

## Problem-based learning methods: Is it effective for developing *madrasa* teacher social competence in teaching?

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### ABSTRACT

Developing social competence of *madrasa* teachers is increasingly popular in the classroom, but of these teachers, mixed results (without clear reasons) are reported. This study aims to see if increasing the use of problem-based learning (PBL) by *madrasa aliyah* or senior high school teachers in Indonesia increases their social competency in education. This study employed a quasi-experimental technique and data from PBL intervention program to investigate how PBL is connected with teachers' social competency and was analyzed using a t-test. In general, the social competence of *madrasa* teachers is solely treated as a predictor of the practice of teaching Islamic religious education. Still, we discovered that the greater use of PBL in learning can favorably affect the social competence of *madrasa* teachers. PBL is positively associated with student involvement and teaching in learning among the *madrasa* teacher social competency subscales. However, according to data analysis, students' favorable responses to Islamic religious education learning practices can moderate the link between PBL and the social competency of *madrasa* instructors. This study has significance for the PBL model's growth in strengthening the social competency of *madrasa* teachers learning Islamic religious education.

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## 1. INTRODUCTION

The ability of *madrasa* or senior high school teachers to teach students as well as become professionals in social competences [1]–[4] is associated with a variety of teacher attributes and behaviors [4]–[6]. Several theories, in particular, show how *madrasa* teachers' social competence influences their abilities and teaching techniques related to instructional practice [1], [7]–[9]. Furthermore, teacher social competency promotes self-development and improves educational institution quality [7], [10], [11].

Most research on the relationship between instructors' social competencies and learning practices, however, has employed cross-sectional data [1], [4], [10], [12]. This means that the data used in the study may be used to compare respondents but cannot explain changes across time, severely limiting the empirical potential to determine causality. Furthermore, a theoretical examination of teacher social competence reveals a reciprocal or cyclical relationship between classroom experience and teacher social competence [11], [13]–

[15]. As a result, changes in instructional practice may affect teacher social competence. According to another research, social competency in *madrasa* learning entails a process of self-development with social [15]–[18].

These studies reveal that social competence is more psychologically investigated in the learning process but do not prove that problem-based learning is strengthened in *madrasa* teacher learning. This innovative research addresses *madrasa* instructors' social competency using a problem-based learning approach that varies from previous studies. This study investigates the relationship between the social competency of *madrasa* teachers and instructional learning practices using data from a problem-based learning (PBL) program intervention in Pekanbaru City, Riau, Indonesia. In 2019, the Riau Province Ministry of Religion provided PBL program interventions to four public *madrasa aliyah* in Pekanbaru City to engage *madrasa* teachers by transforming the learning strategy from teacher-centered lectures to student-centered PBL [12]. The treatment group teachers were taught how to use PBL and were expected to use it in the classroom for one semester, while the seven control group teachers were not encouraged to change their teaching approaches. We used a quasi-experimental study approach with data from the program's instructors and students to investigate how increased use of PBL over one semester was related to changes in teacher social competency in *madrasas* in learning.

This study must evaluate the relationship between *madrasa* teachers' social competencies and instructional practices using data from PBL program interventions in teaching Islamic religious education to *madrasa* teachers as soon as possible. PBL, according to several theories, facilitates learning progression [19]–[23]. Furthermore, the usage of PBL can serve to build a high-quality, competitive learning environment for students, as well as a tradition of higher-order thinking [24]–[28]. As a result, this study aims to see how problem-based learning influences *madrasa* teachers' social competency in Islamic religious education.

## 2. RESEACRH METHOD

### 2.1. Participant

In this study, 14 *madrasas aliyah* out of 26 in Pekanbaru City, Riau, Indonesia, seven were in the treatment group, and seven were in the control group. The program's key goals include teachers from various *madrasas* who teach one of the four essential disciplines of Islamic religious education to *madrasa aliyah* students: *Akidah Akhlak*/moral creed, Al-Qur'an Hadith, *Fiqh*/Islamic jurisprudence, and Islamic cultural history (grade XI). These requirements are met by 139 teachers that participate in the PBL program. The pre-treatment survey was completed by 78% of the treatment group instructors (56 out of 72), while the post-treatment survey was conducted by 67% (48 teachers out of 72). The pre-treatment survey response rate for the control group instructors was 55% (37 out of 67), while the post-treatment survey response rate was 49% (33 out of 67).

