Assessing teacher innovations: expert versus peer ratings

Vijaya Sherry Chand
Ravi J. Matthai Centre for Educational Innovation, Indian Institute of Management Ahmedabad, Ahmedabad, India
Samvet Kuril
Management and Organisations, Amrut Mody School of Management, Ahmedabad University, Ahmedabad, India
Ketan Satish Deshmukh
Innovation and Management in Education, Indian Institute of Management Ahmedabad,, Ahmedabad, India, and
Rukmini Manasa Avadhanam
University of Minnesota Twin Cities, Minneapolis, Minnesota, USA

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Abstract

Purpose – The growing recognition of the role of teacher innovative behavior in educational improvement has led to more systematic assessment of teacher-driven innovations, usually through expert panels. Innovative peer-teachers may be more closely aligned with the correlates of teacher innovative behavior than experts, and hence their participation in such panels might make the process more robust. Hence, the authors ask, "Do expert and peer assessments relate to individual-related correlates of innovative teacher behavior differently?"

Design/methodology/approach – Innovations of 347 teachers in India were assessed by an expert panel and a peer-teacher panel using the consensual technique of rating innovations. Structural equation modeling was used to study the relationships of the ratings with the innovative teachers' self-reported creative self-efficacy, intrinsic motivation, learning orientation and proactive personality.

Findings – Expert ratings were significantly related to creative self-efficacy beliefs ($\beta = 0.53$, $p < 0.05$), whereas peer ratings were not. Peer ratings were significantly related to learning orientation ($\beta = 0.19$, $p < 0.05$), whereas expert ratings were not. Also, expert ratings were found to be indirectly associated with teachers' proactive personality and intrinsic motivation via creative self-efficacy beliefs; peer ratings were not associated with proactive personality.

Originality/value – The paper, through a robust methodology that relates expert and peer assessments with individual-related correlates of innovative behavior, makes a case for educational innovation managers to consider mixed panels of experts and innovative teacher-peers to make the assessment process more robust.

Keywords Innovation ratings, Teacher innovations, Expert and peer raters, Teacher innovative behavior

Paper type Research paper

Introduction

The role of teacher innovative behavior (TIB) in addressing the demands of students as well as the problems that schools in socio-educationally deprived contexts face has been recognized in recent times (Thurlings *et al.*, 2015; Andiliou and Murphy, 2010; Chand, 2014). Echoing the call

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of OECD (2012, p. 4) to "value teachers' innovative work and to publicly recognise teachers' work," governments around the world are making efforts to identify and reward innovative teachers. However, two factors affect the mechanisms used to identify innovative teaching practices: choice of rating criteria and the nature of the raters (Chien, 2019; Hung *et al.*, 2012). Either the criteria are often not specific or their links with personal traits such as creative self-efficacy and learning orientation that are known to be related to innovative behavior (Thurlings *et al.*, 2015) remain underexplored. Literature acknowledges this by noting that the recognition of innovative behavior hinges on its output being seen as "new and useful" (Farr and Ford, 1990) or "novel and/or unique response" to problems (Chand, 2014), without being specific about the evaluation criteria (Efimenko *et al.*, 2018). The raters are usually professional judging panels or educational experts and not practicing teachers. Since innovativeness is related to certain personal traits or the contexts of the innovating teacher, having innovative teacher-peers on such panels might enrich the evaluation of teacher innovations. Based on the earlier argument, we develop the focus of this study: Do the assessments of teacher innovation by educational experts and by innovative teacher-peers relate differently to personal trait-related correlates (individual factors) of innovative teacher behavior? By answering this question, we hope to help education innovation managers make the process of certifying innovative behavior more robust and strengthen the objective basis for incentivizing innovative teachers.

We first review the literature on approaches to rating and the factors associated with TIB; we then describe a methodology for assessing teacher-driven innovation and finally, assess the differences between expert assessments and peer assessments.

Literature review

Defining innovative behavior and innovation

In their review of TIB, Thurlings *et al.* (2015, p. 442) define TIB as "a self-initiated, three-stage process: (1) intentional idea generation, (2) idea promotion, and (3) idea realization." Such an understanding incorporates not only the ideational state but also the "implementational" state in the creativity–innovation continuum (Fullan, 2011). We thus focus on the output of the innovation process, defining it as a self-developed educational action that has "resulted in the achievement of certain educational goals. . . [and incorporates] a novel and/or unique response to a problem or need; a stage of initial development by the teacher, followed by a stage of trial and monitoring (implementation); an evaluation, followed by continuation or modification; and finally, a set of results which constitute an improvement" (Chand, 2014, p. 62). This definition moves away from the problems associated with self-reports of behavior (Thurlings *et al.*, 2015) toward objective assessments of innovation.

