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The confirmatory factor analysis of teacher's research motivation scale

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Abstract

The purpose of the research is to develop the measurement of motivation scale of in class action research conducted by school teachers. The sampling includes 403 teachers, subordinated to the Office of The Basic Education Commission. Data collection was conducted through questionnaires of 20 questions, which were designed into five levels following to the motivation scale in research measurement. This questionnaire consists of three latent variables with nine questions of intrinsic motivation, six questions of failure avoidance and five questions of extrinsic motivation. The purpose of confirmatory factor analysis is to test the construct validity of research latent variables that found the harmony correlation of empirical data contained in this research model. Moreover, the correlation matrix of 20 observed variables shows the correlation among latent variables of intrinsic motivation and extrinsic motivation with the significant level of statistic correlation at 0.05. The highest value of correlation scored 0.696 is founded on observed variables of the intrinsic motivation latent variable.

Keywords: Confirmatory factor analysis, teacher, research motivation

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1. Introduction

The Research Motivation Scale (RMS; Deemer, Martens & Buboltz, 2010) was developed which is grounded in the self-determination and classic avoidance motivation theories, consists of three subscales that correspond to the avoidance, intrinsic and extrinsic motivation constructs: (a) failure avoidance; (b) extrinsic reward and (c) intrinsic reward. Intrinsic motivation and introjection have been empirically linked to the need for cognition, persistence and perceived competence (Barkoukis, Tsorbatzoudis, Grouios & Sideridis, 2008). The quality-dependent rewards increase intrinsic motivation because they result in increased perceptions of competence (Bandura, 1997). Intrinsic motivation is thought to be fostered to the extent that autonomous behaviour is supported and competence developed. Competence, however, need not be the goal of the intrinsically motivated individual rather competence may be a by-product of intrinsic motivation, which serves to reinforce the intrinsically motivated behaviour (Deci & Moller, 2005).

The finding that intrinsic reward correlated most strongly with academic intrinsic motivation to know as opposed to intrinsic motives to accomplish and experience satisfaction represents, in our view, strong support for the construct validity of intrinsic reward because graduate students in the sciences should be internally driven to conduct research by the need to satisfy their curiosities regarding the mechanisms underlying natural phenomena. It is likely the pursuit and acquisition of this understanding that is so enjoyable to graduate students. The significant negative correlation observed between intrinsic reward and external regulation illustrates the dimensionality of regulation proposed by Ryan and Deci (2000), with external regulation lying near one end of the motivation continuum and intrinsic motivation lying on the other. Conversely, the finding that intrinsic reward was unrelated to introjection and identification is consistent with the theoretical predictions of SDT and corroborates previous research in this area (Guay, Vallerand & Blanchard, 2000). Because recent research suggests that drive and reward are better indicators of BAS sensitivity than fun seeking (Smillie & Jackson, 2006)

It is likely that motivation aimed at satisfying needs for prestige and collegial recognition is an approach-based form of regulation, but carries with it the possibility of rejection and, hence, perceived failure. This would suggest that socially-based motives to conduct research are simultaneously energising and fear-arousing rather than distinctly approach or avoidance tendencies. This complex pattern of motivational regulation is consistent with the proposition of Covington and Mueller (2001) that it may not be external rewards themselves that undermine motivation, but rather the relative shortage of rewards available to individuals that triggers the belief that external reward may not be attainable; thus, orienting them to failure-avoidant foci. From a research behaviour perspective, these external inducements may run the gamut from tangible rewards, such as a limited number of faculty openings in academic settings, to limited opportunities for verbal reinforcement from mentors. The approach pattern of extrinsic reward motivation thus seems to be similar to Type A behaviour in that both are fundamentally energising motives, but share in common characteristics of competitiveness and fears of being negatively evaluated by others.

Research has linked avoidance motivation to low self-discipline and perceptions of competence (Bipp, Steinmayr & Spinath, 2008). Avoidance motivation has also been found to negatively predict interest in research over and above the contextual effects of the research training environment (Deemer, Martens & Podchaski, 2007) To our knowledge, however, the latter is the only one in which the predictive utility of avoidance motivation for the research is explicitly examined

2. Objectives

To analyse component factors of teacher's research motivation model.

3. Research problem

What are the component factors of teacher's research motivation model?

