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REGULAR ARTICLE

Development and Psychometric Validation of Teachers' Receptivity to Change Scale

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Abstract In this article, we report the development and psychometric validation of the Teachers' Receptivity to Change Scale (TRCS). The sample included secondary school teachers of Kerala, India. In India, the teachers' receptivity to change becomes important in the context of the newly drafted National Education Policy, (2020) which places teachers' at the center of the reforms. The present study proceeded through five phases namely item analysis, exploratory factor analysis, confirmatory factor analysis, validation of the scale, and test–retest reliability. The development of the tool started with the generation of a pool of items followed by item analysis. The exploratory factor analysis extracted four factors and the confirmatory factor analysis confirmed the four-factors namely individual, organizational, educational, and bridging factors. The structural equation modelling established the four-correlated factor construct of teachers' receptivity to change and an additive model indexing teachers' receptivity to change as the sum of the four factors. Both the model fit indices indicated an excellent fit. The validity of the TRCS established by correlating the teachers' receptivity to change and its factors with multidimensional work motivation scale and engaged teachers' scale indicated a moderate correlation. The final 28 item TRCS showed adequate internal consistency (Cronbach's alpha = 0.897) and discriminant validity. The test re-test reliability analysis (Cronbach's alpha = 0.884) confirmed the temporal stability of the scale. The findings recommend a psychometric reliable and valid scale for assessing teachers' receptivity to change with implications for teachers, researchers, and policy makers.

Keywords Receptivity to change · Tool construction · Factor analysis · Psychometric properties

Introduction

Receptivity to change (RTC), defined as a set of factors, describes how individuals orient themselves to a proposed change (Crisafulli, 1982). The nature of change reflects primarily in terms of stated procedures for educational policy reforms, whereas the outcomes remain unsatisfactory (Hopkins & Reynolds, 2001; Waugh & Godfrey, 1995). When considering the educational system, the focus falls on teachers as the critical change creators (Fullan, 2007). The review of literature has pointed out individual, organisational, and context-specific factors while framing new policies, reforms, strategies or interventions (Armenakis et al., 1993; Berger, 2009; Chauvin, 1992; Daar, 2010; Maika, 2007; Mellencamp, 1992; Waugh & Godfrey, 1995; Wolf & Le Vasan, 2008). The factors influence individual motivation and behaviour (Siegel & Kaemmerer, 1978).

The constant reassessment in the field of education becomes essential in this era of reforms in processes of teaching, learning, curriculum assessments, and evaluation techniques. The acceptance and adaptation by the teachers when embarking on reform are not without challenges. Therefore, for the success of any proposed change, it becomes necessary for the policy makers or the school authorities to consider the problem of overcoming resistance

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(Zimmerman, 2006) and proper support (Wong et al., 2021). The emphasis on quality education calls for the continuous professional development of teachers (Loughran, 2016). It becomes vital to help the teachers accomplish the set goals and implement new strategies for their career progressions.

Assessing teachers' attitudes and behaviours toward any change is a beginning step to encouraging readiness to change. The analyses of the factors that influence the RTC pave the way for understanding the process in terms of individual, organisational and context-specific perspectives. The construct of teachers' receptivity to change could thus stimulate quality sustainable development in the education system. The National Education Policy (2020) and the set sustainable development goals (SDG) adopted by India, call for quality enhancement for teacher empowerment at all levels (Government of India, Department of Education, MoHRD, 2020). The unprecedented pandemic has exposed the multi-layered issues that the teachers faced due to infrastructure obstructions, the digital divide, and the lack of professional training across the National Capital Region of India (Jain et al., 2021). The increasing exhaustion and cynicism in teachers because of adverse effects of COVID 19 made their cognitive and affective attitude toward change less agreeable, according to Sokal et al. (2020). The teachers were pressurised and mentally drained during the challenging times, making the psychological adjustment to work difficult (Baker et al., 2020). The teachers should be receptive to changes within these challenges and the risks, as they ought to be multitaskers.

A rigorous measure of teachers' RTC is required to quantify the orientation towards change based on factors. Despite the studies examining teachers' change, the subsequent modifications in the educational practices call for sustained attention and research. Literature has shown the formulation of theories/ models of change and the impact of several factors on the construct of receptivity (Fullan, 2007; Koo, 2008; Reinholdz & Andrews, 2020). However, the literature mostly had studies relating receptivity to a system, curriculum, or policy change (Lee, 2000; Waugh, 2000; Waugh & Godfrey, 1993; Waugh & Ketusiri, 2009; Waugh & Punch, 1987; Yin, et al., 2011). The literature refers to research conducted in different areas of change such as administrative, curriculum, strategies, professional development, systemic models, and case studies. The studies on receptivity are mostly qualitative and focus on the change process rather than teachers' receptivity (Waugh, 2000). Mellancamp (1992) perceived receptivity as a construct influenced by individual and organisational factors. Wolf and Le Vasan (2008) came up with a framework as an adaptation from the study by Mellencamp (1992) for RTC, which included individual factors (IF), organisational factors (OF), bridging factors (BF), and educational factors (EF) operationally defined by second-order factors.

The present study developed and validated a psychometric tool considering teachers' receptivity to change (TRCS) as a construct with four corresponding factors- individual, organisational, bridging, and educational. The present investigation adapted the RTC framework (Wolf & Le Vasan, 2008) to develop a questionnaire for a quantitative measure. The second-order factors identified from the literature search defined the four first-order factors. The individual factors were self-efficacy and self-regulation. The organisational factors were school climate, principal/school support, professional training, decision-making and communication. When the teachers get incentives and the opportunity to foster their voice through self-worth and engagement, they move forward to negotiate a link among the factors. The educational factors were teacher-oriented characteristics (willingness to change) and system-oriented characteristics (nature of the system and anticipated outcomes).