Assessing teacher innovation: peer and expert ratings

The challenge of measuring innovation in the context of research and development has been met by the use of either objective measures such as publications or, in the context of education, the more common rater-mediated assessments or both (Amabile, 1982; Egan, 2005; McKay and Kaufman, 2019; Scott and Bruce, 1994; Zhou and Shalley, 2003). McKay and Kaufman (2019) note that when it comes to assessing innovative performance through product-based measures (teacher innovations in this case), "peers, colleagues, supervisors, and other stakeholders are the best source" (p. 29). Hung *et al.* (2012) explained that the concern about "interrater reliability" in expert ratings can be addressed through three methods: (1) consensus estimates, in which independent judges are expected to be in near-total agreement; (2) consistency estimates in which the judges apply a given rubric consistently; and (3) measurement estimates, using judges' estimates to derive measurement estimates through techniques such as the many-faceted Rasch model (Bond and Fox, 2015).

This last method counters the disadvantages of the other two, but is not commonly used. Consistency estimates are used commonly in practice, but the judging rubric has to be consistently applied and the researcher has to ensure that varying levels of strictness in evaluations among different judges do not introduce bias. The consensual method, also called the "gold standard" (Carson, 2006), is extensively used in research and is easy to implement, provided adequate time is spent in training the judges. In this method, judges are made familiar with the criteria and its application who then rate the innovations independently. Finally, a mean or summed score is generated for each innovation. This method has been adopted in the present study.

Expert rating is well established in innovation practice (Egan, 2005; Kaufman and Baer, 2012). Peer assessment, in which peers evaluate each other's work, is also recognized in the literature (Lu and Luh, 2012; Rada and Hu, 2002; Woolhouse, 1999) and may be important in innovation assessment, since creative people are more suited to assess creative ideas of others (Benedek *et al.*, 2016). Moreover, problem-solving, creativity and critical thinking in teaching are more suited for assessment by peer assessors (Berg, 2016). However, both expert rating method and peer rating method have their limitations. Seldin (1999) notes that peer evaluations often failed to improve teaching, and uneasiness about evaluating other teachers' performance might influence peer ratings (Kreber, 2002). The biases that supervisory ratings might suffer from are also well studied (e.g. Grant *et al.*, 2009; Mueller *et al.*, 2018; Schuh *et al.*, 2018; Yuan and Woodman, 2010).

These pros and cons of the two types of raters lead scholars to recommend caution while relying on only one type of rater (McKay and Kaufman, 2019). Stewart *et al.* (2019) described how peer-clinicians and experts might have privileged different dimensions while rating ideas related to evidence-based clinical practice. Rodrigues and Rebelo (2019) found the individual disposition of proactive personality to be a predictor of behavior judged to be innovative by supervisors and recommended the collection of peer ratings as well. Potocnik and Anderson (2012) found significant differences between self, peer and observer ratings. All these studies point to the importance of identifying how assessments by different types of raters differ (Cho *et al.*, 2006; Hovardas *et al.*, 2014; Kaufman *et al.*, 2008; Pare and Joordens, 2008). McKay and Kaufman (2019) emphasized that it is worthwhile to assess products from multiple sources and "identify mechanisms that differentiate when and how these sources differ in their judgments" (p. 34). This provided the rationale for our exploration of how the assessments by two types of raters, educational experts and innovative teacher-peers, relate to individual-related correlates of teacher innovative behavior.

Individual factors as correlates of teacher innovation

In their review of teacher innovative behavior, Thurlings *et al.* (2015) provided a comprehensive list of the factors that can influence teacher innovative behavior under three heads: demographic factors, individual factors and organizational factors. Demographic factors are known to be weak correlates of workplace innovation in general (Hammond *et al.*, 2011). In this study, we focus on the public school system, in which organizational factors such as supervisory processes and resourcing are common. We, therefore, focus on the individual factors, among which Thurlings *et al.* (2015, p. 462) identified self-efficacy as very important. Liu *et al.* (2016) noted the role of creative self-efficacy, an ability to be creative in the workplace (Tierney and Farmer, 2002), as a predictor of innovation. Closely related to this is intrinsic motivation, which was identified by Hammond *et al.* (2011) as a key factor in individual workplace innovation, contributing to a state of creativity. Two other factors, "learning orientation" and "proactive personality," are also cited in the same literature as key factors influencing other individual factors contributing to innovation. We discuss these four factors further.

Creative self-efficacy and intrinsic motivation. A belief in the ability to be creative in the workplace leads one to try out new practices (Amabile 1988, p. 131; Hsu *et al.*, 2011). Such "creative self-efficacy" mediates the relationship between individual factors such as motivation and contextual factors such as leadership (Choi, 2004) and between transformational leadership and employee creativity (Hughes *et al.*, 2018; Gong *et al.*, 2009). Given that higher usage of cognitive resources is a feature of creative self-efficacy, and risk-taking is promoted when creative self-efficacy is high, it is likely that experts, more than the peers, would be better placed to identify and appreciate those aspects of teacher innovation that may have been influenced by creative self-efficacy.

