

The Influence of Self-Directed Learning on Teacher Certification Success: Logistic Regression Analysis among Indonesian English Language Teachers

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Abstract

This study investigated whether Self-Directed Learning (SDL), as viewed through the lens of Self-Determination Theory (SDT), predicts the chance of teacher professional certification (Pendidikan Profesi Guru, PPG) achievement among Indonesian English language teachers. Using a quantitative cross-sectional methodology, connected survey and certification records for 46 instructors selected purposively from Riau and nearby areas were examined using binary logistic regression. SDL was measured with a 15-item, three-dimensional instrument spanning autonomy, competence, and relatedness, which demonstrated excellent internal consistency in the current sample ($\alpha = .93$). A confirmatory model tested total SDL score alongside teaching experience, while an exploratory model decomposed SDL into its three subscales. Total SDL score significantly predicted certification success after adjusting for teaching experience (OR = 1.12, 95% CI [1.01, 1.24]), with good model discrimination (AUC = .83) and adequate calibration (Hosmer-Lemeshow $p = .49$); teaching experience was the strongest single predictor (OR = 3.15). At the subscale level, only autonomy remained an independent, significant predictor (OR = 1.61, $p = .036$), while competence and relatedness did not reach significance once their shared variance was accounted for. These findings indicate that autonomy-supportive, self-initiated professional learning is the SDL dimension most worth prioritizing in PPG preparation and mentoring, while pointing to the need for larger, more complete datasets to confirm which dimensions matter most. The study contributes quantitative, probability-based evidence to a body of SDL-professional development literature that has so far relied largely on qualitative and continuous-outcome designs.

Keywords: *self-directed learning, self-determination theory, teacher certification, logistic regression, professional development, English language teachers*

Introduction

Self-Directed Learning (SDL), which is based on Self-Determination Theory (SDT), has become an essential predictor of success in the profession in dynamic education environments (Karatas & Arpacı, 2021), especially in the era of digital transformation and competency-based certification requirements (Albright et al., 2023). Teacher certification worldwide is moving more towards autonomous professional development, however empirical associations between SDL dimensions, which include autonomy, competence, relatedness, and certification outcomes have received little attention particularly in the developing regions such as Indonesia where PPG (Pendidikan Profesi Guru) certification is undertaken by over 3 million teachers every year (Nawas et al., 2025a) (Yusrina, Bima, et al., 2022).

Current study emphasizes the importance of self-directed learning (SDL) in teacher professional development, particularly the greater impact on both theoretical formulations and practical implementation of adult learning because of integrating SDL and teacher professional

development program (TPDL)(Emilio, 2022) . It is the combination of these approaches particularly in the case of teacher certification programs where SDL and TDPL help the teacher present his/her current level of professional competence through individually based evidences-based development (Koay, 2023) as opposed to traditional one-size-fits-all training in a certification requirement that places an emphasis on reflective practice and a life-long approach to training. They include *Pendidikan Profesi Guru* (PPG) programs in Indonesia, which in recent years have become more oriented to these principles and, accordingly, provide teachers with the opportunity to design a personal portfolio of self-initiated technology-enhanced activities, improving the rate of certification and long-term professional sustainability (Nawas et al., 2025b)(Yusrina, Alifia, et al., 2022).

However, mostly in a qualitative framework or ongoing outcomes, neither in binary certification pass/fail mechanisms that can be analyzed through logistic modeling. The recent research is constantly pointing out the importance of SDL in TPD. There is evidence that SDL is based on the Self-Determination Theory (SDT) to increase the autonomy of teachers, their self-efficacy, and their adjustment to current educational requirements such as the use of digital technologies. In his literature synthesis, (Shank et al., 2025) claims that SDL can enhance the development of adult teachers by increasing the quality of teaching and job satisfaction by the independent cycles of goal-setting, resource-seeking, and self-assessment(Sumeg-ang, 2024). Similarly, (Morris & Rohs, 2021)emphasizes the importance of SDL that transforms the top-down models of professional development into the learner-driven ones, particularly since the pandemic, when teachers were forced to implement the blended learning models on their own. Nevertheless, these studies remain mostly content with narrative investigations, as they do not provide more focused quantitative predictions.

