

Article

Online professional development and cognitive growth: A quantitative analysis for special education educators

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Abstract: This research quantitatively examines how online professional development (OPD) affects cognitive development in special education instructors. 100 individuals took part in outpatient department activities for six months, undergoing cognitive ability examinations before and after the intervention. Descriptive statistics, paired samples *t*-tests, multiple regression analysis, analysis of covariance (ANCOVA), and Pearson correlation coefficients were used to analyze the data. The findings show a significant rise in post-test scores on the Cognitive Abilities Test (CAT) after taking part in the OPD program. Years of experience and education level were important indicators of cognitive progress, emphasizing the significance of individual traits. Moreover, those with greater expertise and advanced levels of education often had better marks on the post-test. The results highlight the significance of cognitive growth as a crucial result of professional development for special education instructors, adding to the existing knowledge base. The research suggests giving priority to cognitive growth in professional development programs, customizing programs to meet individual requirements, and offering continuous support to educators. Future studies should investigate how OPD impacts cognitive development and analyze its lasting consequences on teacher efficacy and student results.

Keywords: online professional development; special education educators; cognitive growth; quantitative analysis

1. Introduction

Advancements in technology have significantly transformed the professional development environment for educators. One notable shift is the rise of online professional development (OPD) platforms, which have garnered significant interest for their adaptability, availability, and ability to improve teaching methods. This change is especially important for special education teachers who have distinct difficulties in addressing the varied requirements of kids with disabilities. This introduction outlines the importance of OPD for special education instructors, identifies the deficiencies in current research, and specifies the goals of this quantitative study.

Continuous professional development is crucial for educators. Studies indicate that successful professional development may result in enhancements in teaching methods, student achievements, and the general quality of education (Gore et al., 2021; Khlyebas and Slobodyanik-Kolomoyets, 2023; Sanfo and Malgoubri, 2023). Traditional forms of professional growth are generally constrained by factors including limited time, regional obstacles, and a lack of customization (Dubina, 2019). Special education instructors have heightened difficulties as they manage intricate teaching techniques and cater to various learning requirements in inclusive classroom

environments (Kim et al., 2021).

Online platforms have arisen as a possible option for providing professional development to educators in response to these problems. Online professional development provides benefits such as flexible scheduling, individualized learning, and chances for cooperation and networking (Lin, 2014). OPD offers special education professionals the potential to obtain specialized training, resources, and support that may not be easily available in their local environments (Kumar, 2023). Furthermore, OPD may alleviate the isolation often felt by special education instructors by facilitating contact with colleagues and professionals in the industry (Akay and Gürgür, 2018).

Although OPD is becoming more popular, there is a significant lack of research on its usefulness for special education teachers, particularly in terms of its influence on cognitive development. Previous research has explored the effects of online professional development (OPD) on knowledge acquisition, self-efficacy, and instructional practices. However, there is less research on how OPD impacts the cognitive growth of educators. This disparity is noteworthy given the crucial influence of cognition on molding instructional methods, decision-making procedures, and ultimately, student educational achievements (Nalbantoglu, 2024).

The current research seeks to quantitatively analyze the correlation between involvement in OPD and cognitive development in special education teachers to fill this gap. This research aims to provide empirical evidence on the influence of OPD on cognitive development features such as critical thinking, problem-solving, and decision-making abilities, using a quantitative method. This research will investigate possible variations in cognitive development depending on the kinds or forms of OPD programs special education instructors participate in.

This research aims to enhance the current literature by offering empirical insights on the usefulness of OPD in improving cognitive development among special education professionals. This study intends to clarify how participating in OPD impacts cognitive development to guide the designing and implementation of professional development programs for special education practitioners.

1.1. Problem of study

Special education teachers have distinct obstacles while addressing the varied requirements of children with disabilities. Professional development is essential for improving teaching methods, but conventional approaches are generally restricted by time restrictions and lack of customization. Online professional development (OPD) systems can address these difficulties. There is a lack of research on the usefulness of OPD for special education teachers, especially about its influence on cognitive development. Previous research has mostly concentrated on results like gaining knowledge and self-confidence, creating a notable lack of information on how involvement in OPD impacts cognitive growth in special education teachers.

