

Curriculum Fidelity of Prospective Teachers in Tripura: A Dimension Wise Analysis of Adherence, Exposure, Quality of Delivery and Participant Responsiveness

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Abstract

Curriculum fidelity refers to the degree to which a curriculum is implemented in the manner intended by its developers, and it is widely regarded as a decisive condition for the success of any educational programme. The present study examined the curriculum fidelity of prospective teachers in Tripura, India, across four dimensions, namely adherence, exposure, quality of delivery and participant responsiveness. A descriptive survey design was adopted, and data were collected from 66 prospective teachers (46 female, 20 male) drawn from the language, social science, science and mathematics streams. Dimension scores were normalised on a scale of 0 to 1. As Shapiro-Wilk tests indicated significant departures from normality, non-parametric statistics were employed. The overall level of curriculum fidelity was moderate ($M = 0.50$, $SD = 0.18$), with 65.2 per cent of prospective teachers falling in the moderate category. A Friedman test revealed a statistically significant difference among the four dimensions, and post hoc Wilcoxon signed-rank tests with Bonferroni correction showed that adherence was significantly lower than exposure, quality of delivery and participant responsiveness, with large effect sizes, while quality of delivery was the highest. Mann-Whitney U tests indicated no significant gender differences in any dimension, and Kruskal-Wallis tests showed no stable differences across academic streams. Spearman correlations among the dimensions were strong and positive, supporting the internal coherence of the fidelity construct. The findings suggest that although prospective teachers deliver the curriculum with reasonable quality and coverage, they deviate considerably from the curriculum as prescribed. Implications for teacher education institutions, curriculum developers and policy makers are discussed.

Keywords: *curriculum fidelity, prospective teachers, adherence, exposure, quality of delivery, participant responsiveness*

1. Introduction

A curriculum, however carefully designed, achieves its purpose only when it is implemented in classrooms in the manner its developers intended. The distance between the intended curriculum and the enacted curriculum has therefore been a persistent concern of curriculum scholarship since the early implementation studies of the 1970s (Fullan & Pomfret, 1977). The construct that captures this concern is curriculum fidelity, also described in the literature as fidelity of implementation or programme integrity. Curriculum fidelity denotes the extent to which the delivery of a curriculum conforms to the programme model as planned, in terms of its content, methods, duration and intended processes (Dane & Schneider, 1998; O'Donnell, 2008). When fidelity is low, the outcomes observed in learners cannot be attributed with confidence to the curriculum itself, because what was delivered was not, in any meaningful sense, the curriculum that was designed (Dusenbury et al., 2003).

Fidelity is a multidimensional construct. Dane and Schneider (1998) identified five components of programme integrity: adherence, exposure (or dose), quality of delivery, participant responsiveness and programme differentiation. Adherence refers to whether the components of the curriculum are delivered as prescribed; exposure concerns the amount of the programme actually received; quality of delivery captures the manner and skill with which the content is transacted; and participant responsiveness reflects the degree to which learners are engaged by and involved in the programme. These dimensions have become the standard framework through which implementation is examined in education and allied fields (Carroll et al., 2007; O'Donnell, 2008).

The question of fidelity is particularly consequential in teacher education. Prospective teachers occupy a dual position: they are simultaneously learners of a professionally prescribed curriculum and future implementers of school curricula. The habits of implementation they form during their preparation are likely to shape how faithfully they will enact school curricula in their own classrooms. In India, the National Education Policy 2020 places renewed emphasis on the quality of teacher preparation and on the rigorous transaction of professional curricula (Ministry of Education, 2020), and the National Curriculum Framework for Teacher Education has long stressed systematic and reflective curriculum transaction (National Council for Teacher Education, 2009). Yet empirical evidence on how faithfully prospective teachers implement the curriculum, especially in the north-eastern states of India, remains scarce. Tripura, a small north-eastern state with a growing network of teacher education institutions, offers an instructive context in which to examine this question. The present study therefore investigated the curriculum fidelity of prospective teachers in Tripura across the four dimensions of adherence, exposure, quality of delivery and participant responsiveness, and examined whether fidelity varies by gender and academic stream.