The changes concerning an education system require understanding teachers' receptivity involving their attitudes and behaviours since teachers' implement the change (Waugh, 2000). The need to isolate the important factors to make a quantitative measure of teachers' RTC is essential for advancements in planning and implementing a change. The scale can act as a checklist at the planning stage, considering different dimensions influencing RTC. The administration of the scale can measure and monitor the construct of receptivity repeatedly at the implementation stage of the change. A highly receptive individual has positive views about each of the aspect of the change and behaves positively to the change. A receptivity to change scale with individual, organisational, bridging, and educational factors can be the right solution for a fair, compatible and quantifiable measure irrespective of the nature of change across different educational systems.

Method

Generation of the Initial Pool of Items

We generated a pool of 120 items. The researcher took into account the factor structure of the receptivity to change framework (Wolf & Le Vasan, 2008) as a basis for the development of the items. Respondents used a five-point Likert scale, on which '0' represented 'never' and '4' represented 'always' to indicate to what extent each item described them. Multiple items represented each of the four dimensions. Three experts in the field of education examined the items for content validity, precision, and legibility. Subsequently, after the approval from the Research Conduct and Ethics Committee, we proceeded with the development and validation of the TRCS. We established the final version of the

scale through five different stages of study. A brief description of the studies follow.

Study 1: Item Analysis

The objective of study 1 was to estimate the indices of item difficulty and item discrimination and establish internal consistency.

Sample

The sample included secondary school teachers (teachers who teach in IX and X classes) of Kerala, India. We collected data from 300 secondary school teachers from government and aided schools residing in different parts of Kerala, India, selected through purposive sampling.

Procedure

One of the researchers approached the participants directly with a hard copy of the questionnaire to collect the data. The researcher met the teachers after getting approval from the head of the institution. All the participants submitted a signed consent on their voluntary participation in responding to the items after the researcher informed them about the aim and objectives of the study. The participants self-rated the 120 items using the five-point Likert scale.

Results

We used jamovi software to do the item analysis. The researchers discarded too difficult and easy items with a mean greater than four and lesser than two. The retained items with a mean ranging between two and four indicated that those items were neither too easy nor too difficult. Item rest correlation with a cut-off score lesser than 0.3 decided the item discrimination index, which defined the item's association with the total score on other items (see Table 1). The scale showed adequate internal consistency (Cronbach's alpha = 0.97). We discarded items coded as @3,@4,@5,@7,@9,@15,@24,@25,@27,@40,@92,@93, @94,@100,@106,@107,@110, and @112 after item analysis. After estimating the indices of item difficulty and item discrimination, the scale retained 102 items. Two experts in education and psychology examined the items for content validity and clarity. The retained items had the same codes as in the beginning, irrespective of the 18 items discarded after item analysis.

Study 2: Exploratory Factor Analysis

The objective of study 2 was to explore the items aligned with the four dimensions of the TRCS based on the participants' responses. We used exploratory factor analysis (EFA) in jamovi for data analysis.

Sample

The sample included 300 secondary school teachers from government and aided schools in Kerala, India. Of those who responded, there were 237 females and 63 males.

Procedure

One of the researchers approached the participants directly with a hard copy of the questionnaire. The participants submitted a signed consent on their voluntary participation. We analysed the data for the 102 items for EFA.

Results

The scale indicated adequate internal consistency (Cronbach's alpha = 0.95) of the retained 102 items. A minimum residual extraction, oblimin, factor analysis of the participants' responses to 102 items resulted in the extraction of factor 1, factor 2, factor 3, and factor 4. The items @38 and @71, which had cross-loadings in more than one factor and those items which showed a uniqueness value lesser than 0.4, were excluded from further analysis. The modified scale after the EFA retained 69 items (see Table 2). Experts in education, educational psychology, and teacher education validated the items and found them aligned suitably with the factors.

Factor 1, included the items @1, @2, @8, @10, @11, @12, @13, @14, @17, @18, @19, @20, @21, @23, @28, and @29 aligned suitably with the individual dimension of RTC. These items measure the individual factors (IF) defined by self-efficacy and self-regulation. The items loaded together to form factor 1 with the uniqueness value ranging from 0.40 to 0.58.

Factor 2, which included the items @27, @31, @32, @33, @34, @35, @36, @41, @42, @44, @45, @46, @48, @51, @52, @56, @57, @58, @59, @61, @62, @65, @66, @67, @68, and @69 were appropriate for obtaining the information of organisational factors (OF). These items measure the OF defined by school climate, school/principal support, participation, and communication. The items loaded together to form factor 2 with the uniqueness value ranging from 0.41 to 0.73.

Factor 3, included the items @16, @39, @43, @75, @76, @77, @80, @82, @85, @88, @109, @111, @114, @115 and @117 aligned with the bridging factor (BF) of RTC. The