Intrinsic motivation is understood to be a desire to expend effort on the basis of one's interest in the work being performed and the joy one derives (Amabile, 1996; Ryan and Deci, 2000). Elsbach and Hargadon (2006) identify intrinsic motivation as a driver of creativity and innovation, and Silvia (2008) notes positive affect as its outcome. Intrinsic motivation encourages creativity by augmenting the available cognitive information and creating the cognitive flexibility to identify associations among ideas (Amabile *et al.*, 2005; Hughes *et al.*, 2018). While some studies postulate a positive relationship between intrinsic and extrinsic motivation on the one hand and innovation on the other (Byron and Khazanchi, 2012; George and Zhou, 2002), others show that extrinsic motivation may diminish creative behavior (Byron and Khazanchi, 2012; Deci *et al.*, 1999). Byron and Khazanchi (2012) note that creative performance increases when the rewards are contingent on creativity. This effect is more pronounced when feedback is provided along with choice. However, we rely on Hammond *et al.* (2011), who stressed that intrinsic motivation shows more positive relationship with creative performance than extrinsic motivation. Since motivation is a driver of creativity, it is likely that both expert raters and peer raters would appreciate the expression of motivation in the innovativeness of the innovation. In other words, we do not expect significant differences in the two ratings with respect to intrinsic motivation. Based on the earlier discussion, we hypothesize as follows:

H1a. Creative self-efficacy of teachers is likely to be significantly correlated with expert ratings.

H1b. Creative self-efficacy is likely to play a mediating role between intrinsic motivation and expert rating.

H2a. Creative self-efficacy is not likely to be significantly correlated with peer ratings.

Learning orientation. Learning orientation is the "pattern of beliefs that lead to different ways of approaching, engaging in, and responding to achievement situations" (Ames, 1992, p. 261). It provides an inherent drive that promotes acquisition of skills (Ames and Archer, 1988) and is positively correlated with employees' creativity, with creative self-efficacy mediating the relationship (Gong *et al.*, 2009).Prior research notes that though goal setting may not be necessarily difficult, what differentiates creative people is that they see opportunity where others do not and that they persevere where others give up (Grohman *et al.*, 2017). These qualities are directly related to learning orientation. Learning orientation also helps in reducing the detrimental effects of time pressure (Khedhaouria *et al.*, 2017). Innovative teacher-peer raters, who are practitioners, are more likely to have observed and experienced problems and consequences similar to those evident in teacher innovations and so are more likely to appreciate the innovative teachers' "patterns of beliefs," the drive to acquire skills needed to develop an innovative solution, the pressure of time and the perseverance needed to convert opportunities into innovations. We therefore derive the following hypotheses.

H3a. Employee learning orientation is likely to be significantly correlated with peer ratings.

H3b. Creative self-efficacy is likely to play a mediating role between employee learning orientation and peer ratings.

H3c. Employee learning orientation is not likely to be significantly correlated with expert rating.

Proactive personality. Proactive personality influences innovative behavior by focusing on the individual disposition to engage in a wide variety of roles and attempt to change factors in the environment (Bateman and Crant, 1993; Seibert *et al.*, 2001). Proactive personality has been described as a stable state that may not change easily under the influence of environmental factors (Wang and Wanberg, 2017). It has been noted to be a feature of socio-educationally entrepreneurial teachers who often have to engage in out-of-school activities with the parents and the community in order to achieve their educational goals (Bergeron *et al.*, 2014; Chand, 2006). This behavior may include a reshaping of officially mandated roles to fit the kind of work needed to meet the demands of the local environment. People exhibiting such behavior are known to be more motivated to acquire new knowledge (Major *et al.*, 2006) and look for opportunities to resolve problems (Pan *et al.*, 2018). It is likely that the peer raters, more than the experts, would identify with the features of proactive personality, given that in situations similar to the ones described by the innovative teachers, they would have provoked change, identified relevant information needed to implement the change and engaged in extra-school roles wherever necessary. Hence, we would expect peer ratings to correlate more strongly than expert ratings with proactive personality of innovative teachers.

H4a. Proactive personality is likely to be significantly correlated with peer ratings.

H4b. Proactive personality is not likely to be significantly correlated with expert rating.