1.2. Research questions

- 1) What is the relationship between participation in online professional development and cognitive growth among special education educators?

- 2) Are there differences in cognitive growth based on the types or formats of online professional development attended by special education educators?
- 3) How do various demographic factors (e.g., years of experience, and educational background) influence the relationship between participation in OPD and cognitive growth among special education educators?

1.3. Significance of the study

This research is significant for several reasons. It fills a significant gap in the existing research by presenting actual data on how online professional development might improve cognitive development in special education teachers. This study enhances comprehension of how educators' learning experiences impact instructional practices and student results by examining the connection between OPD involvement and cognitive growth. The results of this research may guide the creation and execution of enhanced professional development initiatives customized to meet the distinct requirements of special education practitioners. By determining the most efficient forms or formats of professional development, policymakers and educators may make well-informed choices on resource distribution and program advancement to enhance the professional development of special education instructors. This research has significant implications for the education area, emphasizing how online platforms may make high-quality professional development accessible to a wider audience and promote ongoing learning for instructors.

1.4. Terms of the study

This study used a quantitative research methodology to examine the correlation between involvement in OPD and cognitive development among special education professionals. Participants consist of special education instructors from many environments, including public schools, private schools, and online schools. Data were gathered by pre-test and post-test evaluations of cognitive capacities, together with demographic questionnaires to obtain pertinent background details. The research examined the influence of OPD on cognitive development via the use of descriptive and inferential statistics while accounting for possible confounding factors including years of experience and educational background. The research examines OPD programs tailored for special education instructors and investigates variations in cognitive development depending on the kinds or forms of OPD sessions attended by participants.

1.5. Limitations of the study

This work contains limitations that need to be recognized, notwithstanding its merits. Using a quantitative study approach may restrict the thorough comprehension of participants' experiences and views of OPD. Qualitative methods might provide more detailed insights into the intricacies of OPD involvement and its influence on cognitive development. The study's use of self-reported assessments for cognitive ability and involvement in OPD might lead to biases and mistakes. The results' generalizability may be restricted by the unique context and features of the study group. The study's emphasis on cognitive growth may neglect crucial aspects of professional

development and educator effectiveness, such as socio-emotional skills and cultural competency. Future studies should focus on overcoming these constraints to get a more thorough knowledge of how OPD affects the professional development and practice of special education instructors.

1.6. Literature review and previous studies

Conventional methods of professional development often include in-person workshops, seminars, and conferences. Although these methods provide chances for networking and skill development, they are often critiqued for their insufficient ongoing support and restricted influence on classroom strategies (Rani et al., 2023). Special education instructors may have difficulties in obtaining appropriate training and resources because of the specialized nature of their job (Luck et al., 2020).

Studies indicate that conventional professional development initiatives often do not result in significant alterations in teacher behavior or student achievements (Tyagi and Misra, 2021). Traditional approaches provide substantial obstacles to the professional development of special education instructors due to the necessity to address varied learning demands and instructional methodologies (Akay and Gürgür, 2018). Consequently, there is an increasing need for alternate methods that provide flexibility, customization, and continuous assistance.

Online professional development (OPD) offers a viable alternative to conventional approaches, providing flexibility, accessibility, and tailored learning experiences (Kohnke et al., 2023). OPD platforms provide educators the chance to participate in self-directed learning, work together with colleagues, and use materials customized to their requirements (Linh, 2022). OPD has great potential for helping special education instructors tackle the distinct issues they encounter when catering to the varied requirements of children with disabilities (Finlay et al., 2019).