Table 1 *Summary of Item Analysis*

Items	M(SD)	IRC	Items	M(SD)	IRC	Items	M(SD)	IRC	Items	M(SD)	IRC
@1*	3.3(0.8)	0.35	@31*	3.5(0.7)	00.45	@61*	3.0(1.0)	0.49	@91*	3.4(0.8)	0.57
@2*	3.5(0.7)	0.39	@32*	3.1(0.9)	00.30	@62*	2.9(1.0)	0.47	@92	2.6(1.0)	0.05
@3	3.1(0.9)	0.23	@33*	3.5(0.7)	00.43	@63*	3.4(0.7)	0.55	@93	1.7(1.1)	0.12
@4	3.1(0.8)	0.28	@34*	3.3(0.8)	00.55	@64*	3.3(0.7)	0.55	@94	2.5(1.2)	− 0.03
@5	2.3(1.3)	0.23	@35*	3.1(0.9)	0.44	@65*	3.2(0.9)	0.59	@95*	3.1(0.9)	0.55
@6*	2.7(1.2)	0.37	@36*	3.0(0.9)	0.52	@66*	3.2(0.8)	0.59	@96*	3.4(0.7)	0.56
@7	2.5(1.1)	0.26	@37	2.5(1.1)	0.28	@67*	3.0(0.9)	0.60	@97*	3.2(0.9)	0.60
@8*	3.5(0.7)	0.36	@38*	3.1(1.0)	0.44	@68*	3.3(0.8)	0.61	@98*	3.2(0.8)	0.53
@9	2.9(1.1)	0.26	@39*	2.8(1.1)	0.31	@69*	3.2(0.9)	0.59	@99*	3.3(0.7)	0.41
@10*	3.6(0.7)	0.39	@40	2.1(1.1)	0.27	@70*	2.9(1.0)	0.38	@100	2.4(1.2)	− 0.01
@11*	3.6(0.7)	0.47	@41*	2.9(1.0)	0.45	@71*	3.2(0.8)	0.62	@101*	3.0(0.9)	0.54
@12*	3.6(0.8)	0.44	@42*	3.3(0.9)	0.62	@72*	3.3(0.7)	0.58	@102*	3.2(0.8)	0.63
@13*	3.5(0.8)	0.47	@43*	2.9(1.2)	0.34	@73*	3.5(1.0)	0.53	@103*	2.8(0.9)	0.43
@14*	3.4(0.8)	0.38	@44*	2.9(1.0)	0.45	@74*	3.2(0.8)	0.60	@104*	3.0(0.9)	0.51
@15	2.5(1.1)	0.14	@45*	3.2(0.9)	0.54	@75*	3.5(1.0)	0.47	@105*	2.9(1.0)	0.49
@16*	3.1(1.2)	0.33	@46*	3.0(0.9)	0.57	@76*	3.4(0.9)	0.52	@106	1.6(0.9)	0.07
@17*	3.4(0.9)	0.46	@47*	3.3(0.8)	0.58	@77*	3.1(1.1)	0.51	@107	2.6(0.9)	0.10
@18*	3.4(0.7)	0.54	@48*	3.2(0.8)	0.59	@78*	3.1(1.1)	0.39	@108*	3.3(0.7)	0.48
@19*	3.7(0.6)	0.41	@49*	3.0(0.9)	0.54	@79*	3.3(0.8)	0.62	@109*	3.4(0.8)	0.46
@20*	3.4(0.7)	0.48	@50*	3.0(0.9)	0.58	@80*	3.1(1.1)	0.47	@110	2.4(1.2)	0.27
@21*	3.4(0.7)	0.43	@51*	3.3(0.8)	0.58	@81*	3.2(0.8)	0.55	@111*	3.1(1.1)	0.40
@22*	3.1(1.1)	0.29	@52*	3.0(0.9)	0.56	@82*	3.3(1.1)	0.44	@112	2.7(1.1)	0.29
@23*	3.2(0.9)	0.52	@53*	3.5(0.7)	0.53	@83*	2.8(0.8)	0.33	@113*	3.2(0.9)	0.56
@24	2.4(1.1)	0.25	@54*	3.5(0.7)	0.56	@84*	3.1(0.9)	0.52	@114*	3.5(0.8)	0.64
@25	2.8(1.3)	0.24	@55*	2.9(1.0)	0.36	@85*	3.0(1.2)	0.45	@115*	3.4(0.8)	0.64
@26*	3.2(1.0)	0.39	@56*	3.2(0.9)	0.56	@86*	3.1(0.8)	0.48	@116*	3.1(0.9)	0.52
@27*	9.2(0.8)	0.40	@57*	3.3(0.9)	0.49	@87*	3.4(0.8)	0.35	@117*	3.3(0.8)	0.57
@28*	3.4(0.80	0.54	@58*	3.4(0.8)	0.59	@88*	3.3(1.2)	0.43	@118*	3.0(1.2)	0.35
@29*	3.6(0.7)	0.45	@59*	3.5(0.7)	0.63	@89*	3.4(0.7)	0.45	@119*	3.3(0.8)	0.59
@30*	3.6(0.7)	0.54	@60*	3.2(0.9)	0.59	@90*	3.7(0.6)	0.54	@120*	3.5(0.7)	0.59

M mean, *SD* standard deviation, *IRC* item rest correlation

*Retained items

items were appropriate for obtaining the information about BF defined by incentives and fostering of voice through self-worth and engagement. The items loaded together to form factor 3 with the uniqueness value ranging from 0.40 to 0.77.

Factor 4, included the items @74, @86, @87, @95, @96, @97, @98, @99, @101, @102, @103, and @105 aligned with the educational dimension of RTC. The items measure the educational factors (EF) defined by the teacher's willingness to adapt, the nature of the system, and anticipated outcomes. The items loaded together to form factor 4 with the uniqueness value ranging from 0.41 to 0.77.

Study 3: Confirmatory Factor Analysis

The study aimed to confirm the factor structure derived from the EFA. We used structural equation modelling (SEM) in SPSS AMOS 27 to carry out the confirmatory factor analysis (CFA).

Sample

The sample included 410 secondary school teachers from government and aided schools in Kerala, India. Of those who responded, there were 350 females and 60 males.

Procedure

As in the previous studies, one of the researchers approached the participants directly with a hard copy of the questionnaire. The participants submitted a signed consent on their voluntary participation. We analysed the data for the 69 items for CFA.