Method

Innovation rating procedure

The data for this study is drawn from a project undertaken by one of the authors in the public school system of a western Indian province in 2013, which resulted in the identification of 5,650 teachers whose work satisfied the definition of teacher innovation given earlier. These were rated by two teams, an expert committee of three members (academics from higher education institutes) and a peer team of eight teachers who had been recognized as innovative teachers in another study undertaken in 2004–2006 (Chand, 2012), using the consensual technique (Amabile, 1982) described earlier. All the innovations were anonymized – the teachers' names and demographic details were masked. This was the only instance where such an activity was conducted at provincial level to assess teacher innovations. Therefore, the data of first year (2013) gives us the unique opportunity to understand the differences between the two raters as raised by creativity and innovation researchers (Hovardas *et al.*, 2014; Kaufman *et al.*, 2008; McKay and Kaufman, 2019; Pare and Joordens, 2008). In the later years, this activity was not done at the central level, but was experimented with at a local decentralized level.

Five criteria framed the assessment: novelty; "need" as indicated by the socioeconomic profile of the school's location; "scope of the activity" in terms of impact on more than one educational aspect; "complexity of the activity" in terms of the resources needed to be mobilized; the "spread-effect" of the work as evidenced by adoption by others.

The judges were trained using a sample of innovations from an earlier study (Chand, 2012) so that a shared understanding of the criteria and of their application could be generated. The members of the teams then did their work independently, each rating every innovation on a scale of 0–100. After the ratings were done, the 5,650 teachers were ranked on the basis of their combined innovation score.

Sample selection

From the 5,650 teachers, 347 (29.68% females) were selected by circular systematic random sampling. This sample size was more than twice the minimum sample size, $N = 164$, prescribed by MacCallum *et al.* (1996) for analysis with the power of 0.8 and 100 degrees of freedom (*df*). As indicated in the analysis section, the *df* for the measurement model of this study was 201.

Measures

Innovation scores for the 347 innovations given by peers ranged from 15 (weakly innovative) to 95 (strongly innovative) ($M = 55.36$, SD = 19.04), whereas ratings by experts ranged from 30 to 96 ($M = 62.03$, SD = 11.96). Demographic variables such as gender, age, educational qualification and caste (an ascribed identity indicating membership in specific social categories used for affirmative action) were also collected.

Creative self-efficacy was measured using the widely accepted four items scale by Tierney and Farmer (2002) with $\alpha = 0.84$. This instrument was used earlier in Indian context and proved to have good validity and reliability (Jaiswal and Dhar, 2015). The three-item Multidimensional Work Motivation Scale was used to measure intrinsic motivation; the instrument measures motivation at the domain level of analysis (Vallerand, 1997) and does not measure motivation for different tasks within a job ($\alpha = 0.74$). Employee learning orientation was assessed with Elliot and Church's six-item scale (1997), ($\alpha = 0.82$). A ten-item short version of the Proactive Personality Scale was used for proactive personality (Bateman and Crant, 1993; Seibert *et al.*, 2001), ($\alpha = 0.88$). These scales have been used with Indian respondents and have reported good reliability and validity (Areepattamannil *et al.*, 2011; Lochab and Nath, 2019). The measures were translated into the local language, checked by back-translation into English and then piloted with a small group of 11 teachers. A team of trained assistants administered the questionnaires. Missing data was not a problem, but one teacher did not indicate work experience and one did not indicate age. Hence, during the final analysis, when controlling for demographics, the total number of teachers was 345.The data was checked for normality using IBM SPSS. Heteroscedasticity and multicollinearity were not present in the data, with VIF < 10 and tolerance (T) > 0.1. The Appendix presents the reliabilities and discriminant matrix.

Findings

The 347 teachers provided the following demographic data: education: Professional Teacher Course (31.4%), Graduate (29.7%), Postgraduate (37.2%) and Doctorate (1.7%); teacher eligibility test qualification (Yes - 60.7%); and caste of respondents (General – 41.8%, Other Backward Classes – 40.9%, Scheduled Castes – 11.5%, and Scheduled Tribes – 5.8%). The mean age of the teachers was 36.07 years (SD = 7.36, $N = 346$) and the average work experience was 12.66 years (SD = 8.57, $N = 346$). Structural equation modeling was used to study the relationships of the expert ratings and of the peer ratings, with the innovative teachers' self-reported creative self-efficacy, learning orientation, proactive personality and intrinsic motivation. We performed confirmatory factor analysis (CFA) in MPlus 8.2 (Muthén and Muthén, 2017), using maximum likelihood estimation with robust standard errors for all the constructs individually. While fitting the measurement model, individual items with standardized loadings less than 0.5 were dropped. Once all the individual constructs satisfied

the model fit criteria, they were combined to form the measurement model, and it fitted the data well with $\chi^2(201) = 326.27$, $p < 0.001$; CFI = 0.96; TLI = 0.96; RMSEA = 0.04; SRMR = 0.05 (Hu and Bentler, 1999).Table 1 presents the items and item loadings of the latent variables with the individual model fit indices, and Figure 1 shows the measurement model.