4. Methodology

The sampling includes 403 teachers, subordinated to the Office of The Basic Education Commission. Data collection was conducted through questionnaires of 20 questions. The questions were designed into five levels following to the motivation scale in research measurement of Deemer, Mahoney & Ball (2011). This 20 questions questionnaire consists of three latent variables that are nine questions of intrinsic motivation, six questions of failure avoidance and five questions of extrinsic motivation.

The RMS is a 20-item self-report instrument designed to tap sources of motivation underlying scholarly involvement in research. The RMS consists of three subscales: (a) intrinsic reward (e.g., 'I enjoy doing research for its own sake'); (b) failure avoidance (e.g., 'I sometimes want to avoid difficult research projects because I am concerned that I may fail') and (c) extrinsic reward (e.g., 'I conduct research to earn the respect of my colleagues'). The confirmatory factor analysis (CFA) of the RMS supports its three-factor structure as well as the discriminated validity of the extrinsic reward and failure avoidance item scores by virtue of the orthogonal relation between their latent constructs. Convergent validity also has been demonstrated through significant correlations with appetitive and aversive forms of motivation. Specifically, the intrinsic reward was found to correlate positively with academic intrinsic motivation and drive motivation, extrinsic reward exhibited significant positive correlations with academic extrinsic motivation and reward sensitivity, and failure avoidance correlated positively with a motivation and fear of failure. The internal consistencies of the RMS subscales have also been substantiated with intrinsic reward exhibiting the highest, followed by failure avoidance and extrinsic reward. Alpha coefficients in the present study were, respectively, 0.90, 0.74 and 0.70 for intrinsic reward, failure avoidance and extrinsic reward.

The analysis is performed through survey components analysed on rotational axes using SPSS for Windows and confirmative analyses using LISREL 8.8 (Student).

5. Results

The correlation matrix analysis of observed variable on the failure avoidance latent variable show statistic correlation of 0.05, the correlation value ranged between 0.100–0.604 but except for two pairs of correlation value at 0.054 and 0.055. The highest value of correlation scored 0.696 is founded on observed variables of the intrinsic motivation latent variable as shown in Table 2.

Table 1. The correlation coefficients of characteristic variables on teacher's RMS

Var	m1	m4	m7	m9	m11	m13	m15	m17	m19	m2	m5	m8	m14	m16	m18	m3	m6	m10	m12	m20
m1	1.000																			
m4	0.389	1.000																		
m7	0.492	0.385	1.000																	
m9	0.438	0.263	0.526	1.000																
m11	0.363	0.211	0.357	0.402	1.000															
m13	0.412	0.363	0.553	0.566	0.458	1.000														
m15	0.360	0.438	0.507	0.461	0.348	0.535	1.000													
m17	0.406	0.397	0.509	0.500	0.467	0.537	0.604	1.000												
m19	0.315	0.196	0.419	0.339	0.319	0.373	0.400	0.470	1.000											
m2	-0.336	-0.171	-0.295	-0.219	-0.374	-0.266	-0.206	-0.247	-0.161	1.000										
m5	0.003	-0.159	-0.006	0.077	0.016	0.140	-0.082	0.072	0.034	0.055	1.000									
m8	-0.027	0.009	0.015	0.008	-0.011	0.020	0.016	0.001	0.093	0.190	0.322	1.000								
m14	0.000	-0.018	-0.010	0.070	-0.028	0.040	-0.035	0.008	-0.062	0.100	0.454	0.355	1.000							
m16	-0.126	-0.195	-0.168	-0.088	-0.170	-0.177	-0.273	-0.205	-0.198	0.119	0.402	0.264	0.467	1.000						
m18	-0.019	-0.084	-0.019	-0.013	-0.077	-0.037	-0.039	-0.011	-0.104	0.054	0.392	0.355	0.455	0.493	1.000					
m3	0.264	0.268	0.201	0.155	0.128	0.099	0.092	0.101	0.102	-0.186	-0.345	-0.252	-0.247	-0.294	-0.217	1.000				
m6	0.185	0.216	0.298	0.165	0.206	0.179	0.169	0.144	0.111	-0.168	-0.351	-0.212	-0.233	-0.366	-0.177	0.696	1.000			
m10	0.397	0.223	0.403	0.464	0.550	0.469	0.292	0.446	0.345	-0.346	0.054	-0.064	-0.013	-0.094	-0.034	0.196	0.256	1.000		
m12	0.317	0.192	0.337	0.289	0.374	0.373	0.203	0.225	0.154	-0.287	-0.100	-0.177	-0.151	-0.191	-0.122	0.441	0.445	0.413	1.000	
m20	0.23	0.23	0.388	0.321	0.307	0.362	0.365	0.355	0.331	-0.149	-0.165	-0.131	-0.172	-0.356	-0.194	0.496	0.573	0.332	0.495	1.000
M	3.390	3.040	3.270	3.580	3.610	3.720	3.220	3.560	3.310	2.350	3.560	2.930	3.170	3.130	3.150	2.830	2.850	3.840	3.330	3.170
SD	0.881	0.944	0.911	0.852	0.868	0.870	0.840	0.863	0.920	0.955	1.005	1.014	0.901	0.924	0.976	1.117	1.135	0.867	1.038	1.020

