioners' effectiveness through the path label (71), and indirect effect through other variables like professional learning communities, coaching, mentoring, conferences and workshops. Other variables in the model also have direct and indirect effects on practitioners' effectiveness, except the workshop strategy with only one direct effect through the path label (76). The letters (e) in the model represent error terms which represent the proportion of variance in the endogenous variable that is not explained by the predictors in the path model.

Advisedly, early childhood practitioners are obliged to grasp professional development opportunities in order to remain up to date with the most recent developments and practices in the field (Arthur et al., 2018). It should be noted that although numerous studies have examined the value of professional development for ECCE practitioners in South Africa (Atmore et al., 2012; Petersen & De Beer, 2016; Ncube, 2017; Gomba, 2019; Harrison, 2020; Mashiane-Nkabinde, 2020), little has been done to assess how effective ECCE practitioners are as a result of undergoing professional development through the structural modelling approach.

3. Research Methods

3.1 Research Design

The study employs an ex-post-facto research design which aims to ascertain the cause-and-effect relationship between variables of interest. It is impossible for the researchers to alter the variables of interest in this kind of design since they have no control over them. The researchers try to identify a small number of existing factors as causative agents (Andadari, 2025). The researchers only attempted to investigate how these needs can determine the practitioners' effectiveness using a structural equation modelling approach because, at the outset of this study, they found that the professional development needs of early childhood practitioners already existed. Since the researchers did not alter any independent variable, this research design is deemed suitable.

3.2 Sampling Strategy

All ECCE practitioners employed by Motheo District's registered ECCE centres at the time of the study were included in the study's target population. The sample size of 211 practitioners who worked in the 45 ECCE centres in the Motheo District was chosen for the study through convenience sampling which is a non-probability sampling technique that enables the researcher to choose a large portion of the target population that is readily available throughout the study (Etikan et al., 2016).

3.3 Instrumentation

The primary data collection tools included two self-created questionnaires: the Early Childhood Professional Development Needs Questionnaire (ECPDNQ) and the Early Childhood Practitioners' Effectiveness Questionnaire (ECEEQ). The ECPDNQ was divided into two sections (A and B) based on a four-point Likert scale design (McMillan & Schumacher, 2014) with responses ranging from "strongly agree" (SA), "agree" (A), disagree (D), and “strongly disagree” (SD). Section A of ECPDNQ focused on the demographic information of ECCE practitioners, while Section B comprised of 60 items (10 in each cluster) distributed across six clusters to assess practitioners’ professional development needs. The ECEEQ had 10 items on practitioners’ effectiveness.

To establish the face validity of the instruments, experts in early childhood education reviewed the items for appropriateness and clarity of language. To assess the instruments' coefficient of internal consistency, they were piloted on a similar sample of 20 early childhood practitioners outside the study area. The Cronbach alpha reliability indices of 0.83 and 0.85 were obtained for the ECPDNQ and ECEEQ, respectively. The high reliability indices found for ECPDNQ and ECEEQ indicate that the instruments are dependable and suitable for data collection for this study. The instruments were subsequently distributed to the ECCE practitioners in the ECCE centres visited for the study. In total, 211 copies of the instruments were administered and recorded for data analysis.

3.4 Data Analysis

The participants' responses to the questionnaire items were captured by using a Microsoft Excel spreadsheet. The collected data was then imported to the Statistical Package for Social Science (SPSS) version 25 and Analysis of Moment

Structure (AMOS) version 25 for analysis. The most parsimonious model and the output path diagram were run using AMOS. The path coefficients (direct effects) were used to elicit the specific professional development needs that predict practitioners' effectiveness. A multiple regression analysis was performed on the data to test the hypothesis formulated for the study. The hypothesis was tested at the 0.05 level of significance. According to Kerlinger and Pedhazur, (2009) and Garson, (2011), any path coefficient which is below 0.05 or does not reach some significant level should be deleted from the output path diagram. Fortunately, all the path coefficients in the output path diagram were above 0.05; therefore, no path was deleted in the output diagram which suggested that all paths were important. This implied that all the predictor variables positively predicted directly or indirectly practitioners' effectiveness.