2. Objectives of the Study

The study pursued the following objectives. First, to assess the level of curriculum fidelity of prospective teachers in Tripura in respect of adherence, exposure, quality of delivery and participant responsiveness. Second, to compare the mean scores of the four dimensions of curriculum fidelity of prospective teachers. Third, to compare the curriculum fidelity of prospective teachers with respect to gender. Fourth, to compare the curriculum fidelity of prospective teachers with respect to academic stream. Fifth, to examine the relationships among the four dimensions of curriculum fidelity.

3. Hypotheses

The following null hypotheses were tested at the 0.05 level of significance. Ho1: There is no significant difference among the four dimensions of curriculum fidelity of prospective teachers. Ho2: There is no significant difference in the curriculum fidelity of prospective teachers with respect to gender. Ho3: There is no significant difference in the curriculum fidelity of prospective teachers with respect to academic stream. Ho4: There is no significant relationship among the dimensions of curriculum fidelity of prospective teachers.

4. Methodology

4.1 Research Design

The study employed a quantitative descriptive survey design, which is appropriate for describing the prevailing status of a phenomenon and for comparing naturally occurring groups without manipulation of variables.

4.2 Population and Sample

The population of the study comprised prospective teachers enrolled in teacher education institutions in Tripura, India. The sample consisted of 66 prospective teachers, of whom 46 (69.7 per cent) were female and 20 (30.3 per cent) were male. With respect to academic stream, 38 (57.6 per cent) belonged to the language stream, 15 (22.7 per cent) to social science, 8 (12.1 per cent) to science and 5 (7.6 per cent) to mathematics. The distribution of the sample broadly mirrors the enrolment pattern of teacher education programmes in the state, in which female candidates and language stream candidates predominate.

4.3 Tool and Scoring

Curriculum fidelity was measured along the four dimensions of the Dane and Schneider (1998) framework as operationalised for curriculum research by O'Donnell (2008): adherence, exposure, quality of delivery and participant responsiveness. Responses on the items of each dimension were aggregated and normalised to a common scale ranging from 0 to 1, with higher scores indicating greater fidelity. Normalisation to a common metric permits direct comparison across dimensions

containing unequal numbers of items. For descriptive classification, scores below 0.40 were treated as low, scores from 0.40 to 0.70 as moderate and scores above 0.70 as high fidelity.

4.4 Statistical Techniques

Data were analysed using Python 3 with the SciPy statistical library. The Shapiro-Wilk test was applied to examine the normality of the distributions (Shapiro & Wilk, 1965). As all four dimension scores departed significantly from normality, non-parametric procedures were adopted (Field, 2018). The Friedman test (Friedman, 1937) was used to compare the four related dimension scores, with Kendall's coefficient of concordance *W* as the effect size, followed by post hoc Wilcoxon signed-rank tests with Bonferroni correction. The Mann-Whitney *U* test was used for gender comparisons and the Kruskal-Wallis *H* test for comparisons across academic streams. Spearman's rank order correlation was used to examine relationships among the dimensions. Effect sizes were interpreted following the conventions of Cohen (1988) and Tomczak and Tomczak (2014).

5. Analysis and Interpretation

5.1 Level of Curriculum Fidelity

Table 1

Descriptive Statistics and Tests of Normality for the Dimensions of Curriculum Fidelity (N = 66)

Dimension	M	SD	Mdn	Min	Max	Skewness	Shapiro-Wilk <i>W</i>	<i>p</i>
Adherence	0.40	0.21	0.45	0.00	1.00	0.20	0.959	.029
Exposure	0.53	0.17	0.58	0.00	1.00	-0.49	0.917	< .001
Quality of delivery	0.58	0.19	0.60	0.00	1.00	-0.45	0.923	< .001
Participant responsiveness	0.51	0.24	0.50	0.00	1.00	-0.16	0.937	.002
Composite fidelity	0.50	0.18	0.53	0.10	0.96			.005

Note. Scores are normalised on a 0 to 1 scale. The composite score is the mean of the four dimension scores.