Table 2 *Summary of Exploratory Factor Analysis*

Items retained	Fac 1	Uni	Items retained	Fac 2	Uni	Items retained	Fac 3	Uni	Items retained	Fac 4	Uni
@1	0.45	0.76	@27	0.45	0.65	@16	0.51	0.74	@74	0.45	0.53
@2	0.57	0.66	@31	0.70	0.56	@39	0.45	0.74	@86	0.58	0.60
@8	0.56	0.67	@32	0.49	0.76	@43	0.56	0.70	@87	0.43	0.71
@10	0.49	0.70	@33	0.69	0.57	@75	0.72	0.46	@95	0.53	0.58
@11	0.58	0.60	@34	0.67	0.51	@76	0.68	0.47	@96	0.50	0.52
@12	0.58	0.62	@35	0.63	0.57	@77	0.53	0.60	@97	0.72	0.40
@13	0.46	0.68	@36	0.57	0.55	@80	0.54	0.65	@98	0.77	0.43
@14	0.51	0.69	@41	0.66	0.60	@82	0.77	0.43	@99	0.48	0.71
@17	0.50	0.66	@42	0.51	0.46	@85	0.55	0.63	@101	0.52	0.61
@18	0.55	0.55	@44	0.72	0.53	@88	0.64	0.54	@102	0.51	0.50
@19	0.53	0.64	@45	0.43	0.63	@109	0.42	0.63	@103	0.41	0.76
@20	0.51	0.51	@46	0.5	0.59	@111	0.42	0.75	@105	0.53	0.62
@21	0.52	0.52	@48	0.55	0.53	@114	0.43	0.48			
@23	0.43	0.43	@51	0.48	0.59	@115	0.40	0.50			
@28	0.51	0.51	@52	0.43	0.60	@117	0.40	0.60			
@29	0.40	0.40	@56	0.59	0.53						
			@57	0.58	0.61						
			@58	0.41	0.62						
			@59	0.45	0.52						
			@61	0.67	052						
			@62	0.52	0.65						
			@65	0.68	0.41						
			@66	0.55	0.53						
			@67	0.68	0.46						
			@68	0.64	0.47						
			@69	0.73	0.43						

Fac 1 factor 1, *Fac 2* factor 2, *Fac 3* factor 3, *Fac 4* factor 4, *Uni* Uniqueness

Results

The scale indicated adequate internal consistency (Cronbach's alpha = 0.96) of the retained 69 items in the current sample. The factor-wise internal consistency showed that IF had an α of 0.90, OF had an α of 0.92, BF α of 0.90, and EF had an α of 0.92.

The estimation of CFA through SEM established a model of the four-correlated factor structure of teachers' RTC (see Fig. 1). In IF, seven items had a solid loading (β) ranging from 0.43 to 0.66. The factor loadings of 11 items in OF ranged from 0.40 to 0.76. In BF, five items had a solid loading ranging from 0.47 to 0.89. Factor loading of five items in EF ranged from 0.67 to 0.82 (see Table 3). Absolute fit indices including Root Mean Square Error of Approximation (RMSEA = 0.053, LO90 = 0.047, HI90 = 0.058) and Goodness of Fit Index (GFI = 0.90) indicated that the model is acceptable. Incremental fit indices, including Adjusted Goodness of Fit Index (AGFI = 0.87), Comparative Fit Index (CFI = 0.91), Tucker-Lewis Index (TLI = 0.90), and Normed Fit Index (NFI = 0.84), indicated that the model is a good fit. Parsimonious fit index ($\chi 2/df = 2.31$) and absolute fit index, Standardised Root Mean Square Residual (SRMR = 0.042), also showed a good fit.

The correlation coefficients (r) indicated a moderate relationship for IF and OF (r = 0.50); a moderate relationship for IF and BF (r = 0.49); a moderate relationship for IF and EF (r = 0.53); a moderate relationship for OF and BF (r = 0.35); a moderate relationship for OF and EF (r = 0.58); and a moderate relationship for BF and EF (r = 0.30). The composite reliability of IF (0.79), OF (0.89), BF (0.83) and EF (0.82) was adequate. The factors had a good discriminant validity but failed to establish convergent validity for individual and organisational factors.

Subsequently, we tested the possibilities of teachers' RTC as an additive model indexing RTC as the sum of four first-order factors (see Fig. 2). The factor loadings and the fitness of the additive model indicated a good fit (RMSEA = 0.053, LO90 = 0.048, HI90 = 0.059; GFI = 0.90; AGFI = 0.87; CFI = 0.91; TLI = 0.90; NFI = 0.84; $\chi 2/df = 2.17$; SRMR = 0.042 (see Table 4).

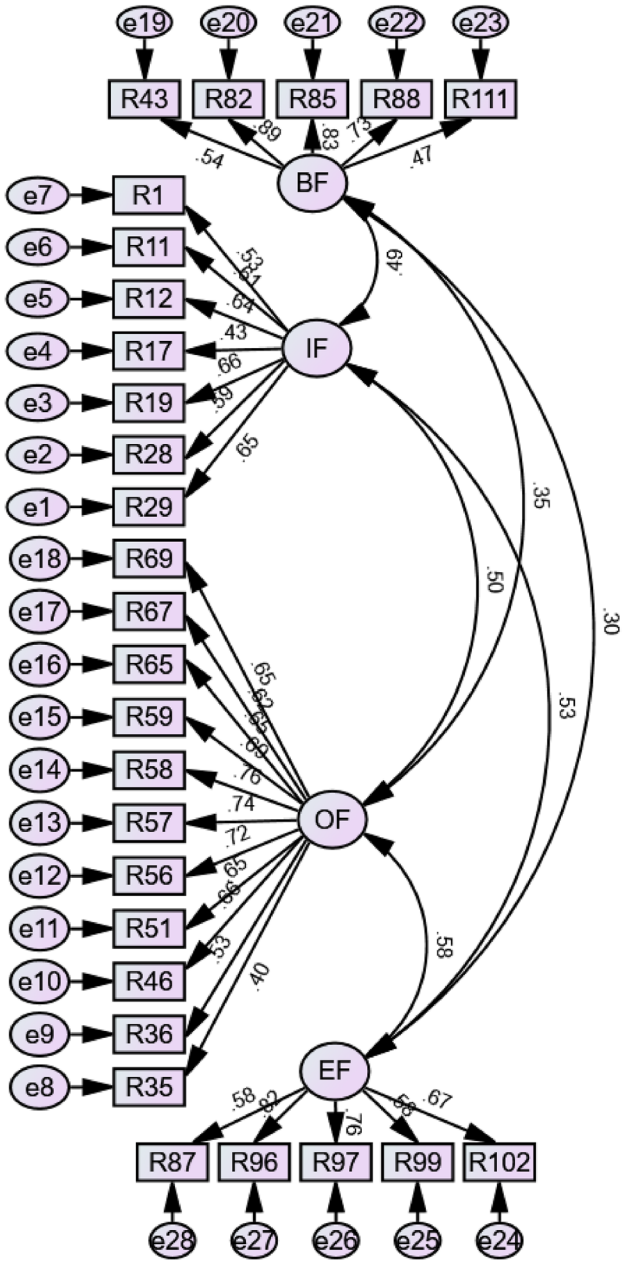

Figure output with standardized co-efficient by IBM AMOS. IF = Individual Factors; OF = Organisational Factors; BF= Bridging Factors; and EF = Educational Factors; e = residuals