We determined the correlations of innovation ratings given by peers and by experts, with teachers' creative self-efficacy, learning orientation, intrinsic motivation and proactive personality while controlling for respondents' background characteristics (Figures 2 and 3). Data for two teachers with missing information on work experience and age were dropped during the analysis. The models accounted for mediation effects of creative self-efficacy using

Construct	Range	*M*	SD	Std. Loadings
Employee learning orientation (α = 0.82, Bootstrap corrected [BC] 95% CI [0.78, 0.85], $\chi^2(7) = 17.149$, $p > 0.05$, CFI = 0.98, RMSEA = 0.07)				
ELO1: I want to learn as much as possible from my work	1–7	5.83	1.21	0.66
ELO2: It is important for me to understand the contents of the work I'm doing	1–7	5.61	1.19	0.56
ELO3: By the end of a deadline/term, I hope to have gained broader and deeper knowledge of what has been covered so far	1–7	5.48	1.25	0.61
ELO4: I desire to completely master new methods of learning	1–7	5.69	1.30	0.69
ELO5: I prefer learning methods that evoke curiosity, even if it is difficult to learn	1–7	5.60	1.35	0.65
ELO6: I prefer learning that really challenges me so I can learn new things	1–7	5.73	1.22	0.66
*Intrinsic motivation (α = 0.74, bootstrap corrected [BC] 95% CI [0.69, 0.78])**				
IM1: In general, I do things because I like to discover interesting new things	3–7	6.05	0.90	0.78
IM2: In general, I do things because I like the feeling of being able to master what I do	4–7	5.59	0.92	0.58
IM3: In general, I do things because of the positive stimulation I experience while doing these activities	3–7	6.18	0.81	0.82
Creative self-efficacy (α = 0.84, bootstrap corrected [BC] 95% CI [0.80, 0.87], $\chi^2(2) = 1.861$, $p > 0.05$, CFI = 1, RMSEA = 0)				
CSE1: I feel that I am good at generating novel ideas	1–7	5.73	1.11	0.74
CSE2: I have confidence in my ability to solve problems creatively	2–7	6.06	0.93	0.84
CSE3: I have a knack for further developing the ideas of others	3–7	5.70	1.00	0.69
CSE4: I am good at finding creative ways to solve problems	1–7	5.89	1.00	0.76
Proactive personality (α = 0.88, bootstrap corrected [BC] 95% CI [0.85, 0.91], $\chi^2(27) = 45.82$, $p > 0.05$, CFI = 0.98, RMSEA = 0.05)				
PP1: I am constantly on the lookout for new ways to improve my life	1–7	6.17	1.08	0.68
PP2: Wherever I've been, I have been a powerful force for constructive change	1–7	5.91	1.09	0.77
PP3: Nothing is more exciting than seeing my ideas into reality	1–7	5.73	1.04	0.68
PP4: If I see something I do not like, I fix it	1–7	5.86	1.00	0.65
PP5: No matter what the odds, if I believe in something I will make it happen	2–7	6.06	0.95	0.63
PP7: I excel at identifying opportunities	1–7	6.17	0.95	0.76
PP8: I am always looking for better ways to do things	1–7	6.28	0.91	0.72
PP9: If I believe in an idea, no obstacle can prevent me from making that happen	1–7	5.47	1.17	0.56
PP10: I can spot a good opportunity long before others can	1–7	5.43	1.08	0.70

Table 1.
Responses to survey instruments

*__Note(s):__ Intrinsic motivation consisted of three items resulting in a saturated model

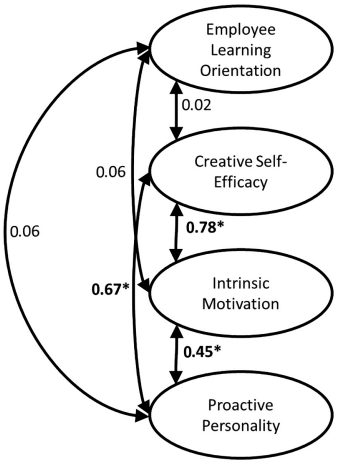


Figure 1.
Measurement model

Note(s): Model Fit Indices: χ^2 = 326.270, df = 201, χ^2/df = 1.623, CFI = 0.960, TLI = 0.955, SRMR = 0.046, RMSEA = 0.042 : 90%CI [0.034,0.051] & PCLOSE = 0.935