Structural Equation Modelling (SEM) was chosen as the analytical approach because it allows for the simultaneous estimation of multiple relationships between observed and latent variables. The SEM is particularly appropriate when the research involves complex models with mediating variables, which is essential for understanding not just whether variables are related, but how they are related. By using SEM, researchers were able to test direct effects (i.e. from independent to dependent variables), examine indirect effects through mediators, and calculate total effects which combine both direct and indirect pathways. This comprehensive modelling capacity makes SEM ideal for testing theoretical frameworks where variables are interconnected by both direct and mediated ways.

4. Results

4.1 Research Questions

4.1.1 What are the direct, indirect and total effects of the causal relationship between practitioners' professional development needs and their effectiveness?

Table 1: Direct, indirect, and total effects of the causal relationship between practitioners' professional development needs and their effectiveness (N = 211)

		Practitioners' effectiveness		
SN		*Direct effect*	*Indirect effect*	*Total effect*
1	In-service training	0.354	0.193	0.547
2	Conferencing	0.124	0.231	0.355
3	Professional learning communities	0.176	0.020	0.196
4	Mentoring	0.078	0.138	0.216
5	Coaching	0.107	0.151	0.258
6	Workshop	0.087	0.000	0.087

The statistics in table 1 above indicates the direct, indirect, and total effects of the causal relationship between practitioners' professional development needs and their effectiveness. Results reveal that for in-service training, (direct effect = 0.354, indirect effect = 0.193 and total effect = 0.547). The direct (unmediated) effect of 0.354 implies that as in-service training increases by 1 unit of standard deviation, practitioners' effectiveness increases by 0.354. For indirect (mediated) effect, as in-service training increases by 1 unit of standard deviation,

practitioners' effectiveness increases by 0.193. For total effect which is due to both direct (unmediated) and indirect (mediated) effects of in-service training on effectiveness, when in-service training goes up by 1 unit, effectiveness increases by 0.547. Results also show practitioners' effectiveness regarding conferencing: direct effect = 0.124, indirect effect = 0.231 and total effect = 0.355. For direct (unmediated) effect, as conferencing increases by 1 unit of standard deviation, practitioners' effectiveness increases by 0.124. For indirect (mediated) effect, as conferencing increases by 1-unit standard deviation, practitioners' effectiveness increases by 0.231. For total effect which is due to both direct (unmediated) and indirect (mediated) effects of conferencing on effectiveness, when conferencing goes up by 1 unit, effectiveness increases by 0.355.

It was also found that for PLCs, direct effect = 0.176, indirect effect = 0.020 and total effect = 0.196. For direct (unmediated) effect, as PLC increases by 1 unit of standard deviation, practitioners' effectiveness increases by 0.176. For indirect (mediated) effect, as PLC increases by 1 unit, practitioners' effectiveness increases by 0.020. For total effect which is due to both direct (unmediated) and indirect (mediated) effects of PLC, when PLC goes up by 1 unit, effectiveness increases by 0.196. Further, the results show that mentoring, coaching and workshops have direct (unmediated) effects of 0.078, 0.107 and 0.087 respectively. Their indirect (mediated) effects are 0.138, 0.151 and 0.000 respectively, and their total effect are respectively 0.216, 0.258 and 0.087, implying that an increase in 1-unit standard deviation will lead to an increase in their respective figures.

4.1.2 To what extent does specific professional development needs predict practitioner effectiveness?

To answer this research question, a simple linear regression analysis was conducted to determine the extent to which each professional development need predicts practitioners' effectiveness as presented in Table 2 below:

Table 2: The predictive power of practitioners' professional development needs and their effectiveness (N = 211)

		Practitioners' effectiveness		
SN	**Professional development needs**	**R**	**R^2**	**p-value**
1	In-service training	0.846	0.715	0.00
2	Conferencing	0.788	0.621	0.00
3	Professional learning communities	0.762	0.580	0.00
4	Mentoring	0.771	0.594	0.00
5	Coaching	0.755	0.570	0.00
6	Workshop	0.759	0.576	0.00

The results in Table 2 above display the predictive power of practitioners' professional development needs and their job effectiveness. Results show that in-service training alone predicts (R^2) 71.5% of practitioners' effectiveness. Conferencing predicted effectiveness by 62.1%, professional learning communities predicted 58.0% of effectiveness, mentoring had the predictive value of 59.4%, coaching predicted effectiveness by 57.0%, and lastly workshop predicted effectiveness by 57.6%. These results show that all the six exogenous

variables used in this study have predictive ability on practitioners' job-effectiveness (the endogenous). This is also evident in the p-values which are below 0.05 level of significance, which implies that all the exogenous variables are significant predictors of practitioners' effectiveness.