Fig. 1 *Confirmatory Factor Analysis Showing the Three-Correlated Factor Model of Teachers' Receptivity to Change*

Study 4: Validation of the Scale

The objective of study 4 was to establish the validity and reliability of the four-factor teachers' receptivity to change scale.

Sample

The sample included 433 secondary school teachers from government and aided schools in Kerala, India. Of those who responded, there were 361 females and 72 males.

Procedure

As in the previous studies, one of the researchers approached the participants directly with a hard copy of the questionnaire. The participants submitted a signed consent on their voluntary participation. We analysed the data for the 28 items. Along with the newly developed scale, we collected the data for work motivation and teacher engagement using the Multidimensional Work Motivation Scale (Gagné et al., 2014) and Engaged Teachers' Scale (Klassen et al., 2013). We used SPSS 27 for data analysis.

Table 3 *Standardized and Unstandardized Loadings of the CFA Model Showing Teachers' Receptivity to Change as a Four-Correlated Factor Construct*

Items	Codes		Factors	B	SE	β
@1	R1	<--	IF	1		0.648
@11	R11	<--	IF	1.034***	0.106	0.585
@12	R12	<--	IF	0.992***	0.093	0.655
@17	R17	<--	IF	0.689***	0.093	0.426
@19	R19	<--	IF	0.943***	0.09	0.642
@28	R28	<--	IF	0.904***	0.089	0.614
@29	R29	<--	IF	0.872***	0.096	0.532
@35	R35	<--	OF	1		0.4
@36	R36	<--	OF	0.896***	0.131	0.527
@46	R46	<--	OF	0.943***	0.126	0.656
@51	R51	<--	OF	1.008***	0.135	0.655
@56	R56	<--	OF	1.159***	0.151	0.716
@57	R57	<--	OF	1.151***	0.148	0.74
@58	R58	<--	OF	1.116***	0.143	0.764
@59	R59	<--	OF	0.923***	0.122	0.689
@65	R65	<--	OF	1.127***	0.151	0.651
@67	R67	<--	OF	1.034***	0.142	0.616
@69	R69	<--	OF	1.197***	0.161	0.654
@43	R43	<--	BF	1		0.54
@82	R82	<--	BF	1.277***	0.113	0.89
@85	R85	<--	BF	1.174***	0.106	0.826
@88	R88	<--	BF	0.993***	0.096	0.73
@111	R111	<--	BF	0.818***	0.106	0.466
@102	R102	<--	EF	1		0.665
@99	R99	<--	EF	0.794***	0.078	0.582
@97	R97	<--	EF	1.152***	0.091	0.756
@96	R96	<--	EF	1.133***	0.084	0.824
@87	R87	<--	EF	0.732***	0.071	0.583

Model fit indices: RMSEA = 0.053 (LO90 = .047, HI90 = .058); GFI = 0.90; AGFI = 0.87; CFI = 0.91; TLI = 0.90; NFI = 0.84; $\chi 2$ /df = 2.31; SRMR = .042

IF Individual Factors, *OF* Organisational Factors, *BF* Bridging Factors, and *EF* Educational Factors, *B* unstandardized beta, *SE* standard error, *β* standardized beta, *RMSEA* root mean square error of approximation, *LO* lower limit, *HI* upper limit, *(A)GFI* (adjusted) goodness of fit index, *CFI* comparative fit index, *TLI* Tucker Lewis index, *NFI* normed fit index, *χ2* model chi square, *df* degrees of freedom, *SRMR* standardized root mean square residual

***$p < 0.001$

The teachers' receptivity to change scale for the present sample showed adequate overall internal consistency (Cronbach's α = 0.897). The Cronbach's alpha for the factors- IF = 0.77; OF = 0.89; BF = 0.79 and EF = 0.80. The final items in the TRCS are given in Table 5.

The 19-item multidimensional work motivation scale (MWMS) measures the different motivational types to understand the motives to do the work (Gagné et al., 2014). The scale measures intrinsic motivation, extrinsic motivation (identified regulation, introjected regulation, and external regulation), and amotivation. Internal consistency assessments for the motivational types of the MWMS as stated by the developers were: intrinsic motivation (INTC) = 0.90; identified regulation (IDF) = 0.75; introjected regulation (INTJ) = 0.70; external regulation (ETL) = 0.76; and amotivation (AMN) = 0.79. The seven-point scale range from 1, which indicates 'not at all' to 7 'completely'. The present sample indicated internal consistency of 0.71 for INTC; 0.88 for IDF; 0.77 for INTJ; 0.88 for ETL; and 0.83 for AMN.

The 16-item engaged teachers' scale (ETS) measures the teacher engagement not just cognitively, emotionally, but socially with colleagues and students (Klassen et al., 2013). The internal consistency of the developed scale was 0.91. The present sample showed an adequate internal consistency of 0.89.