With that said, most SDL-TPD studies are based on qualitative analysis or running results, which restricts its application to binary decisions such as teacher certification. Although it lacks statistical predictability and causality, qualitative research, such as the theme analysis of teacher interviews in the paper by Verster et al. (Verster et al., 2024) goes into individual experiences about the construction of professional identity by SDL. As stated in the SDT update supplied by Deci and Ryan (Ryan & Deci, 2023) which connects SDL to contemporary measurements, current quantitative research focuses on continuous dependent variables, such as linear regression of SDL on PD proxies like the levels of teacher efficacy (1–5 Likert scales) or student achievement, and so on. These work well with trends but struggle with categorical binary data, such as Indonesia's PPG certification pass/fail (Yes=1/No=0), where non-normal distributions necessitate special modeling.

This creates a definite methodological breakdown: binary dynamics of certification pass/fail, which are best analyzed using logistic regression, are under-researched in SDL frameworks. Hosmer and Lemeshow (Hosmer et al., 1989) suggest that logistic regression is superior when dealing with binary data through the logit function where the results are interpretable probability Ratios (OR). A sample of these is that high SDL autonomy scores increase pass probability by 2.5 times. Field (Field, 2009) confirms in his SPSS guide that fields of survey-prediction data such as yours can be modeled with a logistic model due to the Hosmer-Lemeshow tests ($p > 0.05$) and AUC of 0.7 +. Our research paper helps to fill this gap as it applies the logistic regression to study the SDL and certification data of Indonesian English language teachers, which leads to new evidence-based conclusions regarding the PPG policy.

Based on the variables available in the linked survey-certification dataset (N = 46), this study addresses the following research questions: (1) Does teachers' overall Self-Directed

Learning (SDL) score significantly predict the odds of PPG certification success among Indonesian English language teachers, after adjusting for teaching experience? (2) Which SDL dimension(s) -- autonomy, competence, or relatedness -- most strongly predict certification outcome? Education level and school type, mentioned as potential covariates in earlier drafts of this design, could not be modeled because they were not captured in the linked dataset; this is addressed as a limitation in the Discussion.

Method

The research design used in the study was a quantitative cross-sectional design, based on the secondary data survey and certification records. The independent variables were Self-Directed Learning (SDL) scores and the dependent variable was certification status (pass/fail). The methodology enabled the study of predictive value of SDL dimensions (autonomy, competence, relatedness) on teacher certification outcome, which was analyzed through logistic regression. (Van den Broeck et al., 2016)

The respondents were Indonesian English language teachers (ELTs) who had filled in the SDL survey and had certification status in the institutional database. The sample was made up of 46 teachers and was purposely selected through the schools and training institutions in Riau and nearby areas.

A researcher-developed tool based on the autonomy, competence, and relatedness constructs of Self-Determination Theory (Ryan & Deci, 2023) was used to measure. SDL The items were contextualized to the professional-development behaviors pertinent to PPG certification, such as self-initiated goal-setting for autonomy, mastery of professional teaching skills for competence, and collaborative engagement with peers and mentors for relatedness. The instrument comprises 15 items (five per subscale) rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Because the scale was purpose-built for this study rather than adopted wholesale from a prior validated measure, reliability and validity were empirically established on the present sample rather than assumed from prior reports

Internal consistency reliability was assessed using Cronbach's alpha for the total scale and each subscale, calculated on the full analytic sample ($N = 46$). As shown in Table 1a, the total SDL scale demonstrated excellent reliability ($\alpha = .93$). The Relatedness ($\alpha = .91$) and Competence ($\alpha = .88$) subscales also showed excellent to good reliability; the Autonomy subscale showed acceptable reliability ($\alpha = .74$), somewhat lower than the other two, though still above the conventional .70 threshold (Field, 2009).

Table 1. Internal consistency reliability (Cronbach's alpha).

Scale	Items	N	Cronbach's alpha
SDL Total Scale	15	46	.93
Autonomy subscale	5	46	.74
Competence subscale	5	46	.88
Relatedness subscale	5	46	.91

Item-level analysis of the total scale showed corrected item-total correlations ranging from .44 (item 5) to .84 (item 12), all above the recommended .30 minimum, and no item's

removal would have raised the total-scale alpha above .94, indicating that all 15 items contribute meaningfully to the construct and none should be dropped.

