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Impact of teachers' professional development on students' academic performance in higher education

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Abstract
This quantitative research explored the perspectives of Jiangsu University teachers on the impact of teacher professional development on students' academic performance. Survey questionnaires were used to solicit views from 298 teachers who participated in the study. Confirmatory Factor Analysis and Structural Equation Model were used to analyse the data. It was found out that teachers at Jiangsu University were familiar and interested in some specific Professional Development (PD) programs namely: Courses and Workshops, Reading of Professional Literature, Education Conferences and Seminars, Individual and Collaborative research, Observation visits to other Universities, Conflict Management, Classroom Management and Building Students' Engagement. It was revealed that teacher professional development programs attended within the past three years have improved teachers' research abilities and instructional methods. It has also improved students' outcome significantly according to the teachers. However, it was found out that some factors prevented teachers from participating in the PD programs. Among other things, it emerged that there is lack of employer's support and that there is a kind of friction between professional development and work schedule. Relevant suggestions have been given to address this challenge.

Keywords: professional development; students' academic performance; Jiangsu University teachers; professional development courses/programs

Introduction

The teacher factor was recognised by policymakers in the mid-1980s, when researchers such as (Brandt, 1993) identified the teacher as indispensable to students' learning. Brandt believed that students' quality depends on instructional quality and that instructional quality depends on teachers' quality. Knowles (1980) also asserted that education is a lifelong endless process of continuous inquiry; hence professional teachers must be lifelong exemplars' inquirers to be able to meet their students' needs. Professional development (PD) is thus a *sine qua non* aspect of teachers' growth (Fischer et al., 2018; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009).

PD has been defined by some scholars such as Avalos (2011) as a continuous process of teachers' learning including the process of how they learn and apply their knowledge to support students. The process of teachers' learning can be planned and unplanned, formal and informal, thus participating in various courses, reflecting on their own teaching, observing other teachers' teaching, conversations with other colleagues before or after teaching (Postholm, 2012).

According to the Teaching and Learning International Survey (TALIS) of Organisation for Economic Co-operation and Development (OECD) report in 2009, PD was viewed as the body of systematic activities to prepare teachers for their job, including initial training, induction courses, in-service training, and continuous professional development within school settings.

In this paper, we adopted the last two terms namely: in-service training and continuous PD to represent PD within school settings. This last category is viewed as a form of continuous on-the-job training located in school settings (OECD TALIS, 2009)

This research focuses mainly on teachers at all faculties in Jiangsu University (JSU) and not on a particular course or subject as done by existing studies about the subject matter. This research adopts the types of PD programs as enumerated by OECD's TALIS study in 2009 namely: Mentoring and peer observation, Observation visits to other universities, Courses and workshops, reading professional literature, Education conferences and seminars, Individual and collaborative research, Conflict management, Classroom management, Building students' engagement and Qualification programs. The reason is that China is not part of OECD countries; however, its educational system has been influenced by some member countries of the OECD namely, Japan, Germany and United States.

Background of the Study

Notable researchers such as (Darling Hammond et al., 2005; Greenwald, Hedges and Laine, 1996; Rockoff, 2004) have identified a positive relationship between the quality of the teacher and student outcome, stating that there is a positive effect between on-the-job teacher training and student performance (Angrist and Lavy, 2001; Bressoux, 1996).

Some scholars (Barber and Mourshed, 2007) also assert that improving instruction is the only way to improve students'

achievement and that there should always be a balance between the quality of an education system and teachers' quality. To achieve students' outcome, teachers' quality and development should not be compromised. Yoon et al. (2007) revealed that teacher PD has tremendous ramifications on students' learning achievement in three ways. Firstly, PD improved teachers' knowledge and skills; also, teachers acquire effective knowledge and skills, which eventually enhance their teaching, and lastly, PD helps teachers with teaching skills which lead to better students' learning outcomes.

Research has also shown that there can be tremendous improvement in teachers' instructional methods if teachers actively participate in PD activities (Archibald, Coggshall, Croft, & Goe, 2011; Yoon et al., 2007). Notwithstanding, Darling-Harmaond et al. (2009) believed that such PD programs should be intensive, continuous and connected to practice so that they would achieve the effective changes significant for the on-going improvement of teachers' practice and students' outcome (Lindstrom & Speck, 2004).