4.1.3 What is the most parsimonious model that adequately explains the causal relationship between professional development needs and practitioners' effectiveness?

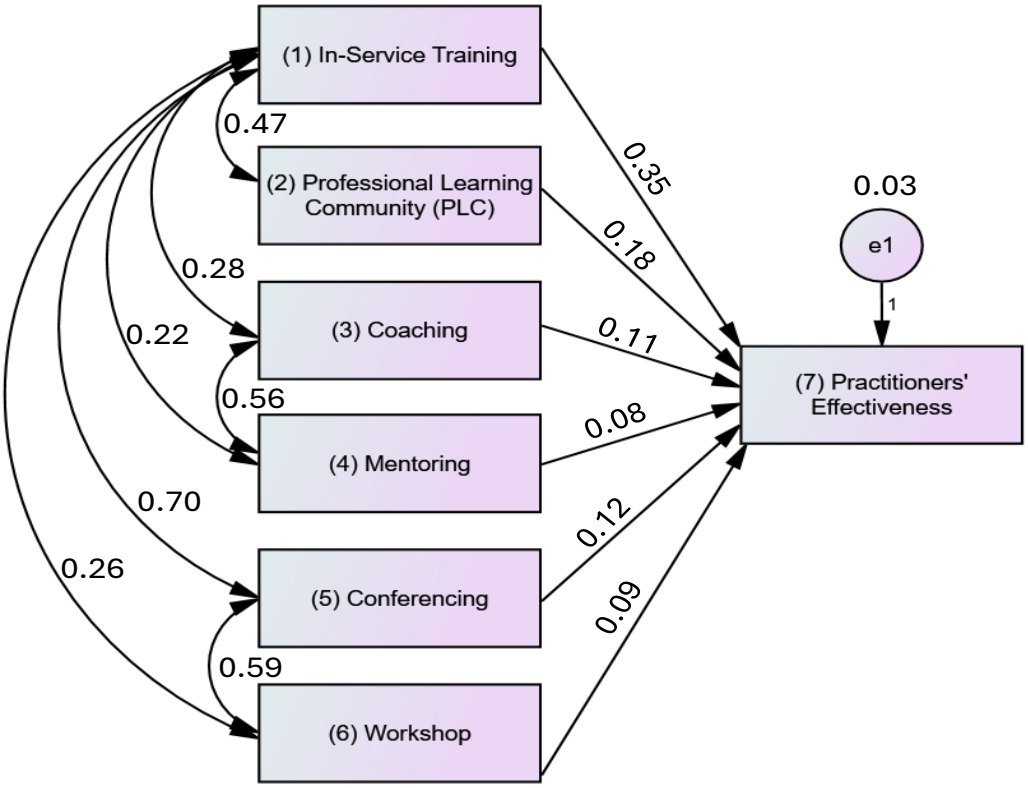

Figure 2: Output path of the hypothesised causal relationship between practitioners' professional development needs and their effectiveness

Figure 2 above represents an output path showing the direct and indirect effects of professional development needs (in-service, professional learning communities (PLCs), coaching, mentoring, conferences, and workshops) on practitioners' effectiveness. Each rectangle shown in the model represents a latent or observed variable, and the circle (i.e. e1) represents the error term associated with the endogenous variable. Results show that in-service training exerts a positive direct effect on practitioners' effectiveness (β = .35), while PLC also directly influences effectiveness (β = .26).