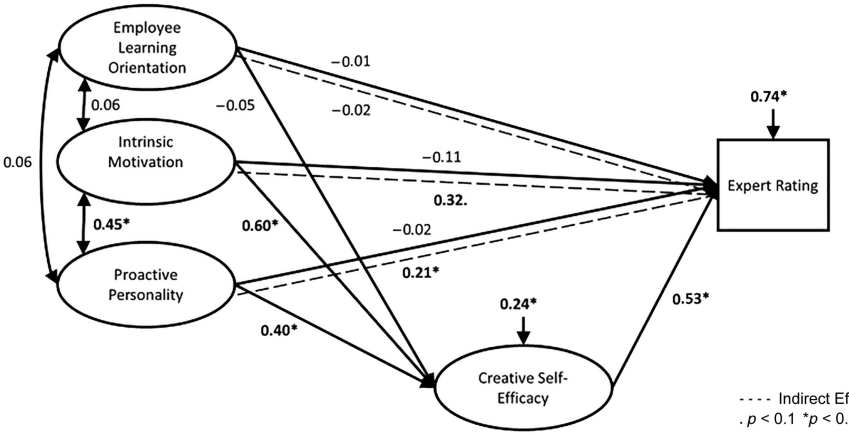


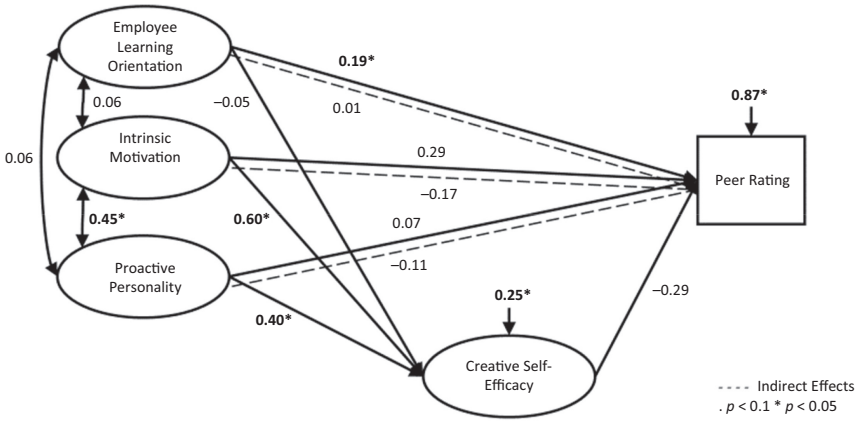
Figure 2.
Relationships of expert ratings with individual-related correlates

Note(s): Model Fit Indices: χ^2 = 575.865, df = 429, χ^2/df = 1.342, CFI = 0.955, TLI = 0.949, SRMR = 0.050, RMSEA = 0.032 : 90%CI [0.024, 0.038] & PCLOSE = 1.000

the maximum likelihood estimator using bootstrapping with 5,000 draws (Hayes, 2009; MacKinnon *et al.*, 2004).

The analysis showed that expert ratings of innovation were significantly related to creative self-efficacy beliefs of the respondent ($\beta = 0.53$, $p < 0.05$) and peer ratings were not significantly related ($\beta = -0.29$, $p > 0.05$) supporting our hypothesis, H1a and H2a. Creative self-efficacy mediated the relationship between intrinsic motivation and expert rating at $p < 0.1$ with $\beta = 0.32$, partially supporting our hypothesis H1b.

Our next hypothesis, H3a, predicting the relationship between peer ratings with learning orientation ($\beta = 0.19$, $p < 0.05$) of the teachers was also supported. Although the hypothesized



Note(s): Model Fit Indices: $\chi^2 = 576.788$, df = 429, χ^2/df = 1.344, CFI = 0.954, TLI = 0.948, SRMR = 0.049, RMSEA = 0.032 : 90% CI [0.025,0.038] & PCLOSE = 1.000

Figure 3.
Relationships of peer ratings with individual-related correlates

role of creative self-efficacy mediating the relationship between employee learning orientation and peer ratings is not supported ($\beta = 0.01$, $p > 0.05$). Employee learning orientation was not significantly related to expert rating as predicted in our hypothesis H3c.

Proactive personality was significantly related with expert rating, rejecting our hypothesis H4b, but we found a significant indirect effect via creative self-efficacy on expert ratings with $\beta = 0.21$, $p < 0.05$. Given that there was no significant relationship between peer rating and proactive personality, H4a was not supported.

Intrinsic motivation was significantly related to creative self-efficacy ($\beta = 0.60$, $p < 0.05$). We detected an indirect effect on expert rating of creative performance ($\beta = 0.31$, $p < 0.10$), but no significant effect, either direct or indirect, on ratings awarded by peers.

We found no significant effect of respondent's age, work experience and education on the ratings scored from either peers or experts. We find that caste and gender had small but significant effects on the innovation ratings obtained by the teachers. Teachers from Scheduled Caste ($\beta = -0.15$, $p < 0.05$) received lower ratings from peers compared to members from the general category. Male teachers were more likely to be rated higher ($\beta = 0.12$, $p < 0.05$) by experts, while peer ratings favored females ($\beta = -0.11$, $p < 0.05$). Innovators from Other Backward Classes (OBC) ($\beta = -0.12$, $p < 0.05$) reported significantly lower creative self-efficacy beliefs compared to members from the general category. We summarize the findings in Table 2.