Table 1 presents the descriptive statistics. The mean scores were 0.40 (SD = 0.21) for adherence, 0.53 (SD = 0.17) for exposure, 0.58 (SD = 0.19) for quality of delivery and 0.51 (SD = 0.24) for participant responsiveness. The composite fidelity score averaged 0.50 (SD = 0.18), indicating a moderate overall level of curriculum fidelity. The Shapiro-Wilk statistic was significant for all four dimensions ($p < .05$), confirming that the distributions departed from normality and justifying the use of non-parametric

statistics.

Table 2

Levels of Curriculum Fidelity of Prospective Teachers (N = 66)

Level	Adherence f (%)	Exposure f (%)	Quality of delivery f (%)	Participant responsiveness f (%)	Composite f (%)
Low (< 0.40)	26 (39.4)	15 (22.7)	9 (13.6)	13 (19.7)	14 (21.2)
Moderate (0.40 to 0.70)	36 (54.5)	48 (72.7)	45 (68.2)	40 (60.6)	43 (65.2)
High (> 0.70)	4 (6.1)	3 (4.5)	12 (18.2)	13 (19.7)	9 (13.6)

Note. f = frequency; percentages are given in parentheses.

As shown in Table 2, 43 prospective teachers (65.2 per cent) exhibited a moderate level of overall curriculum fidelity, 14 (21.2 per cent) a low level and only 9 (13.6 per cent) a high level. The dimension wise classification is revealing: adherence had the largest proportion of low scorers, with 26 prospective teachers (39.4 per cent) in the low category and only 4 (6.1 per cent) in the high category, whereas quality of delivery showed the most favourable distribution, with only 9 (13.6 per cent) in the low category.

5.2 Comparison Among the Dimensions of Curriculum Fidelity (H01)

Because the four dimension scores were obtained from the same respondents, a repeated measures comparison was required. The Friedman test was applied, and the results are given in Table 3.

Table 3

Friedman Test for Differences Among the Four Dimensions of Curriculum Fidelity (N = 66)

Dimension	Mean rank	Chi square	df	p	Kendall's W
Adherence	1.55				
Exposure	2.99	76.03	3	< .001	0.38
Quality of delivery	3.27				
Participant responsiveness	2.19				

Note. The chi square value, degrees of freedom, significance and effect size pertain to the omnibus Friedman test.

The Friedman test revealed a statistically significant difference among the four

dimensions, chi square (3, N = 66) = 76.03, $p < .001$, Kendall's $W = 0.38$, a moderate to large effect. The mean ranks were 1.55 for adherence, 2.99 for exposure, 3.27 for quality of delivery and 2.19 for participant responsiveness, indicating that for a typical prospective teacher adherence was the weakest dimension and quality of delivery the strongest. The null hypothesis H_{01} was therefore rejected.

Table 4

Post Hoc Wilcoxon Signed-Rank Tests with Bonferroni Correction

Pairwise comparison	Z	Adjusted p	Effect size r	Decision
Adherence vs exposure	-5.51	< .001	0.68	Significant
Adherence vs quality of delivery	-6.65	< .001	0.82	Significant
Adherence vs participant responsiveness	-4.16	< .001	0.61	Significant
Exposure vs quality of delivery	-2.92	.021	0.36	Significant
Exposure vs participant responsiveness	-1.83	.405	0.23	Not significant
Quality of delivery vs participant responsiveness	-4.29	< .001	0.53	Significant

Note. p values are Bonferroni adjusted for six comparisons (adjusted alpha = .0083). $r = |Z|$ divided by the square root of the number of non-tied pairs.