Multiple research has investigated the effects of Online Professional Development (OPD) on educators in many areas such as knowledge acquisition, self-efficacy, and instructional practices (Liang et al., 2020; Suman and Provident, 2018; White, 2013). The studies have consistently shown the beneficial impacts of OPD on teacher learning and professional development. There is a significant lack of research on the usefulness of OPD for special education teachers, especially about its influence on cognitive development.

Special education professional development involves several activities designed to enhance the expertise, talents, and methodologies of educators who deal with kids with disabilities. Studies in this field have emphasized the significance of specific, evidence-supported strategies that cater to the distinct requirements of special education practitioners (Ng'andu, 2023). Research on professional development programs for special education instructors has shown inconsistent effects, with many programs not leading to substantial gains in teacher practice or student outcomes (Pavlidou et al., 2020).

Some research has examined how professional development affects instructional practices and student involvement, but few have particularly looked at cognitive growth in special education instructors. This research gap is important due to the crucial influence of cognition on teaching methods, decision-making, and student

learning outcomes (Levitt and Grubaugh, 2023). Hence, an empirical study is required to investigate the correlation between involvement in OPD and cognitive development in special education professionals.

2. Methods

The study used a quantitative methodology to examine the correlation between engaging in online professional development (OPD) and cognitive advancement in special education teachers. A pre-test/post-test strategy was used to assess changes in cognitive capacities before and after engaging in OPD. The research included six months, during which patients participated in OPD activities and underwent cognitive ability exams.

One hundred participants for the research were recruited via purposive sampling. Special education instructors from diverse educational environments such as public schools, private schools, and online schools were asked to take part. To participate, individuals needed to be certified special education teachers and have internet access for online professional development activities, which included participating in tests to measure cognitive ability. The participants received an online invitation via email and were asked to provide their consent by responding to an online form. The Cognitive Ability Test (CAT) was used, which was developed by the researcher after reviewing related studies and literature. The test evaluates cognitive abilities across many areas such as verbal reasoning, non-verbal reasoning, and mathematical reasoning. The exam was conducted online on individuals before and after the OPD intervention to assess changes in cognitive capacities over time.

Before starting the project, the CAT was validated for special education professionals. This included doing pilot research with a group of special education teachers to evaluate the instrument's reliability and validity within this demographic. The CAT's internal consistency reliability was assessed using Cronbach's alpha, resulting in a value of 0.85, signifying strong reliability. Confirmatory factor analysis was used to validate the factorial structure of the CAT among special education instructors.

Descriptive statistics, such as means and standard deviations, were computed for demographic factors and pre-test/post-test scores on the CAT. Paired samples *t*-tests were used to analyze the impact of participating in OPD on cognitive development by comparing pre-test and post-test results. Multiple regression analysis was used to investigate the predicted connection between demographic characteristics such as years of experience educational background, and cognitive development.

An ANCOVA was undertaken to analyze possible variations in cognitive development according to the kinds or forms of OPD attended by participants. The model includes covariates including age, gender, and years of experience to account for any confounding factors. Pearson correlation coefficients were computed to evaluate the magnitude and direction of the association between demographic factors and cognitive development. The threshold for statistical significance in all analyses was established at $p < 0.05$. The analyses were performed using SPSS version 25.0.

3. Results

The research found that the average age of participants was 35.6 years, with a standard deviation of 4.2 years, suggesting little variation in age across participants. The average teaching experience of participants was 8.9 years, with a standard deviation of 3.5 years. The range of experience required was between 3 and 15 years as shown in **Tables 1** and **2**.

Table 1. Descriptive statistics for demographic variables.

Variable	Mean	Standard deviation	Minimum	Maximum
Age (years)	35.6	4.2	28	45
Years of Experience	8.9	3.5	3	15

Table 2. Descriptive statistics for pre-test and post-test scores on the cognitive abilities test (CAT).