Additionally, coaching (β = .11), mentoring (β = .08), conference (β = .12), and workshop (β = .09) each showed positive, though relatively weaker, direct effects on effectiveness. The model suggests that in-service training is the primary exogenous predictor that impact effectiveness directly and indirectly through other variables in the model. The largest direct contribution to

effectiveness was made by in-service training (β = .35). It is a common practice in path analysis that any path with a coefficient less than 0.05 should be deleted from the model to form a most parsimonious model; since no path has a coefficient less than 0.05, this implies that figure 2 represents a parsimonious model that aptly explains the causal relationship between professional development needs and practitioners' effectiveness. The result also indicates that the model explains approximately 97% of the variance in the endogenous variable (practitioners' effectiveness), which is seen in the error of 0.03 for practitioners' effectiveness.

The error term as low as 0.03 indicates that the model fits the data appropriately. This means that the model has strong predictive power such that predictors can explain most of the variance in the endogenous variable. The small error term (0.03) provides evidence for the model's validity and supports its use for inference and prediction. This is also evidence in the CFI value of 0.96 which demonstrated that the model excellently fits the data.

4.2 Hypothesis

H_0: There is no significant causal relationship between professional development needs and practitioners' effectiveness.

Table 3: Regression analysis of the causal relationship between professional development needs and practitioners' effectiveness

Model	Sum of Squares	df	Mean Square	F	Sig.	Dec.
Regression	1284.746	6	214.124	228.644	0.00	Reject H_0
Residual	191.046	204	0.936			
Total	1475.791	210				

Table 3 above shows the regression analysis of the causal relationship between professional development needs and practitioners' effectiveness. In addition, it shows an f-ratio of f(6,204) = 228.644, p = 0.00. Since the p-value is less than the 0.05 level of significance, the result is significant, thus the null hypothesis is rejected. This infers that the causal relationship between professional development needs and practitioners' effectiveness is statistically significant.

5. Discussion

Based on the findings of the study, in-service training has a significant impact on practitioners' effectiveness, both directly and indirectly. Specifically, the direct effect (unmediated) was 0.354, indicating that a one standard deviation increases in in-service training leads to a 0.354 increase in practitioners' effectiveness. This suggests that when practitioners engage more in direct, structured in-service training, there is immediate and considerable improvement in their effectiveness.

In addition to the direct effect, the indirect (mediated) effect was found to be 0.193 which means that part of the impact of in-service training on practitioners' effectiveness operates through other exogenous variables in the model such as professional learning communities, coaching, conferencing and application of new strategies in practice. The total effect (combining direct and indirect

influences) was 0.547, highlighting that overall, in-service training contributes strongly to enhancing practitioners' effectiveness. This finding aligns with that of Michael's (2017) who confirmed that in-service training can be in various forms such as conferences, workshops, seminars, correspondence courses, professional readings, and presentations. Michael (2017) emphasised that if effectively planned and managed, in-service training can be a major source of professional development (PD) for practitioners and the teaching profession in general.

Similarly, conferencing was found to have both direct and indirect effects on practitioners' effectiveness. The direct effect was 0.124, suggesting a modest but positive immediate impact. The indirect (mediated) effect was 0.231, indicating that the larger part of conferencing's impact occurs through mediators such as mentoring, coaching, and workshopping. The total effect was 0.355, underscoring that while conferencing had a lesser direct impact compared to in-service training, its overall contribution was still notable, primarily through indirect pathways. Comparatively, in-service training exerted a stronger total effect on practitioners' effectiveness (0.547) than conferencing (0.355).

This suggests that structured professional development programmes have a more substantial overall influence on effectiveness than conferencing alone, although both forms of professional development are valuable. These findings underscore the importance of designing professional development initiatives that not only provide direct training but also facilitate collaboration and knowledge-sharing among practitioners to maximise their effectiveness. This finding aligns with the earlier finding of Thatcher et al. (2011) who emphasised that conferences provide platforms for practitioners and researchers to share their experiences, research findings, and best practices while enabling attendees to network with colleagues, establish collaborations, and build professional relationships. It also offers opportunities for educators to develop new skills, update their knowledge, and enhance their teaching practices.