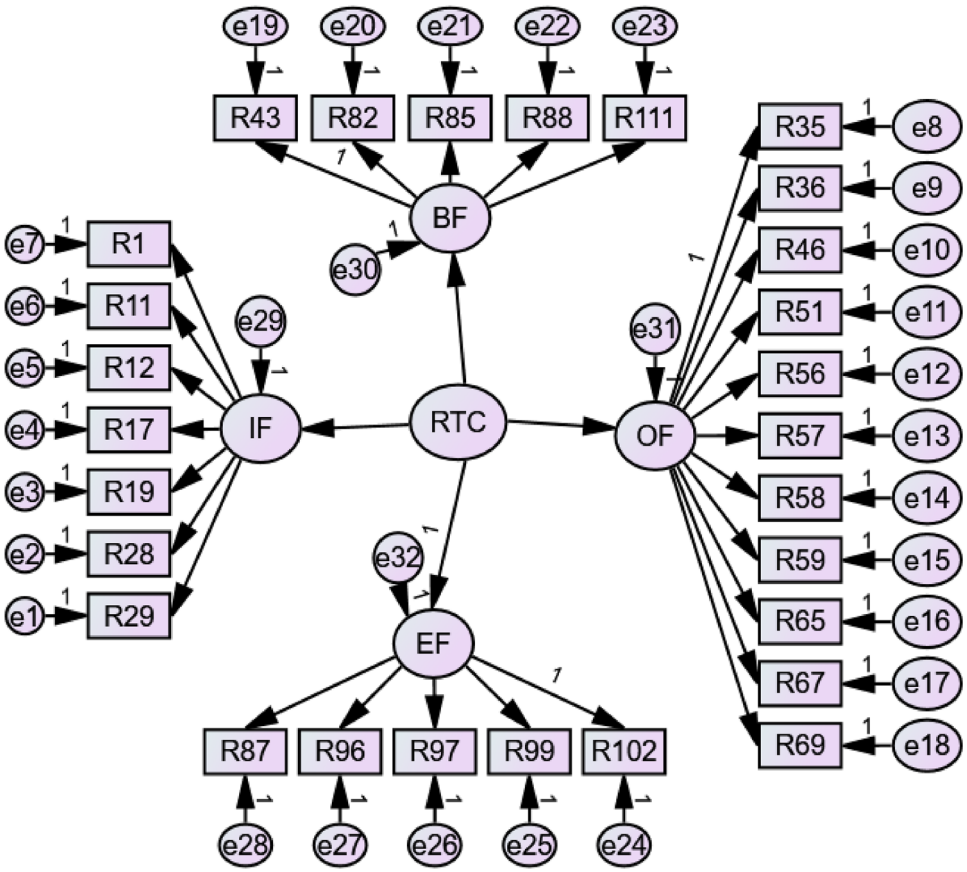

Figure output with standardized co-efficient by IBM-AMOS. IF = Individual Factors; OF = Organisational Factors; BF = Bridging Factors; and EF = Educational Factors; e = residuals

Fig. 2 *Confirmatory Factor Analysis Showing Teachers' Receptivity to Change as an Additive Model*

Results

The teachers' RTC scale showed a significant weak positive correlation with intrinsic motivation ($r = 0.22^{**}$, $p < 0.01$) and identified regulation ($r = 0.27^{**}$, $p < 0.01$); a weak negative correlation with external regulation ($r = -0.16^{**}$, $p < 0.01$); and a significant moderate negative correlation with amotivation ($r = -0.39^{**}$, $p < 0.01$). The individual factor showed a significant weak positive correlation with intrinsic motivation ($r = 0.14^{**}$, $p < 0.01$) and identified regulation ($r = 0.20^{**}$, $p < 0.01$); a weak negative correlation with external regulation ($r = -0.11^{**}$, $p < 0.01$); and a significant moderate negative correlation with amotivation ($r = -0.31^{**}$, $p < 0.01$). The organisational dimension showed a significant weak positive correlation with intrinsic motivation ($r = 0.13^{**}$, $p < 0.01$) as well as identified regulation ($r = 0.16^{**}$, $p < 0.01$); and a weak negative correlation with amotivation ($r = -0.25^{**}$, $p < 0.01$). The correlation analyses showed that the bridging factor had a significant weak positive correlation with intrinsic motivation ($r = 0.20^{**}$, $p < 0.01$) and identified regulation ($r = 0.26^{**}$, $p < 0.01$); a weak negative correlation with external regulation ($r = -0.23^{**}$, $p < 0.01$); and a significant moderate negative correlation with amotivation ($r = -0.43^{**}$, $p < 0.01$). The educational dimension of RTC showed a significant weak positive correlation with intrinsic motivation ($r = 0.27^{**}$, $p < 0.01$) and identified regulation ($r = 0.25^{**}$, $p < 0.01$); a weak negative correlation with external regulation ($r = -0.10^{**}$, $p < 0.01$) and amotivation ($r = -0.27^{**}$, $p < 0.01$). Out of all these dimensions, only the educational factor showed a significant positive correlation with introjected regulation ($r = 0.10^{*}$, $p < 0.05$). The correlation analyses of ETS with the TRCS showed a significant moderate positive relationship between teacher engagement and receptivity to change ($r = 0.49^{**}$, $p < 0.01$). The individual ($r = 0.41^{**}$, $p < 0.01$), organisational ($r = 0.40^{**}$, $p < 0.01$), bridging ($r = 0.31^{**}$, $p < 0.01$), and educational ($r = 0.37^{**}$, $p < 0.01$) dimensions of TRCS showed a significant moderate positive correlation with the Engaged Teachers' Scale.