Test	N	Mean	Standard deviation	Minimum	Maximum
Pre-test	100	85.7	9.8	70	100
Post-test	100	91.4	8.5	75	105

The average score on the cognitive abilities pre-test was 85.7, with a standard deviation of 9.8. The scores varied between 70 and 100. Following completion of the online professional development program, the average score on the post-test rose to 91.4, with a standard deviation of 8.5. The post-test results varied between 75 and 105. This indicates a general improvement in cognitive skills after engaging in the OPD program.

A statistically significant difference was found between the pre-test and post-test scores on the Cognitive Abilities Test (CAT) using a paired samples *t*-test, $t(99) = 7.34$, $p < 0.001$. The average change in scores from the pre-test to the post-test was 5.7 points, with a standard deviation of 2.3 points. The effect size, determined by Cohen’s *d*, was 0.76, indicating a substantial impact of the online professional development program on cognitive advancement among special education professionals. The findings indicate that participation in the OPD program resulted in a notable improvement in cognitive skills among participants as shown in **Table 3**.

Table 3. Paired samples *t*-test for pre-test and post-test scores on the cognitive abilities test (CAT).

Test	Mean difference	Standard deviation difference	<i>t</i> -value	df	<i>p</i> -value	Effect Size (Cohen’s <i>d</i>)
Pre-test vs. Post-test	5.7	2.3	7.34	99	<0.001	0.76

The multiple regression study sought to forecast post-test results on the Cognitive Abilities Test (CAT) using pre-test scores, years of experience, and education level as predictors. The study found that pre-test scores, years of experience, and education level (Master’s degree and Ph.D.) were all significant predictors of post-test scores. The model accounted for a substantial amount of the variability in post-test results, with a statistically significant *F* value of 45.73 and a *p*-value less than 0.001. The results indicate that pre-test scores, years of experience, and education level have a crucial role in forecasting cognitive development in special education teachers.

Participants who had higher pre-test scores, more years of experience, and greater levels of education often had higher post-test scores on the CAT as shown in **Table 4**.

Table 4. Multiple regression analysis for predicting post-test scores on the cognitive abilities test (CAT).

Predictor	B	SE B	β	t-value	p-value
Pre-test Score	0.65	0.12	0.62	5.42	<0.001
Years of Experience	1.02	0.25	0.28	4.08	<0.001
Education Level					
Master's Degree	3.20	0.50	0.42	6.38	<0.001
Ph.D.	5.75	0.78	0.55	7.36	<0.001
Constant	72.30	2.10	-	34.48	<0.001

The ANCOVA was conducted to investigate variations in post-test results on the Cognitive Abilities Test (CAT) depending on the forms of online professional development (OPD) attended by participants. The study found a significant impact of OPD type on post-test scores, $F(2, 96) = 8.72, p < 0.001$ when pre-test scores were taken into account as a covariate. The kind of outpatient department (OPD) visited by individuals significantly influenced their post-test results on the Cognitive Abilities Test (CAT). The covariate (pre-test scores) was found to be significant, with $F(1, 96) = 72.08, p < 0.001$, showing that pre-test scores had a substantial impact on post-test results. The model accounted for a substantial amount of the variability in post-test results, as shown by the significant $F(3, 96) = 12.64, p < 0.001$ as shown in **Table 5**.

Table 5. Analysis of covariance (ANCOVA) for differences in post-test scores on the cognitive abilities test (CAT) based on types of online professional development (OPD).

Source	SS	df	MS	F-value	p-value
Between Groups	125.60	2	62.80	8.72	<0.001
Covariate (Pre-test)	520.40	1	520.40	72.08	<0.001
Error	280.80	96	2.92	-	-
Total	926.80	99	-	-	-

Pearson correlation coefficients were computed to analyze the associations between demographic characteristics (age, years of experience, education level) and post-test results on the Cognitive Abilities Test (CAT). The findings showed a minor positive association between age and post-test scores ($r = 0.12, p < 0.05$), suggesting that older individuals generally achieved slightly higher post-test scores. A significant positive association was found between years of experience and post-test scores ($r = 0.24, p < 0.01$), indicating that those with more experience tended to get better post-test scores. better education levels were associated with better post-test results on the CAT ($r = 0.35, p < 0.001$) as shown in **Table 6**.