In China there is also a tremendous improvement in education so much so that a lot of foreigners are attracted to this soil for studies. Inasmuch as there is positive relational link between teacher PD and Students' Academic Performance (SAP) as shown by researches, to the best of our knowledge, there is a little research done on how Chinese teachers develop themselves and how these developments affect the teachers positively and improve students' outcome.

JSU is not an exception. For the past three years, as one of the best Chinese universities, JSU's performance is on ascendency both locally and internationally as per the world universities' rankings (Centre for the World University Rankings [CWUR, 2016; 2017; 2018/2019]). Currently, JSU with the strength of engineering and strategy of internationalisation is aiming to build a high-level, research-oriented university.

Notwithstanding, there is somewhat little discussion both internally and externally on the factors attributing to this soaring up of Jiangsu university especially in tandem with the fact that students' academic performance are improving owing to teachers' PD or whether there is relationship between teachers' PD and SAP in JSU.

It is against this background that this research seeks to investigate how JSU teachers learn (in-service training) as part of their development for the past three years. It also looks into the PD programs that the teachers are familiar with and interested in hence their participation in them and whether their participation in these programs has improved their method of teaching and research skills. Lastly, this study explores the relationship between teacher's PD on SAP in JSU from the teachers' perspective, not neglecting the negative factors that militate against teachers in participating in PD programs.

Significance of the Study

This study is important as it highlights the PD programs that are embraced by JSU teachers which need to be strengthened by authorities to enhance teacher development and students' performance. It also affirms that there is a positive association between teacher PD and SAP as has been proven by some other researchers, this time in all-subject areas at the university level. It also creates the awareness that there are some factors which militate against the professional development of the teacher and that school authorities are admonished to check them to be able to help develop the teachers in order to intensify performance on the part of students

Research Purpose

The purpose of this research is to ascertain the impact of JSU teachers' PD on SAP. This research addresses this question: What influence has the PD of JSU teachers have on both teachers and SAP for the past three years? To achieve this purpose, this question is further divided into these questions:

1. What PD courses are JSU teachers familiar with and interested in thereby participating in them as part of their learning after university education?
2. Do these PD courses' content undertaken by teachers affect both teachers and students and in what way?
3. What is the relationship between teacher PD and SAP in JSU: is it positive or negative?
4. What factors militate against the PD programs undertaken by the teachers?

Literature review and Theoretical Review

PD has been articulated by some scholars (Griffin, 1983) as any designed activity meant to change the beliefs and practices of the teacher profession and understanding of school persons toward an articulated end" such as improved student performance. It follows that PD can be seen as effective if the end results are met and improved teacher practices and students outcomes (Desimone et al., 2002; Hill, 2009) .

Scholars (Lindstrom & Speck, 2004; Elmore, 2002) are of the view that PD is an on-going collaborative sharing of professional knowledge among teachers on the current trends of issue concerning the teaching job in order to keep teachers formed and informed. Some researches classify PD into formal and informal. According to Yoon et al. (2007) formal PD programs include trainings, courses, or other instructional activities conducted to support teachers' continuing education and inspire positive change in their teaching. For Postholm (2012), teachers reflecting on their own teaching, observing other teachers' teaching, conversations with other colleagues before or after teaching are classified as informal PD.

Again, it has been revealed by researches (Darling-Hammond, 2000; Hattie, 2008; Organisation for Economic Co-operation and Development [OECD], 2005; Rockoff, 2004; Rowe, 2003; Timperley & Alton-Lee, 2008) that there is acknowledgement and recognition by school systems throughout the world that teaching quality is a crucial factor impacting on students' achievement.

It goes without mention that quality and relevant PD program create opportunities for both the individual and collective teacher learning (Birman, Desimone, Porter, & Garet, 2000), where teachers have the chance to observe and be observed while teaching and planning classroom activities (Garet et al., 2001). Effective PD activities focus on promoting continuous professional dialogue among teachers and ensuring that teachers integrate the best practices that are consequential to their teaching experience (Sikora & Alexander, 2004).