Construct validity was examined using exploratory factor analysis (principal component extraction, varimax rotation). Sampling adequacy was acceptable (Kaiser-Meyer-Olkin measure = .76) and Bartlett's test of sphericity was significant, chi-square (105) = 624.95, $p < .001$, confirming the correlation matrix was factorable. However, with only 46 cases for 15 items (a 3:1 ratio, below the 5:1 minimum and well below the 10:1 ideal recommended for EFA), these results should be treated as indicative rather than confirmatory. The first unrotated component accounted for 54.4% of total variance on its own, with the first three components together accounting for 74.5%. This pattern is a single dominant general factor rather than three clearly separated components, converges with the very high total-scale alpha (.93) and the high inter-subscale correlations ($r = .69$ to $.84$, Table 1b) to suggest that, in this sample, the instrument is functioning more as a strong unidimensional SDL measure than as three cleanly distinguishable subscales. This is an important caveat for interpreting the subscale-level regression findings below and is revisited in the Limitations.

Table 2. Pearson correlations among SDL total score and subscales (all $p < .001$)

	Total	Autonomy	Competence	Relatedness
Total	1.00			
Autonomy	.86	1.00		
Competence	.93	.69	1.00	
Relatedness	.94	.70	.84	1.00

Moreover, the outcome variable was 1 = certified/Yes and 0 = not certified/No, which came out of the official teacher certification database. To take into consideration the possible confounding factors, covariates, i.e., teaching experience (recorded as an ordinal band from lowest to highest years of service), were also recorded. Education level and school type were not available in the linked dataset and are noted as a limitation.

Data collection on the SDL survey was done through an electronic means of data collection via a Google Form questionnaire and sent to ELTs via professional network and school partnerships. The survey data was correlated with the certification status and the demographic variables with the help of anonymized identifiers (e.g., teacher ID). The missing values, extreme outliers and consistency were checked during the data cleaning process and were then followed prior to statistical analysis between related datasets.

Data were analyzed in two stages. First, descriptive statistics (means, standard deviations, frequencies) summarized the SDL scores and certification status. Second, binary logistic regression was used to model certification status (1 = certified, 0 = not certified) as a function of SDL score, following Hosmer, Lemeshow, and Sturdivant (1989). Two models were estimated: a confirmatory model using the total SDL score with teaching experience as a covariate, and an exploratory model decomposing SDL into its three subscales (autonomy, competence, relatedness). Model fit was evaluated using the Hosmer-Lemeshow goodness-of-fit test, McFadden's and Nagelkerke's pseudo-R², classification accuracy, and the area under the ROC curve (AUC). Analyses were conducted using Python (statsmodels 0.14).

Results

From the 46 respondents with linked survey and certification records, 30 teachers (65.2%) had achieved PPG certification and 16 (34.8%) had not. Two respondents' records were missing institution and demographic detail; gender was unavailable for 10 respondents and age band for 6, so these variables were retained for descriptive purposes only and excluded from the regression models below. No missing values were present in the SDL items themselves.