The analysis in this study was based on skewed data, which indicates that some teachers and students only completed the pre-treatment or post-treatment surveys. For example, 57 (48.7%) of the 117 unique teachers in the sample completed both the pre-treatment and post-treatment surveys, whereas 36 (30.8%) completed only the pre-treatment survey and 24 (20.5%) completed only the post-treatment survey. As a result, in the final sample analysis for teacher survey data, the number of observations in the pre-treatment period was 93 (53.4%), and the number of comments in the post-treatment period was 81 (46.6%). In terms of student survey data, 1,107 (87.3%) of a total sample of 1,268 students completed both the pre-and post-treatment questionnaires, while 109 (8.6%) completed just the pre-treatment survey and 52 (4.1%) completed only the post-treatment survey.

According to a summary of basic teacher and student background characteristics, 82% of the 56 teachers in the treatment group were female, 38% had a master's degree or higher education level, and the average total teaching experience was 150.13 months (SD 99.39), or about 12.5 years, the average school year at the current school is 24.15 months (SD 41.81), or about two years, and 79% are on permanent contracts. There were no statistically significant differences between the treatment and control groups, according to the basic means t-test. During the pre-treatment period, 44% of the students in the treatment group were female, with a mean language score of 2.66. (score range: 0 to 5; standard deviation: 1.48). T-tests at the start of the study revealed no statistically significant differences in gender composition or Islamic religious education ratings between the treatment and control groups. On the other hand, the therapy group had a higher proportion of children with parents with bachelor's degrees. To account for these differences explicitly, we included them as control variables in all regression models.

### 2.2. Choosing a sample

The *madrasas* for the treatment and control groups were not chosen randomly, which might skew results and limit the extent to which causal conclusions can be established. Given the sample's representativeness, one treatment school is selected from one of the city's seven separate school districts, and

an appropriate control school is picked from the same district. Control *madrasas* were found to be the same sex as treatment schools (one sex in the *madrasa* and grade level) and within two kilometers of each other. Thus, in our sample, we have two *madrasas* (one experimental school and one control school) that are as close to one other regarding gender organization and geographic location as possible. Because *madrasa* teachers and students did not freely or self-select into the treatment or control groups, the danger of selection bias was eliminated.

Although the research sample was not randomly picked, the differences in background characteristics between *madrasa* teachers and students in the treatment and control groups were slight. Furthermore, we show that the likelihood of being in the treatment vs. control group does not differ across instructors depending on the majority of observable characteristics. Students are all in the same situation. Each variable factor was controlled in all regressions. In terms of policy, the *madrasas* in our research are all located in the same city of Pekanbaru, which has a highly centralized education system in which *madrasas* are similar in terms of minimum teacher training and certification criteria curriculum and texts, teacher wages, and finances. The quasi-experimental study approach is validated by the relatively high degree of homogeneity between treatment and control schools.

### 2.3. Design

This study employed a quasi-experimental technique [29] to investigate the association between PBL and the social competency of *madrasa* instructors, collecting survey data from teachers and students in two periods: before and after the usage of PBL in the classroom for one semester. We primarily employ two empirical methods: the difference-in-difference design and instrumental variables estimated using a two-stage least squares technique. These two methodologies are frequently employed in policy assessment studies to examine the causal influence of policies on the variables of interest [30]. The dependent variable of interest in the study utilizing teacher data is a measure of teacher self-efficacy and its subscale. The dependent variables of interest in the study using student data were students' impressions of their teacher's attempts to foster curiosity, degree of class preparation, students' self-assessments about their class involvement, and self-assessments about how often they offered ideas in class. Because teacher and student data can only be connected at the school level, and the study only included 14 *madrasas*, analyzing the relationship between student and *madrasa* teacher factors is impossible. As a result, we first examined teacher data to see how PBL was related to teachers' social competency and its subscales. Following that, we reviewed student data to see how they reacted to PBL. This allowed us to analyze whether the association between PBL and social competence was attributable to PBL-induced changes in pupils.