Post hoc Wilcoxon signed-rank tests with Bonferroni correction are summarised in Table 4. Adherence was significantly lower than exposure ($Z = -5.51$, $p < .001$, $r = 0.68$), quality of delivery ($Z = -6.65$, $p < .001$, $r = 0.82$) and participant responsiveness ($Z = -4.16$, $p < .001$, $r = 0.61$), all with large effect sizes. Quality of delivery was significantly higher than participant responsiveness ($Z = -4.29$, $p < .001$, $r = 0.53$) and exposure ($Z = -2.92$, adjusted $p = .021$, $r = 0.36$). The difference between exposure and participant responsiveness was not significant after correction ($Z = -1.83$, adjusted $p = .405$, $r = 0.23$). The pattern is unambiguous: adherence lags significantly behind every other dimension of curriculum fidelity.

5.3 Curriculum Fidelity and Gender (H_{02})

Table 5

Mann-Whitney U Tests Comparing Male (n = 20) and Female (n = 46) Prospective Teachers

Dimension	Mdn (male)	Mdn (female)	U	Z	p	r
Adherence	0.45	0.45	516.50	0.79	.431	0.10

Exposure	0.60	0.58	500.00	0.56	.576	0.07
Quality of delivery	0.60	0.60	473.50	0.19	.854	0.02
Participant responsiveness	0.50	0.50	457.50	-0.03	.977	0.00
Composite fidelity	0.54	0.53	484.00	0.33	.743	0.04

Note. None of the comparisons is significant at the .05 level.

Mann-Whitney U tests, reported in Table 5, revealed no statistically significant difference between male and female prospective teachers in adherence ($U = 516.50$, $p = .431$, $r = 0.10$), exposure ($U = 500.00$, $p = .576$, $r = 0.07$), quality of delivery ($U = 473.50$, $p = .854$, $r = 0.02$), participant responsiveness ($U = 457.50$, $p = .977$, $r < 0.01$) or the composite fidelity score ($U = 484.00$, $p = .743$, $r = 0.04$). The effect sizes were uniformly trivial. The null hypothesis H_{02} was retained. Curriculum fidelity among prospective teachers in Tripura appears to be independent of gender.

5.4 Curriculum Fidelity and Academic Stream (H_{03})

Table 6

Kruskal-Wallis H Tests Comparing Curriculum Fidelity Across Academic Streams

Dimension	Language Mdn (n = 38)	Social science Mdn (n = 15)	Science Mdn (n = 8)	Mathematics Mdn (n = 5)	H	p
Adherence	0.43	0.40	0.50	0.50	3.51	.319
Exposure	0.54	0.62	0.62	0.65	9.17	.027
Quality of delivery	0.60	0.60	0.60	0.60	2.08	.557
Participant responsiveness	0.50	0.50	0.50	0.50	0.84	.840
Composite fidelity	0.53	0.54	0.54	0.53	1.70	.636

Note. $df = 3$ for all tests. For exposure, no pairwise comparison remained significant after Bonferroni correction.

Kruskal-Wallis tests across the four academic streams, presented in Table 6, showed no significant difference in adherence ($H = 3.51$, $p = .319$), quality of delivery ($H = 2.08$, $p = .557$), participant responsiveness ($H = 0.84$, $p = .840$) or the composite score ($H = 1.70$, $p = .636$). The omnibus test was significant for exposure ($H = 9.17$, $p = .027$, $\eta^2 = 0.10$), with science and mathematics prospective teachers reporting somewhat higher exposure than their language stream counterparts. However, none of the pairwise comparisons survived Bonferroni correction, and the science ($n = 8$) and mathematics ($n = 5$) subgroups were small. The isolated omnibus result should

therefore be interpreted with caution, and Ho₃ was substantially retained.