Some scholars such as (Harris & Sass, 2011; Jacob, Hill, & Corey, 2017; Nilsen & Gustafsson, 2016) have noticed some kind of inconsistencies in teacher PD on students'

performance. That is, there is large variation from positive to negative results. Scholars such as (Desimone, Smith, & Phillips, 2013; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007) have identified that there is a positive association between teachers' PD and students' outcome. Other like (Jacob, Hill, & Corey, 2017) found a null result between PD and students' outcome. Some also had shown a mixed result ((Lindvall, 2017). Accordingly, there is failure on the part of some studies such as (Cuban, 2013; Darling-Hammond, 2013; Hill, Beisiegel, & Jacob, 2013; Kennedy, 2016) to record the sustained effects of PD on instructional methods and students' performance. Still others noted a lack of research on whether PD improves teachers' knowledge and skills and students' outcome (Garet, Porter, Desimone, Birman, & Yoon, 2001).

Again, very few researches (Guskey, 2002; Desimone, 2009; Guskey & Yoon, 2009; Kennedy, 2014, 2016) identified a direct association between specific PD activities and their effects on teachers' instructional methods and students' achievements although there is a substantial body of research on PD.

Even where studies have revealed positive effects, the PD was limited to a small part of teaching practice (Hill et al., 2013) with a small group of teachers (Korthagen, 2016) limiting it to a particular subject area (Penuel, Fishman, Cheng, & Sabelli, 2011).

From the above discussions, there is some kind of inconsistencies, whereas some studies show direct relationship between PD and SAP, others show negative effect depending on the location and methodology of the research. Again, these studies often focus on either all-inclusive school levels or on a particular course or subject teachers.

To the best of our knowledge, a study has not yet been carried out in any Chinese University on this subject matter covering all teachers of various fields of study. This study, thus, seeks to investigate from teachers of all fields at JSU the positive impact of PD programs on Students' Academic Performance. This study is unique from others in that it explicitly shows positive link between PD programs of teachers and improved students' performance without limiting it to a particular course or subject area at JSU but all-inclusive courses. Another distinction is that this research revealed that teachers' participation in PD programs result not only in improvement in instructional methods and improved students' outcomes but also improvement in teachers' research abilities. It also examines the negative factors that militate against PD of JSU teachers. This study thus adds to the little literature that identifies the positive associations between TPD and SAP, most especially in a communist land where education is autocratically and centrally controlled using *Confirmatory Factor Analysis and Structural Equation Model* which has not yet been used by any research conducted on this subject matter.

Significance of the Study

This study is important as it highlights the PD programs that are embraced by JSU teachers which need to be strengthened by authorities to enhance teacher development and students' performance. It also affirms that there is a positive association between PD and SAP as has been proven by some other researchers, this time in all-subject areas at the university level. It also creates the awareness that there are some factors which militate against the professional development of the teacher and that school authorities are admonished to check them to be able to help develop the teachers in order to intensify performance on the part of students

Methodology

Data collection

To achieve the purpose of the research, quantitative method was used. A questionnaire was designed to collect data from 298 teachers (sample) out of about 2550 faculty members (population) from the 4 main categories of courses at JSU namely: Natural Sciences; Engineering; Humanities and Social Sciences. A period of 4 weeks was used in the data collection. The questionnaire was translated from English to Chinese by adopting the pararell approach proposed by Malhotra and Birks (2007) to get enough data from the JSU teachers most of whom do not speak English.

Table 1: Demographic and Basic Information of the Respondents

Respondents	Frequency (298)	Percentage (100%)
Gender		
Male	136	45.6
Female	162	54.4
Marital Status		
Single	20	6.7
Married	278	93.3
Age		
20-30 years	21	7.0
31-40 years	132	44.3
41-50 years	106	35.6
50+ years	39	13.1
Salary		
4000-6000 Yuan	5	1.7
6000-8000 Yuan	43	14.4
8000+ Yuan	250	83.9
Teaching Experience		
Less than 1 year	5	1.7
1-5 years	34	11.4
6-10 years	104	34.9
10+ years	155	52.0
Number of teaching courses		
1-2 courses	80	26.8
3-4 courses	172	57.7
5-6 courses	35	11.7
7+ courses	11	3.7
Level of students taught by a teacher		
Undergraduate	258	86.6
Masters	32	10.7
PhD	6	2.0
Post-Doctorate	2	0.7
Number of supervisees		
None	98	32.7
1-4 students	163	54.7
5-8 students	20	6.7
8+ students	17	5.7
Number of Publications		
Less than 10 papers	114	38.3
10-20 papers	130	43.6
21-30 papers	16	5.4
30+ papers	38	12.8
Number of PD courses attended within 3 years		
None	71	23.8
1-2 courses	188	63.1
3-4 courses	28	9.4
5+ courses	11	3.7