### 2.4. Measurement

Various ways of assessing teacher social competency have been developed throughout the years [31]. In its shortened form *madrasa* teacher social competency test (MTSCT) is used in this study [31]. MTSCT is made up of a stable factor structure that is broad enough to encompass a wide variety of relevant teacher abilities for instructing. It is one of the most extensively used social competence tools for *madrasa* teachers and is included in the national *madrasa* teacher survey. The MTSCT questionnaire used in this study had 54 questions separated into three subscales of *madrasa* teacher social competence, with *madrasa* teacher social competence as the average of 10 subscales. Each of the 54 questions assesses *madrasa* instructors' competence to manage to learn and is graded on a 4-point Likert scale ranging from "not at all" to "A" a lot." The subscales of *madrasa* teacher pedagogic competency include i) Social competence of *madrasa* teachers in learning; ii) Social competencies of *madrasa* teachers in learning management; and iii) Social competencies of *madrasa* teachers in engagement. Cronbach's Alpha was utilized to analyze the instrument's internal consistency, which resulted in (a 0.93) for the complete device.

We utilized a dummy variable created from the instructor's self-reported use of "many problems in progress" reported on a 4-point Likert scale to quantify PBL frequency: i) Never or hardly never; ii) Occasionally; iii) Frequently; and iv) In all or almost all lessons. The variable was categorized as 0 if the instructor reported using PBL "never or almost never" or "occasionally," and one if the teacher reported using PBL "frequently" or "in all or virtually all lessons". The student survey's measure of PBL frequency was built similarly to the *madrasa* teacher survey. We examined student assessments of their teacher's amount of effort to promote student interest, level of class preparation, students' level of engagement in class, and frequency of brainstorming with other students in the category for student outcomes. All metrics are reported on a 4-point Likert scale: (1) strongly disagree; (2) disagree; (3) agree, and (4) agree strongly. In addition, to measure students' intellectual competence, we provide an Islamic religious education exam with five questions and possible scores ranging from 0 to 5.

## 2.5. Procedure

Pre-semester training sessions precede the PBL program's deployment during the *madrasa* semester. Between June and July 2020, teachers from the seven treatment *madrasas* received 30 hours of training (over four days) on how to use PBL in their classrooms. Six doctors who specialize in researching and implementing PBL lead the sessions. A pair of professors oversee each *madrasa's* training meeting. Learning the fundamental ideas of PBL, formulating inquiry questions for PBL, understanding the roles of instructors and students, and building and arranging courses comprise the training curriculum. One professor concentrates on the first two parts of training for each pair of lecturers in charge of training for two *madrasas*, while the remaining lecturers focus on the latter two.

## 2.6. Data examination

Missing scores in *madrasa* teacher survey data varied from 0.6% to 2.3% across all factors and periods. The two variables in the student survey data had two missing values each, giving a 0.08% loss rate. To address missing instances, average imputation is utilized. In addition, the mean value of the relevant variable from the appropriate school and respondent period is used to replace each missing value. Although it was not stated in the study, there was no significant difference in the results compared to the analysis done after excluding the list of respondents with missing values from the regression model.

Using a difference-in-difference methodology [32], [33], we first assessed the PBL program's treatment impact. The difference-in-difference technique captures the treatment effect by comparing the change in the mean over time of the outcome variable for the treatment group to the difference in the standard over time for the control group. The necessary assumption is that changes in outcome variables for the treatment and control groups will be similar across time in the absence of therapy. This is known as the parallel trend assumption because it requires temporal trends in outcome variables to be parallel in both groups before treatment. He should be aware that the beliefs demand identical movements, not the rate of outcome variables. If this assumption is correct, the difference in change over time between the treatment and control groups is regarded as a treatment-caused effect [32]. Empirical validation of the premise of parallel trends necessitates data collection at many periods before treatment. We cannot, however, directly test the assumption of similar developments because we only have data for a single time before and after therapy. Nonetheless, given the relatively high degree of homogeneity between the treatment and control groups, any variations in trends in the outcome variables are unlikely to be related to factors other than the PBL program intervention. The empirical model used to get the difference-in-difference estimate is as (1):

$$Y_{ijt} = \beta_0 + \beta_1 \text{Treat}_j \times \text{Post}_t + \beta_2 \text{Treat}_j + \beta_3 \text{Post}_t + X_{ijt} + \epsilon_{ijt} \quad (1)$$