The result of CFA is to test the construct validity of research latent variables that found the harmony correlation of empirical data contained in this research model, the value of Chi-Square (χ^2) = 89.224 at the degree of freedom = 71, *P*-value = .0071, GFI = 0.978, AGFI = 0.936, RMSEA = 0.062, RMR = 0.018, Model AIC = 367.224, Saturated AIC = 420.000, Model CAIC = 1062.076 and Saturated CAIC = 1469.777. The weight factors of latent variable are 0.692, −0.066 and 0.894 retrospectively. The value of reliability according to Cronbach's alpha coefficient of correlation is 0.479, 0.004 and 0.800 retrospectively as shown in Table 2 and Figure 1.

The focal point in designing a training scheme that would improve research motivation in teachers to conduct classroom action research must accentuate the freedom for teachers to fully express their capabilities. Intrinsic motivation has significantly been linked and is driven by the enjoyment to pursue intrinsic rewards, with the value varying according to each individual preference (Barkoukis, Tsorbatzoudis, Grouios & Sideridis, 2008; Ryan & Deci, 2000; Guay, Vallerand & Blanchard, 2000)

Table 2. The estimate parameter and statistic of teacher's RMS

Variables	SS	SE	t	SC	FS	R^2
The first order factor analysis						
Intrinsic motivation (Int)						
m1	0.441	-	-	0.514	0.100	0.265
m4	0.297	0.049	6.038	0.319	-0.130	0.101
m7	0.607	0.059	10.318	0.690	0.288	0.476
m9	0.608	0.063	9.667	0.725	0.240	0.526
m11	0.558	0.065	8.555	0.672	0.465	0.451
m13	0.624	0.063	9.919	0.743	0.351	0.553
m15	0.546	0.061	8.993	0.666	0.345	0.443
m17	0.556	0.059	9.479	0.662	0.104	0.438
m19	0.427	0.058	7.411	0.454	0.041	0.206
Failure avoidance (Fai)						
m2	0.108	-	-	0.106	0.006	0.011
m5	0.577	0.285	2.025	0.571	0.304	0.327
m8	0.477	0.229	2.084	0.531	0.261	0.282
m14	0.608	0.298	2.040	0.657	0.254	0.432
m16	0.696	0.340	2.044	0.716	0.528	0.513
m18	0.762	0.372	2.047	0.682	0.217	0.465
Extrinsic motivation (ext)						
m3	0.229	-	-	0.203	0.022	0.041
m6	0.262	0.045	5.781	0.300	0.033	0.090
m10	1.014	0.237	4.286	0.977	0.940	0.954
m12	0.357	0.077	4.640	0.396	0.026	0.156
m20	0.354	0.073	4.855	0.349	-0.039	0.122
The second order factor analysis						
Int	0.692	0.372	1.859	0.692	-	0.479
Fai	-0.066	0.076	-0.872	-0.066	-	0.004
Ext	0.894	0.530	1.688	0.894	-	0.800

χ^2 = 89.224, df = 71, *P*-value = .0071, GFI = 0.978, AGFI = 0.936,
RMSEA = 0.062, RMR = 0.018,
Model AIC = 367.224, Saturated AIC = 420.000, Model CAIC = 1062.076,
Saturated CAIC = 1469.777

6. Conclusions and recommendations

From the results of this research have the recommendation to links between research teachers and experts from other academic groups are strongly recommended in order to support the flow of information exchange and induce perspectives from different points of view which will have a positive effect on the development of teaching techniques. And education-related agencies are to provide opportunities for their personnel and develop motivation that increases in conducting classroom action research.

This type of corporation will not only help to increase the quality of research but also motivate teachers to commit to their work and continue on their tasks to achieve their career objectives. Further studies on the variables concerned in increasing research motivation should be carried out and analysed for in-depth correlation to support the future development scheme on teaching efficiency. A support team of research experts is strongly recommended.

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