

EXPLORING THE AFFILIATION BETWEEN TEACHERS' PROFESSIONAL DEVELOPMENT AND STUDENTS' ACADEMIC PERFORMANCE IN HIGHER EDUCATION IN CHINA

by

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This research explored the factors that underlie Teachers' Professional Development in China's Higher Education and their ramification on Students' achievement. The study was carried out in the Jiangsu Province of China where arguably there exist some of the topmost universities in China. Survey questionnaires were used to solicit views from 288 university teachers from (Jiangsu University, Jiangsu University of Science and Technology, Nanjing University and Nanjing Normal University) who participated in the study. Confirmatory factor analysis and structural equation model were used to analyze the data. It was found out that these teachers were familiar and interested in some specific professional development 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 and these positively influenced students' performance. It was revealed that what motivated these teachers to embark on these professional programs include: need to improve the instructional method, managerial skills, research abilities, and the interest for personal development. However, it was found out that some factors militate against teachers from participating in the professional development programs.

Key words: teacher professional development, students' academic performance, motivating factors, Jiangsu Province, China

Introduction

In the mid-1980, researchers identified teachers as an indispensable factor in students' learning [1]. Brandt believed that students' quality depends on instructional quality and that instructional quality depends on teachers' quality. Scholars 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 [2]. Professional development (PD) is thus a sine qua non-aspect of teachers' growth [3]. As defined by Avalos [4] PD is 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 [5]. According to the Teaching and Learning International Survey (TALIS) of Organisation for Economic

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Co-operation and Development [6] 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 PD within school settings.

This paper adopts the meaning of PD as defined by Avalos [4], Postholm [5], and OECD [6] as its operative definition and hinges on the theoretical framework of Reid's Quadrant of teacher learning comprising two dimensions: formal-informal and planned-incidental [7]. This study focuses mainly on university teachers at Jiangsu Province specifically in Jiangsu University, Jiangsu University of Science and Technology, Nanjing University, and Nanjing Normal University all faculties in Jiangsu University. It 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 officially. However, PISA uses Jiangsu Province, Guangdong Province, Beijing and Shanghai schools to access China's performance. Again China's educational system has been influenced by some member countries of the OECD namely, Japan, Germany, and the United States. Using the variables designed by OECD, Formal PD opportunities according to this paper's categorization and for the purpose of this study, include: courses and workshops, education conferences and seminars. Informal PD opportunities here include: reading professional literature, mentoring and peer observation, observation visits to other universities. On the other axis, planned opportunities may be formal or informal, but are characteristically pre-arranged (*i. e.* Individual and collaborative research), whereas incidental opportunities are spontaneous and unpredictable (*i. e.* conflict management, classroom management, building students' engagement, and qualification programs). These descriptions represent polarised positions that encompass the range of learning opportunities encountered by teachers.

The purpose of this study is to explore the PD programs that are embraced by Chinese universities' teachers and their relationship with students' academic performance. It also seeks to ascertain the factors that motivate Chinese teachers to embark on PD programs.

Literature review and theoretical review

Scholars [8] are of the view that PD is an on-going sustainable process of professional learning that allows for collaboration and the sharing of professional knowledge, based on current research to inform the daily work of teachers. Some researches classify PD into formal and informal. According to Yoon *et al.* [9] formal PD programs include training, courses, or other instructional activities conducted to support teachers' continuing education and inspire positive change in their teaching. For Postholm [5], 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 [3, 10, 11] that there are acknowledgment and recognition by school systems throughout the world that teacher 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 [12], where teachers have the chance to observe and be observed while teaching and planning classroom activities [13]. 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 [14]. Some scholars such as [15, 16] have noticed some kind of inconsistencies in teacher PD on students' performance. That is, there is a large variation from positive to negative results. Scholars such as [17, 18] have identified that there is a

positive association between teachers' PD and students' outcomes. Other like [16, 19] found a null result between PD and students' outcomes. Some also had shown a mixed result [20]. Accordingly, some researches [21, 22] also failed to document the sustained effects of PD on either teaching practice or students' outcome. Still, others noted a lack of research on whether PD improves teachers' knowledge and skills and students' outcome [13]. Inasmuch as there is a substantial body of research on PD, very few studies directly link specific teacher development activities to changes in teaching practice and/or improved student outcomes [23, 24]. Even where studies have revealed positive effects, the PD was limited to a small part of teaching practice [19] with a small group of teachers [25] limiting it to a particular subject area [26]. Also there is virtually no clear cut research yet on factors that motivate teachers to embark on PD especially in Chinese higher education. From the discussions, there is some kind of inconsistencies, whereas some studies show a direct correlation between TPD and SAP, others show a 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 teacher.