Where  $I$ ,  $J$ , and  $t$  denote the individual (either instructor or student), school, and period, respectively [34]. Individual  $I$  in school  $j$  at time  $t$ :  $y_{ijt}$  is the dependent variable of interest, such as social competency for *madrasa* instructors or student replies. Based on the mean and standard deviation of group scores, all dependent variables are normalized to have a mean of 0 and a standard deviation of 1. This was done to make interpretation more accessible, particularly regarding how the results changed compared to the control group. If it is more significant than one, the responder is a nursing school student, and if it is less than one, the respondent is a *madrasa* student. If time  $t$  is the post-treatment period (i.e., after the fall 2020 semester),  $\text{Post}$  equals 1; otherwise,  $\text{Post}$  equals 0. (i.e., before the intervention).  $\text{Treat} \times \text{post}$  is an interaction between treatment indicator variables and the period [35].  $X_i$  is a vector control variable that includes individual characteristics like responders. They had gender, education level, overall teaching experience (in months), recent teaching experience at *madrasas* (in months), and kind of employment contract for *madrasa* instructors. In addition, they included the student's gender, parental education level, eldest child status, and test math results for pupils.  $\epsilon_{ijt}$  is an error word that is grouped at the school level.

In addition to adopting PBL in the classroom, treatment group instructors received PBL consultations throughout the semester, which may be associated with teacher self-efficacy independently. Although we discovered that the usage of PBL by treatment group instructors rose considerably after treatment, any treatment effects found using the difference-in-difference methodology may be ascribed partly to consultation. We employ a two-stage least squares instrumental variable estimate method to tackle this problem. This method allows us to empirically quantify the changes in PBL use generated by PBL programs and examine how these exogenous changes are related to *madrasa* instructors' social competency.

## 3. RESULTS AND DISCUSSION

### 3.1. Result

#### 3.1.1. Teacher analysis

Table 1 shows the influence of the PBL program on *madrasa* instructors' social competence and subscales, as measured by the design differences. The first column reveals that the PBL program is

connected with a 0.942 standard deviation rise in the social competence of *madrasa* instructors (p 0.01). Column 2 reports that the PBL program has a significant relationship with the social competence of *madrasa* teachers in instruction, with a standard deviation of 1.011 (p 0.01), and column 4 reports that the PBL program has a significant relationship with social competence in engagement, with a standard deviation of 0.899 (p 0.01). The results in column 3 reveal that the PBL program has no significant influence on *madrasa* instructors' social competency in classroom management. This suggests that the positive impact of PBL programs on the overall social competence of *madrasa* instructors is driven by social competence in teaching and student involvement. PBL had the most significant influence on teachers' social competence in engagement among the *madrasa* teacher social competence subscales, as should be predicted given that the important change represented in treatment was modifications in instructional practice.

Table 1. Problem-based learning and social competence: difference-in-differences estimates

Dependent variable	(1) Social competence of <i>madrasa</i> teachers	(2) Social competence in instruction	(3) Social competence in management	(4) Social competence in engagement
Post treat	0.942*** (0.299)	1.011*** (0.272)	0.509 (0.327)	0.899*** (0.242)
Post	0.012 (0.202)	0.318 (0.184)	0.028 (0.235)	0.013 (0.166)
Treat	0.740** (0.245)	0.811** (0.263)	0.588** (0.250)	0.571*** (0.179)
Student math score	0.046 (0.165)	0.103 (0.136)	0.089 (0.160)	0.067 (0.157)
Female	0.091 (0.473)	0.202 (0.452)	0.088 (0.497)	0.020 (0.315)
Magister/MA and above	0.082 (0.304)	0.022 (0.264)	0.077 (0.311)	0.083 (0.237)
Total teaching experience	0.004** (0.002)	0.003** (0.001)	0.003* (0.002)	0.003* (0.001)
Experience at current school	0.001 (0.002)	0.002 (0.003)	0.000 (0.002)	0.002 (0.002)
Permanent	0.724* (0.378)	0.559 (0.338)	0.662 (0.446)	0.674** (0.272)
Observations	174	174	174	174
R-squared	0.222	0.319	0.131	0.212

\*Note: If the post-treatment period is 1, the pre-treatment period is 0; Treatment: coded 1 if in the treatment group, 0 if in the control group; Average math test results for school-level kids (scores 0e5); Female: Coded 1 if female, 0 if male; MA and above: Coded 1 if the highest education level is S2 or higher, 0 otherwise; Total teaching experience and current school experience in months permanent: Coded 1 if the employee is permanent, 0 if the contract is temporary. The dependent variable was normalized to have a mean of 0 and a standard deviation of 1, based on the mean and standard deviation of the control group. The average of three self-efficacy subscales was used to determine teacher self-efficacy (instruction, student engagement, classroom management). The survey questions for assessing the social competency subscale of *madrasa* instructors were answered on 4 points: The Likert scale (1: "Not at all" to 4: "A lot"), with four questions posed for each subscale. Standard mistakes congregate at the school level. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