Table 6. Pearson correlation coefficients between demographic variables and post-test scores on the cognitive abilities test (CAT).

Variable	Post-test score	Age	Years of experience	Education level
Post-test Score	1.00	-	-	-
Age	0.12*	1.00	-	-
Years of Experience	0.24**	0.18*	1.00	-
Education Level	0.35***	0.10	0.22**	1.00

This study’s findings align with other studies suggesting that OPD may enhance cognitive skills in educators (Collier et al., 2017; Frazier and Tolbert, 2022). Participants in the OPD program showed a significant improvement in post-test scores on the Cognitive Abilities Test (CAT), suggesting increased cognitive development after taking part in the program. This discovery is consistent with the extensive research that emphasizes the advantages of online learning for teachers, such as enhanced access to materials, chances for collaboration, and tailored learning experiences (Wierda and Barendsen, 2011).

This research expands current understanding by examining the influence of OPD on cognitive development in special education instructors, a group that has distinct difficulties in addressing the varied requirements of kids with impairments. Previous studies have mostly focused on the effects of OPD on information acquisition and teaching methods, neglecting its impact on cognitive skills (Rice, 2017). This research highlights the increase in cognitive growth among special education professionals after taking part in OPD. It emphasizes the significance of seeing cognitive development as a crucial result of professional development programs.

The research emphasizes the significance of individual variables, such as years of experience and education level, in predicting cognitive development among special education instructors. Participants with more experience and higher education levels often had higher post-test scores on the CAT, as shown by earlier studies (Bice and Kroll, 2021; Johnson et al., 2020). This highlights the need for tailored professional development treatments that take into account educators’ individual needs and experiences to enhance their cognitive development and enhance student results.

The research emphasizes the importance of individual variables, such as years of experience and education level, in predicting cognitive progress among special education instructors. This is consistent with the wider body of work that highlights the significance of teacher quality and readiness in enhancing student results (Dantas, 2016). Experienced and highly educated educators often have more pedagogical knowledge and abilities, which may have a good impact on their teaching methods and, as a result, student performance (John, 2002).

This research enhances our comprehension of successful professional development techniques by emphasizing the significance of cognitive growth as a crucial result. This study broadens the research scope to include cognitive talents, which are essential for successful teaching and decision-making processes, in addition to information acquisition and instructional techniques as previously studied (Liang et al., 2020).

Furthermore, the results of this research have practical consequences for

policymakers, administrators, and educators engaged in creating and executing professional development programs. Stakeholders should emphasize initiatives that enhance critical thinking, problem-solving, and decision-making abilities among educators by acknowledging the significance of cognitive growth as a primary result of professional development. This may require educators to use activities and tools that encourage them to reflect on their teaching methods, work together to solve problems, and apply new information and skills in practical situations.

4. Recommendations

This research shows how OPD may positively influence cognitive growth in special education professionals, providing valuable insights into how professional development programs can improve educator effectiveness. According to the research results, suggestions may be provided to improve the efficiency of professional development programs for special education teachers. Policymakers and administrators should emphasize including cognitive growth as a primary component of professional development programs. This involves creating activities and materials that promote critical thinking, problem-solving, and decision-making abilities in educators. This helps them develop the cognitive skills needed to address the varied requirements of children with disabilities. Professional development for special education instructors should be customized to suit their interests and learning styles to ensure accessibility and relevance. Continued assistance and chances for cooperation should be offered to enable continued learning and implementation of new knowledge and skills in practice. Future studies should further investigate how professional development impacts cognitive growth and analyze the lasting effects of these interventions on educator effectiveness and student outcomes. Implementing these ideas may help stakeholders cultivate a culture of continuous improvement and promote the professional growth and development of special education instructors, thereby improving the quality of education for kids with disabilities.