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 in China especially the Jiangsu Province the various PD programs teachers are familiar with and interested in and their impact on students' learning. This study is unique from others in that it explicitly explores the factors underpinning teachers' participation in PD programs.

General professional learning opportunities for teachers in china

As a communist republic, China has an autocratic educational system that binds all schools and teachers of which Jiangsu Province is not an exception. Accordingly, the national or provincial ministries of education co-ordinate PD initiatives. Some scholars [27] opined that the former Soviet Union influenced China's educational system and structure. A typical example is an effort by every school to shaping and enhancing teachers' PD. Accordingly, this model was adopted in the early 1950 when there was a shortage of teachers in China which called for an urgent need to train the large newly recruited untrained teachers [28]. In this model, it behooved on every teacher to conduct a good lesson and exhibit an in-depth understanding of the philosophy that underpins the educational theory. Researchers [29, 30] have revealed that this practice has influenced the teaching profession in China to date and eventually the schools have become the avenue of professional learning for teachers. According to [29], in China, teacher PD began from the teacher education institutes ordinarily called *normal colleges/universities* where teachers acquire the rudimentary tutorials qualifying them to become professionals. However, the actual learning takes place in the workplace. Thus, teachers must learn how to learn at the workplace which has become an important aspect of the teachers' regular practice. Authors in [31] have noticed that, in China, the Teaching and Research Groups (TRG, *jiaoyanzu*) support the organization of teacher PD activities in schools. The TRG has a unit called lesson preparation groups (LPG). The TRG and LPG are responsible for a particular subject area and they liaise with Teaching Research Officers (TRO, *jiaoyanyuan*) in subject areas from the teaching research offices (TRO, *ji-aoyanshi*). The TRO are established by the education department at the district or provincial levels. Education Departments at the district or provincial levels establish these teaching-research offices (TRO). They play the role of helping teachers to understand the structure and framework of the curriculum and also with the help of school TRG, they provide pedagogical assistance to school teachers (Guo, 2005). The TRO in tandem with other educational institu-

tions organizes in-service PD activities for subject teachers. For some years now, TRO have set up a learning avenue enabling TRG from a number of schools to collaborate seeking to improve teaching and learning. Apart from the TRO, there are also Academies of Educational Sciences (AES), which works also under the Education Departments of the various levels. The AES focus on teaching and educational research whereas the TRO focus on classroom teaching [31]. Also [31] revealed that TRG is responsible for the organization of activities that focus on aspects of the curriculum *viz* content, pedagogy and assessment, including collective lesson preparation, lesson observations and post-observation conferencing, curriculum planning and open lessons. The TRG also ensures that newly recruited teachers are properly mentored with the help of the *backbone* (*gugan*) teachers who are members of the group and have professional teaching expertise. The essence of these activities organized by TRG is to offer an arena for teachers to deliberate and ruminate over their teaching and to learn from good practices in their subject area. To help teachers appreciate and comprehend the theoretical framework underpinning the instructional method in the classroom, TRO are available to schools and they take part frequently in TRG learning activities. These officers are selected from *gugan* teachers in schools who have achieved excellence in open lessons or teaching competitions, who have done tremendous research on teaching and have an appreciable number of publications [31]. The TRO play a key role in providing leadership through participating regularly in PD activities in schools, especially in lesson preparation, lesson observation, and post-lesson conferencing. Thus, their work centers on classroom practices. Apart from that, they conduct action research addressing both teachers' and learners' needs [32]. In China, every university has its own TRG and TRO. It should be noted that the TRG does not have any administrative power in the management of the school and also has no decision-making power. However, it plays an important role in implementing pedagogical practices in schools. Obviously, in a typical Chinese university, there are internal structures to help guide teachers and their teaching, however, it is still not unclear which factors propel teachers to participate in PD programs.