The results of the instrumental approach factors on the influence of adopting PBL on the social competence of *madrasa* teachers and their subscales are presented in Table 2. Column 1 of the panel contains the findings of the first stage regression. (b). By 44.6% points (p 0.05), the intervention program raised the chance of applying PBL in the classroom either "frequently" or "in all or virtually all indicators". This demonstrates that the PBL intervention program generates significant changes in how teaching occurs in the classroom. Table 2's panel (a) displays the results of the second stage of the instrumental-variable approach regression. The projected PBL frequency values from the first-stage regression estimates were gathered and placed into the deterioration to estimate. Exogenous increases in the usage of PBL were related to an increase in the social competence of *madrasa* instructors by 2.270 standard deviations (p 0.1) in column 1 of the panel (a). PBL also increased self-efficacy in instruction and engagement by 2.115 standard deviations (p 0.1) and 2.016 standard deviations (p 0.05), respectively. PBL was shown to have no significant influence on social competency in classroom management, as in the difference-within-difference estimate.

### 3.1.2. Student analysis

The beneficial relationships shown between *madrasa* instructors' social qualities and PBL may be mediated by the impact of PBL on pupils. Students are put in one classroom in *madrasa aliyah* in Pekanbaru, while instructors in charge of different courses arrive in separate classes at other times to teach their respective subjects; hence grade level analyses relating to student and teacher outcomes are not possible. Students and instructors can communicate at the *madrasa* level, but the school-level study would lack

statistical power because our data only includes twelve *madrasas*. As a result, we can only estimate the link between PBL student reports and student replies and conclude indirectly that any influence identified in the student data may be connected to the positive association discovered in the *madrasa* teacher data between PBL and instructors' social competency.

Table 3 shows the estimated difference-in-difference calculated and student survey data. Estimates were derived for the entire sample and the *madrasa* subsample, which consisted of the three treatment group *madrasas* with the highest PBL increases and their matching control *madrasas*. According to the teacher and student surveys results, instructors from State Madrasa Aliyah 1, State Madrasa Aliyah 2, and State Madrasa Aliyah 4 increased their usage of PBL the most following the PBL program. Column 2 of the panel (a) reveals that the PBL intervention program resulted in a 0.155 standard deviation rise in the perception of attempts to gain teachers' interest (p 0.1). The PBL program had no statistically significant link with other student factors. We discovered that the PBL program improved the *madrasa* teacher's impression of interest by persuasion effort by 0.360 standard deviations (p 0, 05) in panel (b), where the study was confined to the three care schools where PBL rose the highest and their matched control *madrasa*. This demonstrates tremendous growth.

Table 4 summarizes the results of the variable instrumental technique. Estimates for the total sample (panel (a)) and the subgroup of the three *madrasas* with the most considerable improvement in PBL and their matching control schools (panel (b)) are shown separately. PBL boosted the impression of *madrasa* teacher interest induction efforts by 0.792 standard deviations (p 0.1) and the extent to which students communicated ideas with each other in a class by 0.995 standard deviations (p 0.1) in panel (a). There is no statistically significant association between instructor class preparation and student class participation. When the analysis was limited to three *madrasas* that experienced the most tremendous increase in PBL and their matched control *madrasas*, increased use of PBL was associated with a 0.674 standard deviation increase in perceptions of classroom preparation teachers (p 0.1), a 1.010 standard deviation increase in perceptions of the *madrasa* teacher's interest in persuasion efforts (p 0.1 0.01), and a standard deviation increase in students' sharing of ideas in class.