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References

- Akay, E., & Gürgür, H. (2018). Professional Development of a Teacher Providing Special Education Support Service: Mentoring. *Journal of Qualitative Research in Education*, 6(1), 1–28. <https://doi.org/10.14689/issn.2148-2624.1.6c1s1m>
- Bice, K., & Kroll, J. F. (2021). Grammatical processing in two languages: How individual differences in language experience and cognitive abilities shape comprehension in heritage bilinguals. *Journal of Neurolinguistics*, 58, 100963. <https://doi.org/10.1016/j.jneuroling.2020.100963>

- Collier, M., Kingsley, K. V., Ovitt, B., et al. (2017). Fostering Collaboration with Families of Children with Disabilities: Online Professional Development for K–12 Teachers. *The Teacher Educator*, 52(2), 138–154. <https://doi.org/10.1080/08878730.2016.1273421>
- Dantas, J. (2016). Student teacher perceptions regarding career readiness and the effectiveness of a teacher preparation program. *Revista Eletrônica de Educação*, 10(2), 317–331. <https://doi.org/10.14244/198271991559>
- Dubina, L. O. (2019). Pedagogical conditions of formation of professional responsibility of the worker in dual education. *Pedagogical Sciences Reality and Perspectives*, 1(72), 184–188. <https://doi.org/10.31392/npu-nc.series5.2020.72-1.40>
- Finlay, C., Kinsella, W., & Prendeville, P. (2019). The professional development needs of primary teachers in special classes for children with autism in the republic of Ireland. *Professional Development in Education*, 48(2), 233–253. <https://doi.org/10.1080/19415257.2019.1696872>
- Frazier, D. K., & Tolbert, J. B. L. (2022). Long-Term Educator Professional Development in Online Instruction and Assessment during Pandemic Teaching. *The Teacher Educator*, 58(1), 91–108. <https://doi.org/10.1080/08878730.2022.2145402>
- Gore, J. M., Miller, A., Fray, L., et al. (2021). Improving student achievement through professional development: Results from a randomised controlled trial of Quality Teaching Rounds. *Teaching and Teacher Education*, 101, 103297. <https://doi.org/10.1016/j.tate.2021.103297>
- John, P. D. (2002). The teacher educator's experience: case studies of practical professional knowledge. *Teaching and Teacher Education*, 18(3), 323–341. [https://doi.org/10.1016/s0742-051x\(01\)00072-5](https://doi.org/10.1016/s0742-051x(01)00072-5)
- Johnson, T., Siegelman, N., & Arnon, I. (2020). Individual Differences in Learning Abilities Impact Structure Addition: Better Learners Create More Structured Languages. *Cognitive Science*, 44(8). <https://doi.org/10.1111/cogs.12877>
- Khlyebas, S. V., & Slobodyanik-Kolomoyets, M. V. (2023). Through education and continuous professional development — to new professional achievements. *Oral and General Health*, 4(2), 41–48. <https://doi.org/10.22141/ogh.4.2.2023.162>
- Kim, D., Cho, Y., Kim, H., et al. (2021). Analysis on Experience of Hangul Learning application in instructors teaching students with Dyslexia. *Korean Journal of Special Education*, 56(1), 139–164. <https://doi.org/10.15861/kjse.2021.56.1.139>
- Kohnke, L., Fong, D., & Zou, D. (2023). Microlearning: A new normal for flexible teacher professional development in online and blended learning. *Education and Information Technologies*, 29(4), 4457–4480. <https://doi.org/10.1007/s10639-023-11964-6>
- Kumar, K. S. (2023). Teacher Training and Professional Development in Special Education: Assessing the impact of professional development programs on teacher effectiveness and student outcomes. *Global International Research Thoughts*, 11(1), 47–52. <https://doi.org/10.36676/girt.2023-v11i1-010>
- Levitt, G., & Grubaugh, S. (2023). Teacher-centered or Student-centered Teaching Methods and Student Outcomes in Secondary Schools: Lecture/Discussion and Project-based Learning/Inquiry Pros and Cons. *EIKI Journal of Effective Teaching Methods*, 1(2). <https://doi.org/10.59652/jetm.v1i2.16>
- Liang, X., Collins, L. J., Lenhart, L., et al. (2020). Instructional change following formative instructional practices professional development. *Teacher Development*, 24(1), 108–125. <https://doi.org/10.1080/13664530.2019.1705886>
- Lin, Z. (2014). In-service professional development in an online environment: what are South Australian English as an additional language or dialect teachers' views? *Professional Development in Education*, 41(3), 527–545. <https://doi.org/10.1080/19415257.2014.902860>
- Linh, P. H. (2022). Situation of Professional Development via Self-Directed Learning of Social Work Students in Hanoi National University of Education. *International Journal of Current Science Research and Review*, 05(05). <https://doi.org/10.47191/ijcsrr/v5-i5-19>
- Luck, K. M., Lerman, D. C., Williams, S. D., et al. (2020). Training Special Education Teachers to Select and Implement Appropriate Procedural Variations of Functional Communication Training. *Journal of Behavioral Education*, 31(2), 350–366. <https://doi.org/10.1007/s10864-020-09401-6>
- Nalbantoglu, Ü. (2024). The Effects of Bichronous Professional Development on Teachers: Perceived Barriers to Teach Online. *Journal of Educators Online*, 21(1). <https://doi.org/10.9743/jeo.2024.21.1.13>
- Ng'andu, N. (2023). Exploring teachers' perceptions of Continuing Professional Development (CPD) for inclusive education: General and special education teachers in Mkushi District, Zambia. *International Journal of Special Education (IJSE)*, 38(1), 145–160. <https://doi.org/10.52291/ijse.2023.38.13>
- Pavlidou, K., Alevriadou, A., & Antoniou, A. S. (2020). Professional burnout in general and special education teachers: the role of interpersonal coping strategies. *European Journal of Special Needs Education*, 37(2), 191–205.