Methodology

Sample and data

To achieve the purpose of the research, a quantitative method was used. A questionnaire was designed to collect data from 288 teachers (sample) in the Jiangsu Province in China, tab. 1. These were teachers from Jiangsu University, Jiangsu University of Science and Technology, Nanjing University and Nanjing Normal University from the faculties of Natural Sciences; Engineering; Humanities and Social Sciences. The questionnaire was translated from English to Chinese by adopting the parallel approach proposed by [33] to get enough data from the teachers most of whom do not speak English. At least two teachers from each university were identified and the link to the questionnaire as designed with e-survey, was sent to him or her through *WeChat*. He or she in turn circulated it through any platform of teachers in that particular university. A period of 4 weeks was used in the data collection.

Survey questionnaire and measures

To ensure that there is no ambiguity in the constructs, the questions in Chinese were proofread several 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 [6]. The main constructs of the questionnaire included:

Table 1. Demographic and basic information of the respondents

Respondents	Frequency (288)	Percentage (100%)
Gender		
Male	128	44.4
Female	160	55.6
Marital status		
Single	28	9.7
Married	260	90.3
Age		
20-30 years	15	5.2
31-40 years	132	45.8
41-50 years	80	27.8
50+ years	26	9.02
Salary		
4000-6000 Yuan	5	1.7
6000-8000 Yuan	40	13.9
8000+ Yuan	243	84.4
Teaching experience		
Less than 1 year	4	1.4
1-5 years	32	11.1
6-10 years	101	35.1
10+ years	151	52.4
Number of teaching courses		
1-2 courses	75	26
3-4 courses	175	60.8
5-6 courses	28	9.7
7+ courses	10	3.5
Level of students taught by a teacher		
Undergraduate	240	83.3
Masters	39	13.5
PhD	7	2.5
Post-Doctorate	2	0.7
Number of supervisees		
None	90	31.3
1-4 students	163	56.6
5-8 students	20	6.9
8+ students	15	5.2
Number of publications		
Less than 10 papers	110	38.2
10-20 papers	130	45.1
21-30 papers	20	7.0
30+ papers	28	9.7
Number of PD courses attended within 3 years		
Non-e	65	22.5
1-2 courses	188	65.3
3-4 courses	25	8.7
5+ courses	10	3.5

- 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.*
- 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); PD is too expensive; there is lack of employer support; PD conflicts with my work schedule; I do not have time because of family responsibilities; there is no relevant PD offered and there are no incentives for participating in PD.*

Analytical procedure

This study used two main analytical tools – AMOS 22.0 and STATA 15.0. We followed three main analytical procedures. Firstly, we screened the data to ensure a more accurate data is used for analysis. We performed descriptive statistics such as frequencies, percentages, mean and standard deviations. Secondly, we used AMOS software to establish the validity and reliability of the variables by conducting confirmatory factor analysis (CFA), fig. 1. Thirdly, we used STATA software to estimate the relationship that exists among the variables. We used hierarchical multiple linear regression estimate the relationships.

Factor loadings of the measures were all greater than 0.5 which is the expected score, see tab. 2. According to the recommendations given by scholars (Kline, 2005, Hu and Bentler, 1999), Chi-square, χ^2 , or CMIN is expected to be statistically insignificant at 5%; The 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 tab. 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 Extraction (AVE) was checked. According to [34], 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. Discriminant validity and descriptive analysis of factors that propel teacher to participate in PD programs

Factors (motivating teachers)	Construct reliability (CR)	Average variance extracted (AVE)	Instruction	Research	Interest	Management
Instruction	0.798	0.572	0.756			
Research	0.819	0.693	0.530	0.833		
Interest	0.880	0.649	0.438	0.321	0.805	
Management	0.881	0.713	0.538	0.482	0.487	0.844