Table 2. Problem-based learning and *madrasa* teacher social competence: two-stage least squares estimates

Dependent variable	(a) Second stage			
	(1) Social competence of <i>madrasa</i> teachers	(2) Social competence in instruction	(3) Social competence in management	(4) Social competence in engagement
Predicted PBL	2.270* (1.190)	2.115* (1.159)	1.143 (0.945)	2.016** (0.949)
Post	0.122 (0.646)	0.421 (0.636)	0.250 (0.509)	0.378 (0.522)
Treat	841** (0.334)	0.768** (0.325)	0.603** (0.288)	0.597** (0.259)
Controls	YES	YES	YES	YES
Observations	174	174	174	174
(b) First stage				
Dependent variable: PBL	(1)			
Post treat	0.446** (0.158)			
Post	0.194 (0.131)			
Treat	0.013 (0.066)			
Controls	YES			
Observations	174			
F-statistic	14.89			

\*Problem-based learning: The dummy variable is coded 1 if problem-based learning is used "often" or "in all or virtually all lessons," and 0 if it is used "never or almost never" or "sometimes". Panel (a) PBL prediction is the same as panel (b) regression PBL prediction; Post: coded 1 if the period is post-treatment, 0 if it is pre-treatment. Treatment is marked 1 if you are in the treatment group and 0 if you are in the control group. All regressions took the following factors into account: Gender: Female is coded 1 while male is coded 0; Teacher education level: Coded 1 if the highest education level is S2 or higher, 0 otherwise; In months, total teaching experience and present school experience permanent employee: Code 1 if permanent employee, 0 if contract employee. Based on the mean and standard deviation of the control group, the second stage dependent variable was standardized to have a mean of 0 and a standard deviation of 1. The average of three subscales of *madrasa* teacher social competence was used to determine *madrasa* teacher social competence (instruction, student involvement, classroom management). The *madrasa* instructors' social competence subscale was assessed using a 4-point Likert scale (1: "Not at all" 4: "A lot"), with four questions posed for each subscale. Standard mistakes tend to congregate at the school level. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

Table 3. Problem-based learning and student outcomes: difference-in-differences estimates

Dependent variable	(1)	(2)	(3)	(4)
	Teacher preparation	Teacher inducement	Share idea	Class participation
(a) Sample: All schools				
Post treat	0.090 (0.086)	0.155* (0.084)	0.159 (0.114)	0.093 (0.079)
Controls	YES	YES	YES	YES
Observations	2266	2266	1944	2266
R-squared	0.013	0.011	0.011	0.072
(b) Sample: PBL top three schools				
Post treat	0.240 (0.130)	0.360** (0.090)	0.214 (0.157)	0.027 (0.114)
Controls	YES	YES	YES	YES
Observations	1146	1146	988	1146
R-squared	0.012	0.018	0.011	0.059

\*Note: All dependent variables were standardized to have a mean of 0 and a standard deviation of 1, based on the mean and standard deviation of the control group. Teacher inducement: students' general perception of the teacher's efforts to encourage participation (1: "Strongly disagree" ~ 4: "Strongly agree"); Teacher preparation: students' general perception of teacher preparation for class (1: "Strongly disagree" ~ 4: "Strongly agree"); Sharing ideas with classmates: the extent to which ideas are shared with classmates during class (1: "Not at all" ~ 4: "A lot"); Class participation: Self-assessment of enthusiastic class participation (1: "Strongly disagree" ~ 4: "Strongly agree"). All control regressions were: Gender: Coded 1 if female, 0 if male; Teacher education level: coded 1 if the highest education level is S2 or more, 0 otherwise; Total teaching experience and current school experience in months; Type of work: Coded 1 if permanent worker, 0 if temporary contract. Top three PBL *madrasa* refers to the treatment *madrasa* and its rival *madrasas* where the increase in the use of PBL is among the largest (top three) among the treatment schools. Standard error clustered at school level. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

Tabel 4. Problem-based learning and student outcomes: two-stage least squares estimates

(a) Second stage-all schools				
Dependent variable	(1)	(2)	(3)	(4)
	Teacher preparation	Teacher inducement	Share idea	Class participation
Predicted PBL	0.457 (0.438)	0.792* (0.439)	0.995* (0.603)	0.472 (0.429)
Controls	YES	YES	YES	YES
Observations	2266	2266	1944	2266
(b) Second stage-PBL top three				
Dependent variable:	(1)	(2)	(3)	(4)
	Teacher preparation	Teacher inducement	Share idea	Class participation
Predicted PBL	0.674* (0.348)	1.010*** (0.355)	0.724* (0.433)	0.075 (0.303)
Controls	YES	YES	YES	YES
Observations	1146	1146	988	1146
(c) First stage				
Dependent variable: PBL	(1) All schools	(2) PBL top three		
Post treat	0.196*** (0.038)	0.357*** (0.052)		
Controls	YES	YES		
Observations	2266	1146		
F-statistic	346.90	295.38		