The results also demonstrate that the effectiveness of practitioners is positively impacted by professional learning communities (PLCs). A one standard deviation increase regarding participation in PLC activities results in a 0.176 increase in effectiveness. With the assistance of other model variables, the indirect effect was 0.020 for a total effect of 0.196. This implies that although PLCs largely increase effectiveness through practitioners' direct involvement and cooperation, their mediated influence is limited. This finding is in congruence with that of Spencer-Johnson (2018) that PLCs can be supportive to also provide opportunities for shared vision among the teachers who provide quality teaching-learning to attain higher academic performance levels.

Regarding other types of professional development, the findings indicate that the effectiveness of practitioners is affected differently through coaching, mentoring, and workshops. The overall effect of mentoring was 0.216, with a direct effect of 0.078 and a higher indirect effect of 0.138. Coaching also showed a 0.107 direct effect and a 0.151 indirect effect, for a total effect of 0.258. These results imply that instead of an immediate direct impact, coaching and

mentoring have a greater influence through mediated pathways that may improve practitioners' capacity for reflection, problem-solving, and peer-learning.

In contrast, workshops displayed a direct effect of 0.087 but had an indirect effect of 0.000, indicating that the influence of workshops on practitioners' effectiveness occurs exclusively through direct mechanisms; that is, workshops offer immediate benefits without significantly influencing secondary mediators such as collaboration or ongoing application of knowledge.

In contrast, coaching produced the total effect (0.258), followed by PLCs (0.196) and mentoring (0.216). Despite their benefits, workshops had the lowest overall effect (0.087) of all the professional development needs that were examined. These findings highlight how different professional development needs have varying effects. Overall, it is apparent that interventions that promote ongoing, customised professional support like coaching and mentoring are more successful than one-time events like workshops.

Additionally, the comparatively lower mediated effects found for workshops and PLCs may indicate that these formats' reflective and collaborative aspects need to be strengthened in order to increase their indirect benefits for practitioners' development. Overall, the results show how crucial it is to plan professional development programmes that maximise practitioners' effectiveness by combining opportunities for sustained, collaborative learning and reflection with direct instruction.

5.1 Specific professional development needs that predict practitioner effectiveness

The results presented in Table 2 revealed that practitioners' professional development needs significantly predict their job-effectiveness. Among the six professional development strategies that were analysed, in-service training demonstrated the highest predictive power by accounting for 71.5% ($R^2 = 0.715$) of the variance regarding practitioners' effectiveness. This suggests that structured in-service training programmes play a crucial role in enhancing practitioners' performance by providing targeted knowledge and skills that directly translate into improved practice. Conferencing and mentoring also exhibited strong predictive values of 62.1% and 59.4% of the variance in practitioners' effectiveness, respectively. These findings imply that opportunities for shared learning, dialogue, and professional support through conferencing and mentoring significantly enhance practitioners' ability to perform above norm. Similarly, PLCs accounted for 58.0%, coaching for 57.0% and workshops for 57.6% of the variance in effectiveness, indicating moderate, yet meaningful predictive capacities.

Importantly, all six exogenous variables were found to be statistically significant predictors of practitioners' effectiveness, as evidenced by p-values below the 0.05 threshold. This consistent pattern of significance suggests that professional development in its various forms is a significant driver of practitioners' job performance. The differences in predictive power among the professional development needs highlight the varying degrees to which each approach

contributes to practitioners' growth. The higher predictive value for in-service training may be attributed to its structured, curriculum-based nature, which often provides direct, applicable skills and knowledge. In contrast, the relatively lower predictive values observed for workshops, coaching, and PLCs may reflect the need for sustained engagement and follow-up activities to maximise their impact on practice. Overall, these findings emphasise the necessity for ongoing, structured professional development programmes to promote practitioners' effectiveness. This suggests that while all forms of professional development that were analysed are beneficial, investments in in-service training, conferencing, and mentoring may yield the most substantial improvements in practice. This finding aligns with that of Smith et al. (2020) who found that structured and sustained professional development contributed to over 70% of practitioners' effectiveness.