Survey Questionnaire and Measures

To ensure that there is no ambiguity in the constructs, the questions in Chinese were proofread severally by many Chinese language experts at the School of Foreign Language Department at Jiangsu University. To achieve the purpose of the study, the observed items measuring level of familiarity and level of interest in PD programs and students' academic performance were adapted from OECD (2009). The main constructs of the questionnaire included:

How many Professional Development (PD) Courses have you attended for the past three years? This was asked to find out from teachers how they continuously improve themselves on the job

Also teachers were to rate how they strongly *agree* or *disagree* whether these PD programs' contents have helped them improve upon both their research abilities and instructional methods hence these questions:

The PD content has helped me improve upon my research abilities and *The PD courses have helped me improve upon my instructional method.*

To elicit from teachers whether they are aware and that have interest in the general PD programs, teachers were asked to rate their *level of familiarity* and *level of interest* of these PD programs namely: *Mentoring and peer observation, Observation visits to other universities, Courses and workshops, Reading professional literature, Education conferences and seminars, Individual and collaborative research, Conflict management, Classroom management, Building students' engagement* and *Qualification programs*

Again teachers were asked: *what is your own Judgement of the students` academic performance in view of the PD courses? (Please rate your answers in these areas: Grade, Interest in Subject)* in order to know their own- judgement of PD programs attended and their effects on students' performance in terms of Grade and the students' interest in the subject whether there is improvement: *no improvement, little improvement, average improvement* and *high improvement*

Finally teachers were asked to rate how they strongly disagree or agree whether these factors present barriers to their participation in PD programs namely: *I do not have the pre-requisites (e.g. qualifications, experience, seniority); professional development is too expensive; there is lack of employer support; professional development conflicts with my work schedule; I do not have time because of family responsibilities; there is no relevant professional development offered;* and *there are no incentives for participating in professional development*.

Analysis

By way of analysis, the validity and the reliability of the measurement instruments needed to be ascertained and thus, Confirmatory Factor Analysis (CFA) in SPSS AMOS (v. 23) was calculated. Factor loadings of the measures were all greater than 0.5 which is the expected score (see Table 2). According to the recommendations given by scholars (Kline, 2005; Hu and Bentler, 1999), Chi-square ($\chi 2$) or CMIN is expected to be statistically insignificant at 5 percent; CMIN divided by the degree of freedom (DF) should be less than 3, RMSEA and SRMR are supposed to be less than 0.08 and TLC and CFI are also expected to be greater than 0.90. It is obvious from Table 2 that all the fit-indices presented met their respective thresholds.

Cronbach Alpha (CA) was calculated in checking the internal consistency of the observed items and the results showed that all the constructs exceeded the expected threshold value 0.7. Construct Reliability (CR) value for each construct was also greater than 0.7. To measure the convergent validity, the Average Variance Explained (AVE) was checked. According to Fornell and Larker (1981), a minimum score of 0.5 means that there was a high convergent validity. The AVE of each construct was higher than the minimum score indicating a high convergent validity.

Table 2: Confirmatory Factor Analysis

Observed, First-Order Latent: CMIN=54.442; DF=30; p-value=0.004; CMIN/DF=1.815; RMSEA=0.052; SRMR= 0.013; GFI=0.969; NFI=0.972; IFI=0.987; TLC=0.976; CFI= 0.987	**Std. Factor Loadings**
Level of Familiarity; CA=0.808; AVE=0.675; CR=0.889	
Courses and workshops	0.954
Reading professional literature	0.753
Education conferences and seminars	0.927
Individual and collaborative research	0.596
Level of Interest: CA=0.907; AVE=0.639; CR=0.898	
Observation visits to other universities	0.843
0.84	0.848
Courses and workshops	0.742
Conflict management	0.761
Classroom management	0.798
Building students' engagement	
Students' Performance: CA=0.887; AVE=0.798; CR=0.888	
Grade	0.864
Interest in the Subject	0.922

CA= Cronbach Alpha; AVE= Average Variance Extracted; CR= Construct Reliability

To determine the discriminant validity as suggested by studies (Li et al. 2019) the constructs were evaluated by comparing the square root of the AVEs (√AVEs) with the inter-correlation score. The square root of AVE should be greater than respective inter-correlation score in order to achieve discriminant validity. In each of the constructs as indicated by Table 3, √AVEs were greater than their inter-correlations, connoting that there exists discriminant validity among the constructs studied.