To determine the discriminant validity as suggested by studies (Li *et al.* 2019) the constructs were evaluated by comparing the square root of the AVE (\sqrt{AVE}) with the inter-correlation score. The square root of AVE should be greater than the respective inter-correlation

Table 3. Discriminant validity and descriptive analysis of PD programs teachers are familiar with and interested in

	CR	AVE	Level of familiarity (LF)	Level of interest (LI)	LF one	Performance
LF two	0.798	0.572	0.756			
LI	0.872	0.631	0.457	0.794		
LF one	0.881	0.713	0.532	0.468	0.845	
Performance	0.887	0.797	0.404	0.559	0.378	0.893

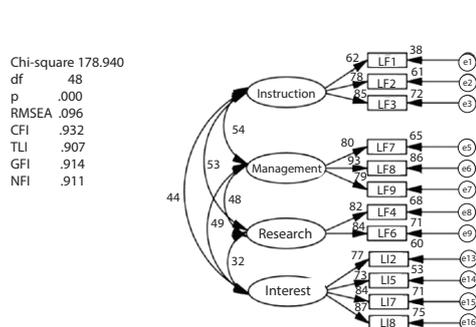


Figure 1. Model showing factors that motivate teachers to embark on PD

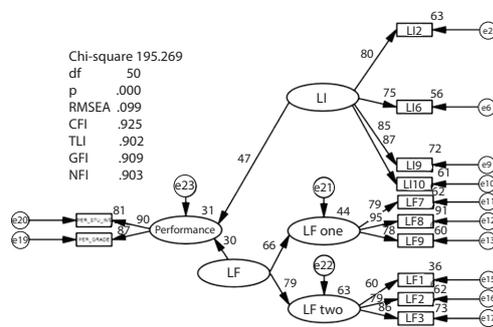


Figure 2. Model showing PD programs teachers are familiar with and interested in and their relationship with students' performance

score in order to achieve discriminant validity. In each of the constructs as indicated by tab. 3, $\sqrt{\text{AVE}}$ (bolded and underlined in tab. 2) were greater than their inter-correlations, connoting that there exists discriminant validity among the constructs studied.

From fig. 2, it is obvious that Chinese teachers show the level of interest (LI) in 2, 6, 9, and 10 denoting observation visits to other universities, individual and collaborative research, building students' engagement, respectively and show the level of familiarity (LF) in 1, 2, 3, 7, 8, and 9 representing mentoring and peer observation, observation visits to other universities, courses and workshop, conflict management, classroom management, and building students' engagement. Accordingly, teachers' level of interest in and familiarity with these PD programs significantly and positively affects students' performance.

Results and discussions

Relationship between teachers' interest in and familiarity with professional development programs and students' performance

In this section, we followed three steps to estimate the results. First, the influence of the control variables on students' performance was estimated. Second, the influence of both control variables and interest and familiarity (combined) of PD on students' performance were estimated. Third, the influence of both control variables and interest and familiarity (using the dimensions) of PD on students' performance were estimated. In Model 2 of tab. 4, the results show that beyond the control variables, level of interest, and level of familiarity significantly and positively influence students' performance. This also adds to the existing literature which shows positive affiliation between teachers' PD programs and students' performance [18, 22, 23].

Table 4. Relationship between teachers' interest in and familiarity with PD programs and students' performance

Step 1	Students' performance			
	Model 1		Model 2	
	Coefficients	Std. err.	Coefficients	Std. err.
Constants	0.597***	0.124	0.554***	0.136
gender	0.161**	0.06	0.160**	0.062
Marital status	0.133**	0.045	0.130***	0.045
Age	0.257***	0.041	0.256***	0.042
Major subject	0.110**	0.042	0.108**	0.045
Academic position	0.181**	0.076	0.184**	0.076
Salary	0.112**	0.045	0.112**	0.047
Steps 2 and 3				
Level of Interest			0.365***	0.059
Level of Familiarity			0.258***	0.059
R-Squared		0.309	0.538	
Observation		288	288	