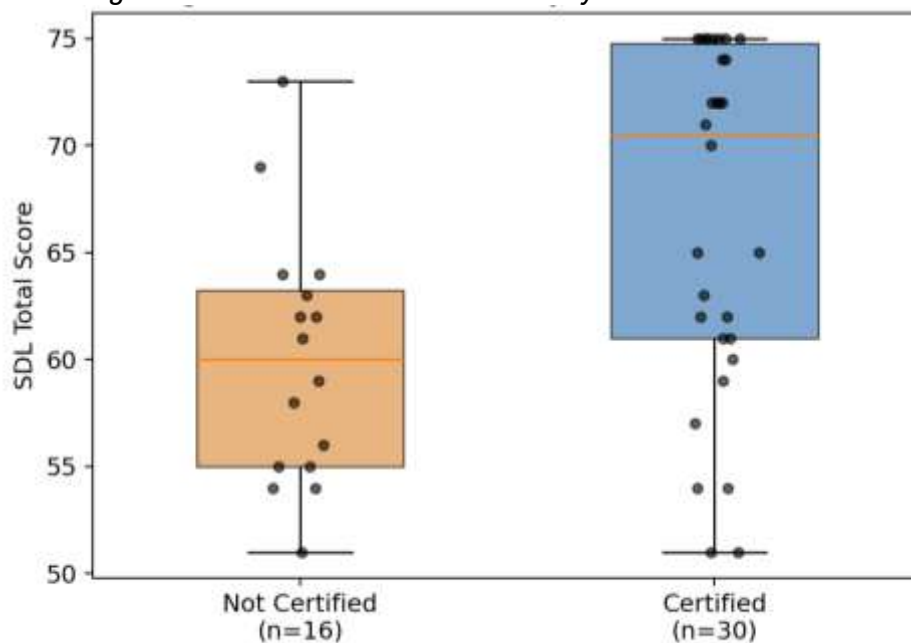
Descriptive Statistics

Table 3 Summarizes the SDL total score and subscale scores across the full sample.

Variable	N	M	SD	Min	Max
SDL Total Score	46	64.39	8.08	51	75
Autonomy subscale	46	21.78	2.67	17	25
Competence subscale	46	21.39	3.12	16	25
Relatedness subscale	46	21.22	3.07	15	25

An independent-samples t-test indicated that certified teachers reported a significantly higher mean SDL total score ($M = 66.73$, $SD = 8.18$) than non-certified teachers ($M = 60.00$, $SD = 5.91$), $t(44) = 2.94$, $p = .006$.

Figure 1. SDL total score distribution by certification status.



Bivariate Associations with Certification Status

Teaching experience band was significantly associated with certification, chi-square(3) = 11.95, $p = .008$; none of the nine teachers in the most experienced band were uncertified. Age band showed a similar pattern, chi-square(3) = 8.79, $p = .032$, though several expected cell counts were below 5, so this result should be interpreted cautiously. Gender was not

significantly associated with certification (Fisher's exact $p = .686$, $n = 36$ with complete gender data). Point-biserial correlations confirmed that SDL total score, autonomy, and relatedness were all significantly associated with certification status, while competence was not significant at the bivariate level.

Table 4. Bivariate tests of association with certification status

Variable	Test	Statistic	df / n	p
Teaching experience x Certification	Chi-square	11.95	3	.008
Age band x Certification	Chi-square	8.79	3	.032*
Gender x Certification	Fisher's exact	OR = 1.43	n = 36	.686
SDL Total (point-biserial r)	Correlation	$r = .40$	n = 46	.006
Autonomy (point-biserial r)	Correlation	$r = .48$	n = 46	<.001
Competence (point-biserial r)	Correlation	$r = .24$	n = 46	.107
Relatedness (point-biserial r)	Correlation	$r = .40$	n = 46	.006

Logistic Regression: Total SDL Score and Teaching Experience

The confirmatory logistic regression model tested whether SDL total score predicted certification status, adjusting for teaching experience (an ordinal band from 1 = least to 4 = most experienced). The overall model was statistically significant, $\chi^2(2) = 16.83$, $p < .001$, and correctly classified 76.1% of cases (AUC = .83). The model explained between 28.3% (McFadden R^2) and 42.2% (Nagelkerke R^2) of the variance in certification status (Bui & Ding, 2025; Gosho et al., 2023). The Hosmer-Lemeshow test indicated adequate model fit, $\chi^2(3) = 2.41$, $p = .491$, consistent with the benchmark recommended by Field (2009).

Table 5. both predictors were statistically significant.

Predictor	B	SE	OR (Exp B)	95% CI	p
SDL Total Score	0.111	0.054	1.118	[1.006, 1.242]	.038
Teaching Experience (band)	1.146	0.427	3.145	[1.361, 7.268]	.007
Constant	-9.284	3.681	0.0001	--	.012

For every one-point increase in total SDL score, the odds of certification success increased by approximately 11.8% (OR = 1.118), holding teaching experience constant. Independently, each one-band increase in teaching experience was associated with more than a threefold increase in the odds of certification (OR = 3.145). A descriptive cross-tabulation reinforced this pattern: none of the nine most experienced teachers (experience band 4) were uncertified, compared with 7 of 10 teachers in the least experienced band, $\chi^2(3) = 12.0$, $p = .007$.