\*Note: Regression in panel (b) is limited to the top three treatment *madrasas* in terms of increased use of PBL as well as corresponding control *madrasas*. PBL predictions in panel (a) are obtained from the first stage regression in panel (c), column 1; PBL predictions in panel (b) were obtained from the first stage regression in panel (c), column 2. Teacher induction: Student motivation general perceptions of teacher efforts to encourage participation (1: "Strongly disagree" ~ 4: "Strongly agree"); Teacher preparation: students' general perceptions of class preparation teachers (1: "Strongly disagree" ~ 4: "Strongly agree"); Sharing ideas with classmates: the extent to which ideas are shared with classmates during class (1: "Not at all" ~ 4: "A lot"); Class participation: Self-assessment of enthusiastic class participation (1: "Strongly disagree" ~ 4: "Strongly agree"). All regressions controlled for the following: Gender: Coded 1 if female, 0 if male; Teacher education level: Coded 1 if the highest education level is S2 or more, 0 otherwise; Total teaching experience and current school experience in months; Permanent employee: Coded 1 if permanent employee, 0 if temporary contract. Standard error clustered at the *madrasa* level. \*\*\*p<0.01, \*\*p<0.05, \*p<0.1.

### 3.2. Discussion

In this study, we investigate if increasing the usage of PBL by *madrasa aliyah* teachers in Indonesia increases their social competency. According to estimates produced using a difference-in-difference design and an instrumental variable approach, the PBL curriculum had a favorable influence on the social competence of *madrasa* instructors. In addition, difference-in-difference design analysis of student data revealed that the PBL program positively influenced students' views of the degree of effort a teacher

expended to pique students' interest. PBL was positively related to *madrasa* teachers' perceptions of class preparation, efforts to induce *madrasa* teacher interest, and the frequency with which students shared ideas in class when estimated using an instrumental variable approach on the subset of schools with the most significant increase in PBL use.

The positive relationships between PBL and *madrasa* teachers' social competencies suggest that learning practices are not just the product of *madrasa* teachers' social competencies, as is commonly assumed, but may also contribute to changes in *madrasa* teachers' social competencies. Based chiefly on cross-sectional data analysis, academics tend to regard *madrasa* instructors' social competency as a factor of the learning method approach [9], [31], [36]–[38]. This study gives empirical evidence for alternative understanding; it may also be for learning techniques to influence *madrasa* teachers' social competency. Data analysis using the quasi-experimental PBL approach spanning two time periods gave more evidence for determining causality than earlier research based on cross-sectional data. This study introduces teaching practice as a moderating element impacting *madrasa* teachers' pedagogy, contributing to the literature on teacher social competency development [18], [39]–[42].

Experience may have a significant role in strengthening the social competence of *madrasa* instructors, according to the three primary sources of building social competence of *madrasa* teachers founded on social cognitive theory. When instructors consider their performance as *madrasa* teachers effective, they achieve experience mastery. PBL may result in a more favorable educational experience for pupils, resulting in a rise in the social competency of *madrasa* instructors [5], [43]–[46]. Due to data constraints, we did not directly analyze the link between pupils and *madrasa* instructors' social competency. The favorable links were shown between PBL and student results, on the other hand, indicate the likelihood of mastery experiences [12], [37], [47]–[49]. Among the three *madrasas* that saw the most significant increase in PBL, there was a positive and statistically significant change in how they carried out their teacher's efforts to stimulate interest and preparatory classes, as well as an increase in the frequency with which they shared ideas with other students in the class. If expressed to teachers, students' good opinions of instructors in the classroom can help teachers who appreciate the effectiveness of their own teaching. Furthermore, participation in course content is likely tied to contributing thoughts in class. Positive impressions of *madrasa* instructors and increased interaction in the classroom by sharing ideas likely to lead to mastery experiences that promote teacher social competency.