Table 4 *Standardized and unstandardized loadings of the confirmatory factor analysis showing an additive model indexing teachers' receptivity to change as the sum of four first-order factors*

Codes	X		y	B	SE	β
	IF	<--	RTC	0.81***	0.11	0.75
	OF	<--	RTC	0.82***	0.13	0.51
	BF	<--	RTC	0.93***	0.16	0.73
	EF	<--	RTC	1		0.74
R1	@1	<--	IF	0.89***	0.10	0.54
R11	@11	<--	IF	0.91***	0.10	0.62
R12	@12	<--	IF	0.95***	0.09	0.64
R17	@17	<--	IF	0.69***	0.09	0.43
R19	@19	<--	IF	0.99***	0.09	0.65
R28	@28	<--	IF	1.04***	0.09	0.59
R29	@29	<--	IF	1	0.11	0.65
R35	@35	<--	OF	1		0.40
R36	@36	<--	OF	0.90***	0.13	0.53
R46	@46	<--	OF	0.94***	0.13	0.66
R51	@51	<--	OF	1.01***	0.16	0.66
R56	@56	<--	OF	1.15***	0.15	0.72
R57	@57	<--	OF	1.15***	0.15	0.74
R58	@58	<--	OF	1.11***	0.14	0.76
R59	@59	<--	OF	0.92***	0.12	0.69
R65	@65	<--	OF	1.12***	0.15	0.65
R67	@67	<--	OF	1.03***	0.14	0.62
R69	@69	<--	OF	1.19***	0.16	0.66
R43	@43	<--	BF	1		0.54
R82	@82	<--	BF	1.27***	0.11	0.89
R85	@85	<--	BF	1.17***	0.11	0.83
R88	@88	<--	BF	0.99***	0.10	0.73
R111	@111	<--	BF	0.82***	0.11	0.47
R102	@102	<--	EF	1		0.67
R99	@99	<--	EF	0.80***	0.08	0.59
R97	@97	<--	EF	1.15***	0.09	0.75
R96	@96	<--	EF	1.12***	0.08	0.82
R87	@87	<--	EF	0.74***	0.07	0.59

Note. Model fit indices: RMSEA = 0.053, LO90 = .048, HI90 = .059; GFI = 0.90; AGFI = .87; CFI = 0.91; TLI = 0.90; NFI = 0.84; $\chi 2$ /df = 2.17; SRMR = .042

IF Individual Factors, *OF* Organisational Factors, *BF* Bridging Factors, *EF* Educational Factors, *B* unstandardized beta, *SE* standard error, *β* standardized beta, *RMSEA* root mean square error of approximation, *LO* lower limit, *HI* upper limit, *(A)GFI* (adjusted) goodness of fit index, *CFI* comparative fit index, *TLI* Tucker Lewis index, *NFI* normed fit index, *χ2* model chi square, *df* degrees of freedom, *SRMR* standardized root mean square residual

*** $p < 0.001$

Study 5: Test–Retest Reliability of TRCS

The objective of study 5 was to confirm the internal consistency of the four-factor teachers' receptivity to change scale by conducting a re-test on the same sample from the previous study.

Sample

The sample included 103 secondary school teachers of Kerala, India, from government and aided schools who responded to the questionnaire in study 3.

Table 5 *The 28-Item Teachers' Receptivity to Change Scale*

Sl no	Codes	Items
1	@1	I am able to adapt to new ways of doing things
2	@11	I believe I can effectively manage the classroom with diverse students
3	@12	I believe in my professional competencies
4	@17	I am open minded to varying opinions
5	@19	I am a person with a positive attitude
6	@28	I set goals with a sense of purpose
7	@29	I very well know my strength and weaknesses
8	@35	I feel that my opinions are valued in my school
9	@36	I get opportunities to develop my leadership qualities
10	@46	There is support for continuous professional development
11	@51	The school is ready to take up improvement initiatives when needed
12	@56	The principal provides encouragement for professional growth
13	@57	Teachers and administrators work together in a collaborative manner
14	@58	Teachers can actively explore new concepts
15	@59	Teachers can take up active responsibility for various school programmes
16	@65	I get opportunities for meaningful discussions in school related meetings
17	@67	I get appreciations for the contributions I make
18	@69	I feel that the school recognises each individual's uniqueness
19	@43	I feel that I do not get the deserving reward for my work
20	@82	I cannot maintain my interest in working with students
21	@85	I fail to take action to reach my goal
22	@88	I am not willing to learn from my failure
23	@111	I feel I am unprepared for changes
24	@102	I am hardworking, efficient, and dependable
25	@99	The education system has a positive effect on knowledge construction
26	@97	The nature of the present education system is conducive to individual development
27	@96	I am very well equipped and willing to use new technologies in the teaching–learning process
28	@87	The present system of education helps to develop learners as socially responsible informed citizens

Procedure

As in the previous studies, one of the researchers approached the participants directly with a hard copy of the questionnaire. The participants submitted a signed consent on their voluntary participation. We analysed the data for the 28 items using SPSS 27.

Results

The present sample had an adequate internal consistency (Cronbach's alpha = 0.884). Factor-wise internal consistency indicated that the individual factor had an α of 0.83, the organisational factor had an α of 0.85, the bridging factor had an α of 0.73, and the educational factor had an α of 0.76.

Discussion

The evidence from the five studies indicated that the Teachers' Receptivity to Change Scale is a valid and reliable measure for the sample of secondary school teachers. In each of the stages of the research, purposive sampling was used for the selection of sample. The sample size consideration for study 1, 2, and 3 took into account the well-known heuristic of Comfrey and Lee's recommendation that 300 ought to be a good sample size for factor analysis (Finch, 2020). The minimum sample size for study 4 was estimated to be 384 from the Krejcie and Morgan (1970) table, taking into consideration, the total population of secondary school teachers in Kerala, India. For study 5, the minimum sample size required was calculated using the formula by Bonnet (2002)

and was estimated to be around 40. Cronbach's alpha, the reliability estimate of the higher-order construct of teachers' RTC and the four lower-order factors established adequate consistency across the studies. The factor-wise composite reliability was adequate. The test–retest reliability coefficients showed excellent temporal stability for the scale. The repeated critical analysis of each of the scale items by educational experts established the content validity during studies 1, 2, and 3.

The final Teachers' Receptivity to Change Scale with 28 items indexing teachers' RTC as a four-correlated factor structure and as the sum of the four factors showed adequate discriminant validity. The construct of teachers' RTC showed a positive correlation with the more self-determined types of motivation (intrinsic and identified) and a negative correlation with the controlled motivational types (external and amotivation). The total score of the teachers' RTC showed a moderate positive correlation with the total scores of the ETS. The moderate correlation of the four factors of TRCS (IF, OF, BF, and EF) with ETS scores differentiated these factors from teacher engagement. The uniqueness of the four factors in the teachers' RTC is reinforced when they showed a moderate positive correlation.