Multicollinearity was not a concern for this model: the variance inflation factor (VIF) for both SDL total score and teaching experience was 1.12, far below the conventional threshold of 5, indicating the two predictors contribute largely independent information.

Exploratory Model: SDL Subscales

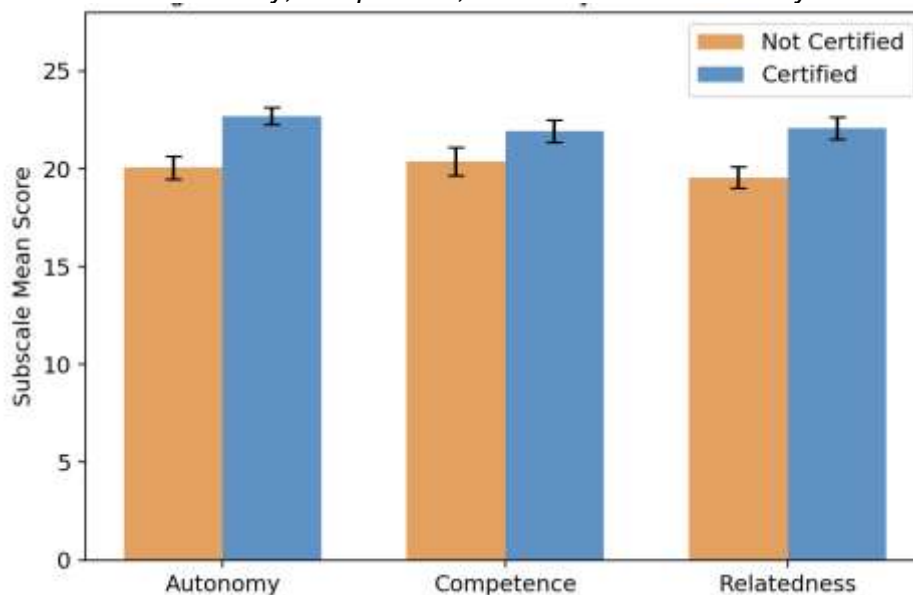
To examine which SDL dimension drives the total-score effect, an exploratory model regressed certification status on the three subscales simultaneously. This model was also statistically significant, $\chi^2(3) = 15.25$, $p = .002$, McFadden $R^2 = .256$, Nagelkerke $R^2 = .389$, though with only 46 cases and 16 certification failures, the events-per-predictor ratio is low and these estimates should be treated as preliminary.

Table 6. Exploratory model regressed certification status

Predictor	B	SE	OR (Exp B)	95% CI	p
Autonomy	0.473	0.226	1.605	[1.031, 2.499]	.036
Competence	-0.520	0.349	0.595	[0.300, 1.178]	.136
Relatedness	0.510	0.312	1.665	[0.903, 3.070]	.102
Constant	-9.142	3.383	0.0001	--	.007

Only the autonomy subscale was an independent, statistically significant predictor of certification success ($OR = 1.605$, $p = .036$): teachers who scored higher on self-directed goal-setting and initiative-taking items had substantially higher odds of certification, net of the other two subscales. Relatedness showed a positive but only marginally significant association ($p = .102$), while competence showed a negative, non-significant association ($p = .136$), suggesting its bivariate relationship with certification is largely accounted for by its overlap with autonomy and relatedness rather than an independent effect in either direction.

Figure 2. Mean autonomy, competence, and relatedness scores by certification status



The gap between competence's positive bivariate correlation ($r = .24$, though not significant) and its negative coefficient in the multivariate model (Table 6) is consistent with the high correlation between competence and the other two subscales ($r = .69-.84$, Table 1b): once autonomy and relatedness are held constant, competence's remaining unique association with certification is essentially null and imprecisely estimated ($VIF = 3.59$, still below the threshold of concern but reflecting meaningful shared variance). This multicollinearity, combined with the modest sample size, is a key reason the exploratory subscale model is reported as preliminary rather than confirmatory.