Discussion

This study attempted to find out whether experts and peer evaluators relate differently to four individual-related factors that influence innovative behavior: creative self-efficacy, intrinsic motivation, learning orientation and proactive personality. Our findings about the relationship of the ratings with creative self-efficacy and employee learning orientation were as expected, except that the hypothesis regarding mediation of employee learning orientation and peer ratings relationship by creative self-efficacy was not supported. A different study design may be needed to explore this relationship carefully. In practice, creative self-efficacy is most likely to be evidenced in the effort put in to tap into a variety of cognitive resources and in the risks that such effort would have implied. Hence, it was reasonable to expect the experts to be able to value more those aspects that indicated creative self-efficacy and, by

Hypothesis	Conclusion
H1a: Creative self-efficacy of teachers is likely to be significantly correlated with expert ratings	Supported
H1b: Creative self-efficacy is likely to play a mediating role between intrinsic motivation and expert rating	Supported, but at 0.1 significance level
H2a: Creative self-efficacy is not likely to be significantly correlated with peer ratings	Supported
H3a: Employee learning orientation is likely to be significantly correlated with peer ratings	Supported
H3b: Creative self-efficacy is likely to play a mediating role between employee learning orientation and peer ratings	Not supported
H3c: Employee learning orientation is not likely to be significantly correlated with expert rating	Supported
H4a: Proactive personality is likely to be significantly correlated with peer ratings	Not supported
H4b: Proactive personality is not likely to be significantly correlated with expert rating	Not supported *Proactive personality is significantly related to expert ratings indirectly via creative self-efficacy*

Table 2.
Summary of findings

extension, the role of intrinsic motivation. Peer evaluators would not have had the exposure that the experts might have had of examining a variety of innovations from other contexts, and so the presence of experts does add value to a judging panel.

The peer ratings seemed to relate better to learning orientation of the teachers. In practice, learning orientation can be inferred from an enhanced ability to spot opportunity, perseverance in the face of hindrances, modifications made to innovations over time and better management of time pressure. We had expected the innovative teacher-peer raters to be more sensitive than the experts to certain aspects related to the implementation and to the perseverance needed to convert opportunity into results. The overall implication for teacher innovation managers is that it is useful to have teachers, who themselves have a track record of innovative behavior, to complement the perspectives that experts bring to the evaluation task.

The findings do not support our hypotheses with respect to proactive personality, which is related to innovative behavior through individual dispositions to engage in attempts to change the environment. We offer a tentative explanation for the findings about proactive personality, realizing that further study is needed. The features that indicate "proactive personality" is also seen as going into the makeup of an entrepreneurial teacher. Chand (2006) have described how proactive teachers show extra-role behaviors and engage in socially entrepreneurial roles to achieve their educational goals. Eyal and Inbar (2003) and Eyal and Yosef-Hassidim (2012) show how proactive teachers use the autonomy they have to show entrepreneurial behavior. It is likely that the experts were rewarding the entrepreneurial behavior captured in the teacher innovations. The distinction between teacher innovative behavior and teacher entrepreneurial behavior needs to be more carefully researched, and the antecedents of these two behaviors distinguished clearly. The peer ratings, on the other hand, do not show significant correlation with proactive personality, just as there is no correlation with creative self-efficacy. The peers may be taking these for granted, instead stressing the learning orientation, thereby rewarding the quality of experimentation that innovative teachers exhibit.

As expected, age, work experience or education had no impact on the ratings. Caste and gender had small but significant effects on the innovation ratings. We are inclined to treat the findings with respect to gender and caste as initial exploratory results that need further investigation.

The findings reported here have three implications for practice in general and teacher innovation managers in particular. The first is to ensure that panels examining teacher-driven innovations comprise both experts with the necessary theoretical expertise and innovative practitioners. Peers seem to value the learning orientation, that is, the spirit of experimentation and trial and error that innovative teachers might be building into their innovations. Experts, on the other hand, bring a different perspective that seems to value expression of creative self-efficacy and a proactive personality or entrepreneurial behavior. Having these two complementary perspectives on a judging panel would only make the process of recognizing and rewarding innovative teachers more robust. This study indicates which criteria would represent the two perspectives.

Teacher innovation managers need to be more rigorous in their identification of the criteria to be applied to teacher-generated innovations. As noted earlier, teachers' innovative work is increasingly being recognized and rewarded. However, there is no transparency about the criteria used, or they are not specified carefully. For instance, in India, the nodal national government agency for educational research and training instituted a Teacher Innovations Award in 2017–2018, designed to specifically reward "individual teachers and teacher educators attempting innovations" (http://www.ncert.nic.in/programmes/teacher_award/innovaion_award.html). A few other private initiatives, for example, the Zero-investment Innovations for Education Initiatives (www.ziiei.com), followed in its footsteps. However, based on the publicly available information, it is difficult to judge the quality of the criteria used. Other schemes such as the "Teach for Innovation" award program of Teach for America or the Hong Kong Chief Executive Award for Teaching Excellence do indicate the criteria, but it is not clear whether the perspectives of innovative peers and experts have been taken into account. Efimenko *et al.* (2018, p. 12) note that most of the European awards use nonspecific indicators such "good teaching practice" and stimulation of "student-centered learning."