The findings of the present study confirm a factor structure as found in previous studies (Mellencamp, 1992; Wolf & Le Vasan, 2008). Results substantiate the observations of prior studies (Mellencamp, 1992; Wolf & Le Vasan, 2008) in confirming the influence of individual and organisational factors while validating the RTC scale. The present model also confirmed the presence of bridging and educational factors as visualised by Wolf and Le Vasan (2008). Wong et al. (2021) have mentioned that the teachers supported an implementation when given adequate support. Individual differences influence the inclination to accept or reject a change (Armenakis et al., 1993). Findings justify the importance of school climate and principal/ school support, which are associated with organisational factors (Berger, 2009; Chauvin, 1992; Daar, 2010; Maika, 2007). Voice, an associated bridging factor, helps the teachers initiate and make decisions (Mellencamp, 1992; Wolf & Le Vasan, 2008). Studies evaluating teachers' RTC to a particular system, curriculum, or strategy change found incentives, support, anticipated outcomes, nature of the change etc. as inducing factors for a positive change (Lee, 2000; Waugh & Godfrey, 1995; Waugh & Ketusiri, 2009; Waugh & Punch, 1987; Yin, et al., 2011).

The fit indices of the four-correlated factor and additive models estimated from the confirmatory factor analysis using structural equation modelling in study 3 indicated a good model fit. The model fit indices confirmed the validity of the four-correlated factor model. The co-variances might have influenced the convergent validity of individual and organisational factors. The correlation between the factors indicated that they are reliable. Thus, the second model (Fig. 2) becomes more critical, in which the construct of teachers' receptivity to change is considered the sum of four first-order factors.

Study 5 aimed at establishing the temporal stability of the scale. The test–retest reliability analyses indicated that the teachers' receptivity to change scale has adequate internal consistency. The overall and the factor-wise reliability coefficients indicated the TRCS to be a reliable measure.

Conclusion

The present study reports the development and validation of the teachers' receptivity to change scale (TRCS) through five studies. The development of the tool started with the generation of a pool of 120 items based on four factors-individual, organisational, bridging, and educational which were subjected to content validation followed by item analysis. Subsequently, 18 items were discarded from the scale after the item analysis and validation, making it to a pool of 102 items. Study 2, with the aim of exploratory factor analysis (minimum residual extraction, oblimin), extracted four factors (16 items in IF, 26 items in OF, 15 items in BF, and 12 items in EF). After removing items with cross-loading, the modified scale had a pool of 69 items. The reliability analysis of the scale indicated adequate internal consistency. Confirmatory factor analysis in study 3 confirmed the four-factor model. The structural equation modelling established the four-correlated factor construct of teachers' receptivity to change and an additive model indexing teachers' receptivity to change as the sum of the four factors. Both the model fit indices indicated an excellent fit. After the CFA and expert validation, the final scale had a pool of 28 items (7 items in IF, 11 items in OF, 5 items in BF, and 5 items in EF). The factors showed adequate composite reliability and discriminant validity but failed to achieve convergent validity due to covariance. The reliability coefficients indicated by Cronbach's alpha showed that the scale and the factors had adequate consistency. Study 4 established the validity of the TRCS by correlating the teachers' RTC and its factors with a 19-item multidimensional work motivation scale (Gagné et al., 2014) and a 16-item engaged teachers' scale (Klassen et al., 2013). Study 5 confirmed the temporal stability of the scale through test re-test reliability analysis.

Implications and Limitations

The teachers' receptivity to change scale will benefit educational policymakers, organisational authorities, trainers, educators, and researchers to determine those individuals who are receptive to changes by focusing on the different

factors. The scale can be applied in the context of educational change relating to teachers, such as teaching, learning, curriculum, assessment, and professional training. Further consideration and validation of the scale in cross-cultural samples and the inclusion of teachers from different educational levels (elementary, higher secondary, and higher education) helps analyse teachers' receptivity to change in finer psychometric depth. The total score and the factor-wise scores help evaluate exact interpretation, with higher scores indicating higher receptivity levels. The scale has its application in measuring teachers' RTC in educational management, assessment, organisation, pre-service and in-service teacher education. The scale may also be a helpful outcome assessment measure for implementing new policies, interventions, or strategies, with academic and practical implications.

The current study limits its sample to secondary school teachers of Kerala, India. The establishment of cross-cultural validity of the new tool is anticipated for better replicability. Future research can also validate this study by comparing its stability across different educational levels. The study provides further psychometric enhancement of the receptivity to change model, thereby developing a tool for the quantitative measurement of the construct of teachers' RTC based on four factors. The results of the current study indicated that the scale is reliable and valid for assessing teachers' receptivity to change among secondary school teachers. The four-factor theorisation is reliable since it attains stability in a large sample. It indicates how the receptivity to change construct may orient secondary school teachers.

Data Availability Statement

The datasets generated and analysed during the current study are not publicly available since they constitute an excerpt of research in progress but are available from the corresponding author on reasonable request.

Author Contributions Conceptualisation: [Trixy Elizabeth John, Benny Thomas, and N. T. Sudhesh]; Literature Search and data collection: [Trixy Elizabeth John]; Data Analysis: [Trixy Elizabeth John and Santhosh Kareepadath Rajan]; Writing- Original draft preparation: [Trixy Elizabeth John]; Review and Editing: [Trixy Elizabeth John, Benny Thomas, N.T. Sudhesh, and Santhosh Kareepadath Rajan].

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Declarations

Conflict of Interest The authors have no competing interests to declare relevant to this article's content. All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethics Approval The Institutional Review Board, CHRIST (Deemed to be University), Bangalore, Karnataka – 560 029 approved the study.

Consent to Participate All the participants gave informed consent to participate before the data collection in each stage of the study. In the current data, no identifying characteristics of the participants are involved.

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