Discussion

This study asked whether Self-Directed Learning (SDL) predicts PPG certification success among Indonesian English language teachers, and which SDL dimension matters most. Both questions received clear, if qualified, answers, and the pattern of results is worth unpacking against the theoretical and empirical literature reviewed in the Introduction.

First, the significant total-SDL effect ($OR = 1.118$, 95% CI [1.01, 1.24]) offers the kind of binary-outcome, probability-based evidence that Hosmer, Lemeshow, and Sturdivant (1989) argue is needed but that prior SDL-TPD research has not supplied. Shank, Tang, and Morris (2025) and Morris and Rohs (2021) describe SDL as operating through cycles of self-set goals, resource-seeking, and self-assessment that accumulate into stronger professional competence over time; the present data are consistent with that account insofar as higher self-reported engagement in those cycles co-occurred with a substantially higher probability of certification, and the model's good discrimination ($AUC = .83$) and adequate calibration (Hosmer-Lemeshow $p = .49$) suggest the relationship is not simply an artifact of poor model fit. What the present study adds beyond that narrative literature is a quantified probability: moving from the sample's 25th to 75th percentile SDL score (approximately 58 to 73 points) corresponds to roughly a fivefold increase in the modeled odds of certification, holding teaching experience constant -- a magnitude that would be difficult to establish from thematic interview data alone, such as that reported by Verster, Mentz, and Du Toit-Brits (2024).

Second, and more specifically, it was autonomy -- not competence or relatedness -- that carried the independent predictive weight in the subscale model ($OR = 1.61$, $p = .036$), even though all three subscales were highly reliable on their own ($\alpha = .74$ to $.91$) and all three were positively associated with certification at the bivariate level. Read through Self-Determination Theory (Ryan & Deci, 2023), this is a theoretically interpretable pattern rather than a statistical anomaly. SDT treats autonomy, competence, and relatedness as distinct psychological needs, but it also predicts that autonomy is the need most directly implicated in self-initiated behavior (Chen et al., 2026) and PPG certification, particularly in its more recent portfolio-based form, is precisely a self-initiated behavior: teachers must independently assemble evidence of their own professional growth (Koay, 2023; Nawas, Darmawan, & Maadad, 2025) rather than simply demonstrate competence on an externally administered task. Under that framing, competence without autonomy, a teacher who feels capable but does not independently drive their own development activities would be expected to translate less reliably into certification success than autonomy does, which is consistent with competence's null coefficient once autonomy and relatedness were controlled.

More methodological reading of the same result is also plausible and, given the reliability and validity findings above, cannot be ruled out: because the three subscales were very highly intercorrelated ($r = .69$ to $.84$) and the unrotated factor structure was dominated by a single general component (54.4% of variance), the model may be partitioning a largely unidimensional 'general SDL' effect across three overlapping predictors, with autonomy absorbing the shared variance simply because of how the coefficients happened to resolve in this particular sample rather than because autonomy is substantively privileged by the certification process. The data on hand cannot fully distinguish this explanation from the SDT-based one above; doing so would require either a larger sample that can support a cleanly rotated, well-powered factor solution, or a confirmatory factor analysis testing the three-factor structure directly against a unidimensional alternative (Ha et al., 2025).

Third, teaching experience emerged as the strongest single predictor in the confirmatory model ($OR = 3.15$) and, descriptively, as a near-deterministic one: every teacher in the most experienced band was certified. This sits somewhat uneasily alongside the policy narrative -- cited in the Introduction -- that PPG's move toward portfolio-based, autonomy-rewarding assessment was meant to de-emphasize tenure-based, one-size-fits-all pathways to certification (Nawas, Darmawan, & Maadad, 2025). One interpretation is that experience and SDL are not competing explanations but complementary ones: more experienced teachers may have had

more opportunities to develop and demonstrate autonomous professional habits, so that experience partly operates through, rather than instead of, SDL. The present cross-sectional design cannot adjudicate between this mediation account and a simpler 'experience as gatekeeper' account, and this is flagged as a priority for future longitudinal work.