5.5 Relationships Among the Dimensions (Ho₄)

Table 7

Spearman Rank Order Correlations Among the Dimensions of Curriculum Fidelity (N = 66)

Dimension	1	2	3	4
1. Adherence	1.00			
2. Exposure	0.63**	1.00		
3. Quality of delivery	0.68**	0.64**	1.00	
4. Participant responsiveness	0.65**	0.65**	0.87**	1.00

Note. ** p < .001.

Spearman correlations, shown in Table 7, were positive, strong and significant for every pair of dimensions (p < .001).

6. Discussion

Three findings of the study merit particular attention. The first and most consequential is the pronounced weakness of adherence relative to the other dimensions. Prospective teachers in Tripura reported delivering the curriculum with reasonable quality and covering a fair proportion of its content, yet they departed substantially from the curriculum as prescribed, with nearly two fifths of the sample falling in the low adherence category. This pattern echoes international findings that teachers routinely modify, omit or resequence prescribed material (Bümen et al., 2014; Remillard, 2005), and it lends empirical weight to the warning of Dusenbury et al. (2003) that adherence is the most fragile component of implementation. In the framework of Carroll et al. (2007), adherence is the very measurement of fidelity, and its erosion threatens the validity of any inference about the effectiveness of the teacher education curriculum: what prospective teachers experience is, to a considerable degree, not the curriculum that was designed for them.

Second, the strong correlation between quality of delivery and participant responsiveness (rho = 0.87) is consistent with the integrated model of Berkel et al. (2011), in which skilled delivery elicits engagement and engagement in turn sustains delivery. The practical implication is that interventions aimed at improving delivery quality are likely to yield collateral gains in learner engagement, and vice versa. That both of these process dimensions outstripped adherence suggests that the deviations observed are not primarily failures of skill or of engagement, but of alignment with the prescribed programme, which may reflect time constraints, examination pressures or insufficient familiarity with curricular intentions.

Third, the absence of gender differences, with effect sizes near zero, indicates that curriculum fidelity in this context is a function of the implementation environment rather than of demographic characteristics. This is a substantively meaningful null result: it suggests that remedial efforts need not be differentiated by gender and may be directed at the programme level. The stream comparisons were likewise largely non-significant, although the tentative advantage of science and mathematics candidates in exposure invites further investigation with larger and more balanced subsamples, since the structured and sequential character of science and mathematics syllabi may naturally support fuller coverage.

The moderate overall level of fidelity ($M = 0.50$), with only 13.6 per cent of prospective teachers in the high category, falls short of the threshold at which programmes reliably produce their intended outcomes (Durlak & DuPre, 2008). Given that the fidelity habits of prospective teachers are likely to carry into their future classrooms, these findings have significance beyond teacher education itself.

7. Limitations and Suggestions for Further Research

Fidelity was assessed through self-reported scores, which may be inflated by social desirability; future studies should triangulate self-reports with classroom observation and document analysis. The study was cross-sectional, whereas fidelity is known to change over time (Dusenbury et al., 2003); longitudinal designs following prospective teachers into their induction years would illuminate whether fidelity patterns formed during preparation persist into practice. Further research may also examine institutional, motivational and curricular predictors of adherence, and replicate the dimension wise comparison in other states and programme types.

8. Conclusion

The study examined the curriculum fidelity of prospective teachers in Tripura across the dimensions of adherence, exposure, quality of delivery and participant responsiveness. Overall fidelity was moderate, and the four dimensions differed significantly, with adherence emerging as the weakest dimension by a wide margin and quality of delivery as the strongest. Curriculum Fidelity of the prospective teachers of Tripura was not varied with demographic factors like Gender, Academic Stream etc. But the correlation among the four dimensions of Curriculum Fidelity is very strong. Prospective teachers of Tripura were good in Delivery Skill and Learner Engagement but problem to alignment with the prescribed curriculum. Strengthening adherence, through clear implementation expectations, monitoring and supportive supervision, is the most promising route to raising the fidelity, and thereby the effectiveness, of teacher education curricula in the state.

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