Table 3: Discriminant Validity and Descriptive Analysis

Variables	**MEAN**	**STD. DEV.**	**1**	**2**	**3**
Level of Familiarity (1)	2.8498	0.64046	0.822		
Level of Interest (2)	3.1368	0.59218	.409***	0.799	
Students Performance (3)	2.6270	0.59188	.331***	.520***	0.893

*** *~ P-value significant at 1% (0.001).*

~√AVE are bold and underlined

Discussions

After the CFA, Structural Equation Model (SEM) was estimated to answer the research questions of the study. Table 4 and Figure 1 present the summary of the structural path estimations. The results as presented show that both Level of Familiarity (LF) and Level of Interest (LI) have a positive effect on Student Performance (PER). This indicates that JSU teachers' familiarity, interest and participation in PD programs positively affects students' academic performance. This affirms other researches such

as (Desimone, Smith, & Phillips, 2013; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007) which revealed a positive effect on teacher professional development and students outcome. This analysis therefore answers question 3: *What is the relationship between teacher PD and SAP in JSU: is it positive or negative?*

Table 4: Path Summary

Path	Std. Estimate	C.R.
PER<--- LF	.216	3.110**
PER<--- LI	.457	6.879***

*** ~ P-value significant at 1% (0.001) ** ~ P-value significant at 5% (0.01)*

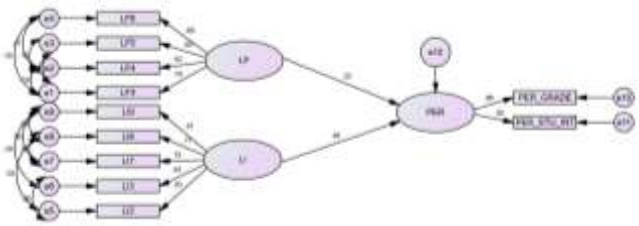

Fig 1: Structural Equation Model

From Table 1 and Table 5 it is obvious that the number of courses attended by teachers within 3 years has a significant effect on teachers. Accordingly, the teachers asserted that the PD courses have improved their research abilities and instructional method. From Table 1, the number of courses that were attended by most teachers falls within 1-2 courses recording 188 teachers, 28 teachers attended 3-4 courses, 11 teachers attended more than 5 courses, and 71 teachers did not attend any course at all. 92. 9% of the teachers agreed that the contents of the courses attended have helped them improved themselves in terms of research abilities and teaching methodology. This answers the research question 2: *Do these PD courses' content undertaken by teachers affect both teachers and students and in what way?* It also resonates with other researches that professional development courses ensures positive influence on teachers' knowledge, skills, and instructional practice, as well as students' achievement (Holland, 2005; McCutchen et al., 2002; McLaughlin & Talbert, 2006).

Table 5: Degree of Agreement on PD Courses' Contents improving Teachers Research Abilities and Instructional Method

PD courses' contents have improved my Research Abilities	Frequency *298*	Percentage *100%*	PD courses' contents have improved my instructional Method	Frequency *298*	Percentage *100%*
Strongly Disagree	3	1.0	*Strongly Disagree*	3	1.0
Disagree	18	6.0	*Disagree*	18	6.0
Agree	231	77.5	*Agree*	231	77.5
Strongly Agree	46	15.4	*Strongly Agree*	46	15.4