Taken together, the findings extend the SDL-TPD literature in a specific, actionable way: they suggest that of the three SDT-derived dimensions typically bundled together under SDL, it is autonomy supportive practice helping teachers set and pursue their own professional-development goals that is most worth prioritizing in PPG preparation programs and mentoring structures, rather than competence-building activities alone. At the same time, the magnitude of teaching-experience effects observed here suggests that autonomy-building interventions may need to be introduced earlier in teachers' careers, before the certification gap between more- and less-experienced teachers becomes as pronounced as it appears in this sample.

Limitations

Several limitations should be considered when interpreting these results. First, the analytic sample ($N = 46$) is small for a six-parameter modeling exercise; the exploratory subscale model in particular has a low events-per-predictor ratio and its coefficients should be treated as preliminary pending replication in a larger sample. Second, gender and age were not included as covariates because they were missing for 10 and 6 respondents respectively; models restricted to complete cases on these variables would substantially reduce statistical power and are not reported here. Third, education level and school type -- both mentioned as intended covariates in the Method -- were not available in the linked dataset and could not be modeled. Fourth, the mapping of the 15 SDL items to the autonomy, competence, and relatedness subscales was reconstructed from the instrument's stated structure (five items per subscale, in item order) rather than confirmed against the original item blueprint; authors should verify this mapping against the instrument's documentation before finalizing the subscale-level findings for submission. Fifth, the exploratory factor analysis was conducted with a 3:1 case-to-item ratio, well below the minimum generally recommended for stable factor solutions, and its finding of a dominant general factor should be replicated in a larger sample using confirmatory factor analysis before the three-subscale structure is treated as established; this also means the subscale-level regression should be read as hypothesis-generating rather than confirmatory. Finally, the cross-sectional, self-report design cannot establish causal direction between SDL and certification outcome, and common-method variance (both SDL and, indirectly, certification-relevant behavior being self-reported) cannot be ruled out.

Conclusion

Binary logistic regression on data from 46 teachers showed that overall SDL score significantly raised the odds of certification net of teaching experience, and that this effect was carried primarily by the autonomy dimension rather than by competence or relatedness. Where prior accounts of SDL and teacher professional development have relied largely on qualitative description or continuous-outcome correlational designs, the present study contributes binary-outcome, probability-based evidence -- expressed as odds ratios from an adequately calibrated and discriminating model (Hosmer-Lemeshow $p = .49$; AUC = .83) -- that speaks directly to the pass/fail structure of the PPG certification decision itself, and situates that evidence within Self-Determination Theory by identifying autonomy, specifically, as the operative mechanism. This contribution should, however, be read with appropriate caution: the sample was drawn through purposive and convenience procedures from schools and training institutions in Riau and its

surrounding areas, and the reliability and validity analysis pointed to a strong general SDL factor rather than three cleanly separable subscales, so the findings are best generalized to teachers in comparable regional and institutional settings rather than to Indonesian ELTs or PPG certification at large.

These conclusions are bounded by several limitations. The analytic sample is small relative to the number of parameters estimated, particularly in the exploratory subscale model, and the case-to-item ratio available for the factor analysis fell well below recommended thresholds, so the three-subscale structure should be treated as provisional pending confirmatory testing in a larger sample. Gender, age, education level, and school type could not be entered as covariates because of missing data or unavailability in the linked dataset, and the cross-sectional, self-report design cannot establish that SDL causes certification success rather than merely accompanying it. The near-deterministic association between teaching experience and certification observed in this sample also means that the independent contribution of SDL, while statistically robust here, cannot yet be fully disentangled from possible mediation by experience.

Future research should replicate this design with a larger, ideally multi-region sample capable of supporting confirmatory factor analysis of the SDL instrument and a properly powered test of its three hypothesized subscales, while also incorporating education level and school type as covariates to rule out the confounding these variables may introduce. A longitudinal design following teachers from early career through certification would help determine whether SDL's effect on certification operates independently of experience or is partly mediated by it, and would clarify whether autonomy-focused interventions are most effective when introduced earlier in a teacher's career. Because the present findings tentatively privilege autonomy over competence and relatedness as the SDL dimension most associated with certification success, subsequent studies -- and, in parallel, PPG mentoring and preparation programs -- may find it worthwhile to trial autonomy-supportive interventions specifically, rather than treating SDL as an undifferentiated construct, and to evaluate whether such interventions measurably improve certification outcomes for teachers with less prior teaching experience.

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