5.2 The most parsimonious model that adequately explains the causal relationship between professional development needs and practitioners' effectiveness

In figure 2 results were presented regarding the path model that illustrated the direct and indirect effects of practitioners' professional development needs - specifically in-service training, PLCs, coaching, mentoring, conferencing, and workshops concerning their job effectiveness. In the model, each rectangle represents an observed or latent variable, while the circles (e1–e6) represent error terms associated with each endogenous variable. The results revealed that in-service training exerts the strongest direct effect on practitioners' effectiveness ($\beta = 0.35$), highlighting its central role in enhancing practitioners' effectiveness. Also, PLCs demonstrated a notable direct effect ($\beta = 0.26$), suggesting that collaborative professional structures contribute meaningfully to practitioners' development. Coaching ($\beta = 0.11$), mentoring ($\beta = 0.08$), conferencing ($\beta = 0.12$), and workshops ($\beta = 0.09$) all exhibited positive, though limited direct effects on practitioners' effectiveness.

The model confirmed that in-service training serves as the primary exogenous predictor, influencing effectiveness both directly and indirectly through interactions with other variables. The prominence of in-service training within the model supports the view that structured, ongoing professional development interventions are crucial to enhancing practitioners' effectiveness.

In terms of model fit, the analysis indicates that approximately 97% of the variance in practitioners' effectiveness is explained by the exogenous variables, as evidenced by a very low error value of 0.03. The negligible value of the error term suggests that the model provides a strong and reliable explanation of the data which supported its predictive validity. Additionally, given that all path coefficients exceeded the commonly accepted threshold of 0.05 as recommended by Kerlinger and Pedhazur, (2009) and Garson, (2011), no path was eliminated, thus the model can be considered as being parsimonious. This parsimony enhances the model's interpretability and statistical efficiency, ensuring that only meaningful and significant paths were retained.

In sum, the findings suggest that professional development activities collectively and substantially promote practitioners' effectiveness. They highlight the critical importance of targeted interventions such as in-service training, while also recognising the supportive roles played by professional learning communities, coaching, mentoring, conferencing, and workshops. The strong model fit and predictive validity affirm the robustness of the proposed framework and its potential for informing practice and policy regarding professional development needs.

6. Conclusion And Recommendations

The findings of this study underscore the pivotal role that professional development plays in enhancing practitioners' effectiveness, with in-service training emerging as the most influential strategy. Both direct and indirect pathways revealed that structured, ongoing professional development initiatives, particularly in-service training, have the strongest impact on job-performance. Also, conferencing and mentoring significantly contribute to effectiveness, especially through mediated mechanisms that foster collaboration, reflection, and reciprocal learning. While PLCs, coaching, and workshops show moderate effects, their value lies in reinforcing a culture of continuous improvement and support.

The model presented in this study offers a comprehensive and parsimonious explanation of how various professional development needs influence practitioners' effectiveness by accounting for 97% of the variance observed. The clear hierarchy of effects shows in-service training leading, followed by conferencing, mentoring, coaching, PLCs, and workshops – all of which provide actionable insights for stakeholders. These results suggest that for maximum impact, professional development programmes should prioritise sustained, structured initiatives while also integrating collaborative and reflective practices.

Ultimately, the study affirms that a multifaceted approach to professional development that involves combining direct instruction with opportunities for peer-interaction, mentoring, and collaborative inquiry, is essential for fostering practitioner growth and elevating overall job-performance. These insights have important implications for educational policy and practice, thus emphasising the need for strategic investment in high-impact professional development interventions.

The findings underscore a clear link between professional development needs and practitioners' effectiveness, with important implications for stakeholders such as policymakers, education departments, and training institutions. These stakeholders should prioritise the design and implementation of context-sensitive PD programmes, particularly for rural practitioners in South Africa whose professional challenges are often distinct from their urban counterparts. Policymakers must also recognise that one-size-fits-all PD strategies are outdated; instead, rural educators require tailored support that addresses limited resources, geographical isolation, and specific community needs. This could include locally relevant content, blended delivery models (e.g. mobile-

based or low-bandwidth online training) and mentorship opportunities involving experienced rural practitioners.

7. Limitations

Firstly, this study was limited to only six variables of practitioners' professional development needs and was restricted to rural communities of the Free State Province of South Africa. This limited the generalisation of the results to other provinces. Secondly, the data used for reporting the professional development needs of practitioners relied on self-reporting which may have introduced a measure of bias or inaccurate self-assessment.

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