Table 6: Factors Preventing Teachers from PD Participation

Factors preventing teachers from PD participation	Frequency *298*	Percentage (*100%*)
1. ***I do not have the pre-requisites (e.g. qualifications, experience, seniority)***		
2. Strongly Disagree	43	14.4
3. Disagree	171	57.4
4. Agree	68	22.8
5. Strongly Agree	16	5.4
6. ***professional development is too expensive***		
7. Strongly Disagree	15	5.0
8. Disagree	93	31.2
9. Agree	159	53.4
10. Strongly Agree	31	10.4
11. ***there is lack of employer support***		
12. Strongly Disagree	6	2.0
13. Disagree	26	8.7
14. Agree	196	65.8
15. Strongly Agree	70	23.5
16. ***professional development conflicts with my work schedule***		
17. Strongly Disagree	5	1.7
18. Disagree	52	17.4
19. Agree	192	64.4
20. Strongly Agree	49	16.4
21. ***I do not have time because of family responsibilities***		
22. Strongly Disagree	11	3.7
23. Disagree	145	48.7
24. Agree	114	38.3
25. Strongly Agree	28	9.4
26. ***there is no relevant professional development offered***		
27. Strongly Disagree	6	2.0
28. Disagree	63	21.1
29. Agree	186	62.4
30. Strongly Agree	43	14.4
31. ***there are no incentives for participating in professional development***		
32. Strongly Disagree	8	2.7
33. Disagree	61	20.5
34. Agree	178	59.7
35. Strongly Agree	51	17.1

From Table 6 it is observed that seven factors militate against teacher professional development at JU. These factors answer the research question: *What factors militate against the PD programs undertaken by the teachers?* The ''I do not have the pre-requisites (e.g. qualifications, experience, seniority)'' factor was discredited by most of the teachers. 171 out of 298 representing 57.4% disagreed with this assertion. This means that almost all the teachers qualify for professional development. However, professional development is very expensive which was admitted by the teachers and that there is lack of support from employers. Out of 298 teachers, 159 and 196 representing 53.4% and 65.8% respectively, indicated that professional development is too expensive and that there is lack of support from employers to undertake these courses.

Most teachers also agreed that PD courses conflict with their work schedule. Out of 298 teachers, 192 representing 64.4% agreed on this factor. This means that there is inappropriate time for teachers at JU to undertake these courses even if there is available means.

The *''I do not have time because of family responsibilities''* factor deserves some attention. Out of the 298 teachers, 114 agreed and 145 disagreed on the assertion. This represents 38.3% and 48.7 respectively. Family responsibilities, thus, is a potential factor that prevents teachers from pursuing professional development. 59.7% of the teachers agreed that there are no incentives for participating in professional development.

Managerial Implication

It is inferred from the analysis that most of the teachers qualify to embark on PD programs, however, they agreed that PD courses are very expensive and that there is lack of employer support. Again, it was revealed by some of the teachers that there are no incentives for participating in the PD programs. We want to suggest to the authorities that there should be a motivation for JSU teachers to participate in PD programs either at locally or international levels. Authorities could also increase the available funds for teachers PD programs. This could help motivate teachers a lot in realising the need to participate in these PD courses to be up-to-date in order to help students achieve academic excellence. It needs to be mentioned that teachers be exposed to relevant PD programs that will impact on their teaching and to facilitate students' outcome. It was revealed in this research that most of the teachers at JSU are married (278 out of 298, representing 93.3%). How do married couples manage to participate in professional development courses? It is very expedient to reflect on this question by authorities to devise other PD courses that will be favourable for married couples. Lastly, out of the 298 teachers, 192 of them representing 64.4% agreed that PD programs conflict with their schedule. We therefore entreat authorities to ensure that PD programs organised be it local or abroad do not conflict with teachers work schedule.

Conclusion

It could be reiterated that this study focused on the impact of PD on students' performance from the perspective of Jiangsu University teachers within the past three years. This study is very crucial in the sense that PD is an undying subject matter that constantly needs researchers' attention most especially in the Chinese soil where there seems to be a few research conducted and especially in a university setting. The study concluded that there is a positive correlational effect between teacher professional development and students' performance in all the courses offered at the university without restrictions; that PD improves teachers' research abilities and instructional method and that teachers' level of familiarity and interest in PD programs and their participation have significantly improved students' grade and heightened their interest in teachers' subject

Limitations and Recommendations for future Studies

This study is limited in that it only focused on the opinion of teachers as regards the subject matter. The study did not compare students' grade to verify the teachers' assertion that their participation in PD courses has positively affected students' performance. We therefore recommend that subsequent research could consider focusing on each faculty teachers at the university and compare students' grades to ensure the perspectives of both teachers and students. Subsequent research could also ascertain from students how they think teachers PD programs affect their academic performance. This could be done at each faculty level and/or at random covering all students of various fields at Jiangsu University.

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