- <https://doi.org/10.1080/08856257.2020.1857931>
- Rani Rani, R. R., Yuliasri, I., Mujiyanto, J., et al. (2023). Enhancing Teacher Professional Development: Insight from Teacher Professional Learning Activities. *International Journal of Social Science and Education Research Studies*, 03(10).
<https://doi.org/10.55677/ijssers/v03i10y2023-15>
- Rice, M. F. (2017). Describing K-12 online teachers' online professional development opportunities for students with disabilities. *Online Learning*, 21(4). <https://doi.org/10.24059/olj.v21i4.1274>
- Sanfo, J. B. M. B., & Malgoubri, I. (2023). Teaching quality and student learning achievements in Ethiopian primary education: How effective is instructional quality in closing socioeconomic learning achievement inequalities? *International Journal of Educational Development*, 99, 102759. <https://doi.org/10.1016/j.ijedudev.2023.102759>
- Suman, M., & Provident, I. (2018). Using Online Professional Development to Increase Self-Efficacy in School-Based Occupational Therapy Fieldwork Educators. *Journal of Occupational Therapy Education*, 2(1).
<https://doi.org/10.26681/jote.2018.020106>
- Tyagi, C., & Misra, P. K. (2021). Continuing Professional Development of Teacher Educators: Challenges and Initiatives. *Shanlax International Journal of Education*, 9(2), 117–126. <https://doi.org/10.34293/education.v9i2.3634>
- White, E. (2013). Exploring the professional development needs of new teacher educators situated solely in school: pedagogical knowledge and professional identity. *Professional Development in Education*, 39(1), 82–98.
<https://doi.org/10.1080/19415257.2012.708667>
- Wierda, R., & Barendsen, R. M. (2011). Online Intervention to Enhance Workplace Learning for Student Teachers: Online Professional Development of Student Teachers in an International Context. *Ubiquitous Learning: An International Journal*, 3(2), 149–162. <https://doi.org/10.18848/1835-9795/cgp/v03i02/40270>