*** significant at 1%, ** 5%, and * 10% levels

Factors motivating professional development programs

In fig. 1, the variables that makeup *instruction* are LF 1, 2, and 3 thus, mentoring and peer observation (LF1), observation visits to other universities (LF2), and courses and workshops (LF3); *management* also has LF 7, 8, and 9, indicating, conflict management, classroom management, and building students' engagement, respectively; *research*'s variables includes LF 4 and 6 representing reading professional literature, and individual and collaborative research. The last factor is *interest* with variables level of interest (LI) 2, 5, 7, and 8 which corresponds with observation visits to other universities, education conferences and seminars, conflict management and classroom engagements. The results in tab. 4 illustrate factors that motive teachers to embark on PD programs beyond key control variables such as gender, age, marital status, and academic positions. Two steps were followed. First, the influence of the control variables on PD programs was estimated. Second, the influence of both control variables and other factors on PD were estimated. The results in Model 1 of tab. 4 show that demographic variables such as age, gender, marital status, major subject taught, academic position and salary significantly influence teachers' PD programs. In Model 2 of tab. 5, the results show that beyond the control variables, instruction, research, management and interest significantly and positively influence teachers' PD programs suggesting that these factors motivate PD.

Table 6 shows a descriptive analysis of the challenges that militate against teachers in participating in PD programs. Accordingly, agreed that PD programs are too expensive and that there is no employer support and that PD conflicts with work schedule and that there are no relevant PD programs offered, that there are no incentives for participating in PD programs. Nonetheless, most teachers opined that they have a relative time for embarking on PD programs inasmuch as they have prerequisite qualifications.

Table 5. Factors motivating PD programs

Step 1	PD programs			
	Model 1		Model 2	
	Coefficients	Std. err.	Coef.	Std. err.
Constants	2.622***	0.357	0.755**	0.372
Gender	0.189**	0.074	0.181**	0.064
Marital status	0.131**	0.053	0.144***	0.046
Age	0.121**	0.050	0.121**	0.044
Major subject	0.139**	0.052	0.175***	0.046
Academic position	0.148**	0.070	0.173**	0.079
Salary	0.132**	0.055	0.115**	0.049
Step 2				
Instruction			0.139**	0.054
Research			0.167***	0.052
Management			0.161**	0.056
Interest			0.279***	0.062
R-squared	0.256		0.487	
Observation	288		288	

*** significant at 1%, ** 5%, and * 10% levels

Table 6. Factors/challenges preventing teachers from embarking on PD programs

Challenges	Strongly disagree	Disagree	Agree	Strongly agree
I do not have the pre-requisites (<i>e. g.</i> qualifications, experience, seniority)	40	170	60	18
PD is too expensive	10	83	150	45
There is a lack of employer support	6	20	196	66
PD conflicts with my work schedule	5	50	194	39
I do not have time because of family responsibilities	16	140	111	21
There is no relevant PD offered	4	61	184	39
There are no incentives for participating in PD	6	59	176	47
Observations	288	288	288	288

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 a 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 Chinese teachers to participate in PD programs either at local or international levels. Authorities could also increase the available funds for teachers' PD programs. This could help motivate teachers to participate in PD programs.

Conclusions

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 significant and positive affiliation/relationship between teachers' familiarity with and interest in PD and students' performance. That is to say that teachers' familiarity with and interest in PD programs propelled them to participate in them and this has a significant relationship with students' outcomes as revealed by previous studies [9, 22-24]. This study also brings to the fore the factors that motivate teachers to embark on PD programs namely: instruction, research, management, and interest. Inasmuch as teachers are willing to participate in PD programs, there faced some challenges that need proper attention.

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' grades to verify the teachers' assertion that their participation in PD courses has positively affected students' performance. Also the population sample (288 teachers) is relatively small to warrant generalization. We, therefore, recommend that subsequent research could consider focusing on a large population and also compare students' grades to ensure the perspectives of both teachers and students are accurate. Also qualitative research could be adopted to solicit views from teachers as well. Subsequent research could also ascertain from students how they think teachers PD programs affect their academic performance. There could also be a comparative study of either faculty to faculty in the same university or different universities in the same province or even beyond the province on the subject matter.

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