This study has shortcomings that should be addressed in future research. First, the use of a subject-near assessment of *madrasa* teacher social competency is the first possible shortcoming of this study. Some academics suggest that *madrasa* teachers' social competency should be developed in conjunction with the unique teaching situation, such as the subject being taught [37], [50]–[53]. Although the extra predictive value and generalizability of such characteristics have not been identified, further research using different measures of *madrasa* teacher social competency may result in more robust estimations. Second, this study employed self-reported teacher social competency indicators from teachers. Simply measuring instructors' evaluations, on the other hand, might lead to positive or negative self-assessment bias, distorting and underestimating the link between teachers' social competencies and others. Several data sources to assess social competencies, such as teacher and student evaluations, can lead to more accurate and stable results [38], [42], [50], [54]. Third, the primary findings have limits in terms of generalizability. This study had a limited sample size and was only done in schools in the Pekanbaru Metropolitan City. In addition, the response rate to the *madrasa* teacher survey is poor. As a result, generalizing the findings to national or international levels may have limitations. Future research should broaden the scope and quantity of *madrasa* professors to acquire more generalizable results. Finally, this study only looked at the influence of PBL after it had been in place for one semester. The instructional technique may be broadened to acquire complete knowledge of how PBL influences the social competency of *madrasa* instructors (e.g., more than one semester). Long-term impacts should also be evaluated using outcomes recorded at subsequent periods.

According to estimates generated using a difference-in-difference design and an instrumental variable method, the PBL program had a favorable influence on the social competency of *madrasa* instructors in Islamic religious education learning. In addition, difference-in-difference design analysis of student data revealed that the PBL program positively influenced students' views of the degree of effort a teacher expended to pique students' interest. Finally, estimating an instrumental variable approach on the subset of schools with the most significant increase in PBL use discovered that PBL was positively related to teachers' perceptions of class preparation, attempts to elicit teacher interest and the frequency with which students shared ideas in class.

This study provides empirical evidence for alternative understanding; it might also be used to impact the social competency of *madrasa* instructors in studying Islamic religious education via learning activities. Data analysis using quasi-experimental approaches spanning two time periods gave more support for causal interpretation than earlier research based on cross-sectional data. This study adds to the literature on the development of *madrasa* teachers' social competencies in Islamic religious education learning by including



teaching practice as a mediating element that impacts their social competence. This study aims to create a theory of problem-based learning on the social competency of *madrasa* instructors in studying Islamic religious education. The Ministry of Religion of the Republic of Indonesia can generally develop the conclusions of this study in all *madrasas* learning at *madrasas*. This study only looked at the influence of PBL after it had been in place for one semester. The length of applying the instructional technique can be prolonged to acquire more full knowledge of how PBL influences the social competency of *madrasa* instructors (e.g., more than one semester). Long-term impacts should also be evaluated using outcomes recorded at subsequent periods. So, in the *madrasa* teaching profession, developing *madrasa* teacher self-efficacy in language learning through a capable PBL process is critical.

#### 4. CONCLUSION

According to estimates generated using a difference-in-difference design and an instrumental variable method, the PBL program had a favorable influence on the social competency of *madrasa* instructors in Islamic religious education learning. In addition, difference-in-difference design analysis of student data revealed that the PBL program positively influenced students' views of the degree of effort a teacher expended to pique students' interest. Finally, estimating an instrumental variable approach on the subset of schools with the most significant increase in PBL use discovered that PBL was positively related to teachers' perceptions of class preparation, attempts to elicit teacher interest and the frequency with which students shared ideas in class. This study provides empirical evidence for alternative understanding; it might also be used to impact the social competency of *madrasa* instructors in studying Islamic religious education via learning activities. Data analysis using quasi-experimental approaches spanning two time periods gave more support for causal interpretation than earlier research based on cross-sectional data. This study adds to the literature on the development of *madrasa* teachers' social competencies in Islamic religious education learning by including teaching practice as a mediating element that impacts their social competence. This study aims to create a theory of problem-based learning on the social competency of *madrasa* instructors in studying Islamic religious education. The Ministry of Religion of the Republic of Indonesia can generally develop the conclusions of this study in all *madrasas* learning at *madrasas*. This study only looked at the influence of PBL after it had been in place for one semester.

The length of applying the instructional technique can be prolonged to acquire more full knowledge of how PBL influences the social competency of *madrasa* instructors (e.g., more than one semester). Long-term impacts should also be evaluated using outcomes recorded at subsequent periods. So, in the *madrasa* teaching profession, developing *madrasa* teacher professionalism in teaching, and learning through a capable PBL process is critical.

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