The third implication is the need to invest in developing a pool of peer-innovators who can complement the experts who are more easily available. In order to demonstrate the feasibility of this approach, the authors extended the findings of this study to a series of "educational innovation" exhibitions conducted by the teacher-training institutes in the province where this study was done, in 2017 and 2018 (Chand *et al.*, 2020). Innovative peers were identified to work with the experts. The officials who were managing the display of the innovations then derived a combined assessment of the innovations. In brief, this study indicates that combining the two perspectives has value, more attention should be paid to the criteria for evaluation and developing a pool of innovative teachers as evaluators is not easy, but is possible.

Limitations

This study focused exclusively on the public educational system in a developing country; extending these findings to the private sector and to developed country contexts has to be done with caution. The study was conducted in just one province; countries such as India are linguistically and socioeconomically very diverse, and so replication in related contexts is desirable. This study used a correlational design, treating the individual-related factors, which can technically be treated as antecedents of innovative behavior, as correlates of innovation score. An experimental design would be needed to account for the temporal sequencing of the variables included in the study. Finally, this study adopted the widely used consensual approach to rating innovations. While this may be adequate for most purposes, a measurement-estimates-based approach, which also accounts for factors such as systematic rater bias (strictness or leniency), will enable more rigorous examination of rater effects.

References

Amabile, T.M. (1982), "Social psychology of creativity: a consensual assessment technique", *Journal of Personality and Social Psychology*, Vol. 43 No. 5, pp. 997-1013.

Amabile, T.M. (1988), "A model of creativity and innovation in organizations", *Research in Organizational Behavior*, Vol. 10 No. 1, pp. 123-167.

Amabile, T.M. (1996), "Creativity and innovation in organizations", *Harvard Business School Background Note*, January, pp. 396-439.

Amabile, T.M., Barsade, S.G., Mueller, J.S. and Staw, B.M. (2005), "Affect and creativity at work", *Administrative Science Quarterly*, Vol. 50, pp. 367-403.

Ames, C. (1992), "Classrooms: goals, structures, and student motivation", *Journal of Educational Psychology*, Vol. 84 No. 3, pp. 261-272.

Ames, C. and Archer, J. (1988), "Achievement goals in the classroom: students' learning strategies and motivation processes", *Journal of Educational Psychology*, Vol. 80 No. 3, pp. 260-267.

Andiliou, A. and Murphy, P.K. (2010), "Examining variations among researchers' and teachers' conceptualizations of creativity: a review and synthesis of contemporary research", *Educational Research Review*, Vol. 5 No. 3, pp. 201-219.

Areepattamannil, S., Freeman, J.G. and Klinger, D.A. (2011), "Influence of motivation, self-beliefs, and instructional practices on science achievement of adolescents in Canada", *Social Psychology of Education*, Vol. 14 No. 2, pp. 233-259.

Bateman, T.S. and Crant, J.M. (1993), "The proactive component of organizational behavior: a measure and correlates", *Journal of Organizational Behavior*, Vol. 14 No. 3, pp. 103-118.

Benedek, M., Nordtvedt, N., Jauk, E., Koschmieder, C., Pretsch, J., Krammer, G. and Neubauer, A.C. (2016), "Assessment of creativity evaluation skills: a psychometric investigation in prospective teachers", *Thinking Skills and Creativity*, Vol. 21, pp. 75-84.

Berg, J.M. (2016), "Balancing on the creative highwire: forecasting the success of novel ideas in organizations", *Administrative Science Quarterly*, Vol. 61 No. 3, pp. 433-468.

Bergeron, D.M., Schroeder, T.D. and Martinez, H.A. (2014), "Proactive personality at work: seeing more to do and doing more?", *Journal of Business and Psychology*, Vol. 29 No. 1, pp. 71-86.

Bond, T.G. and Fox, C.M. (2015), *Applying the Rasch Model: Fundamental Measurement in the Human Sciences*, L. Erlbaum, Mahwah, New Jersey.

Byron, K. and Khazanchi, S. (2012), "Rewards and creative performance: a meta-analytic test of theoretically derived hypotheses", *Psychological Bulletin*, Vol. 138, No, 4, p. 809.

Carson, S. (2006), "Creativity and mental illness", *New Haven, CT: Invitational Panel Discussion Hosted by Yale's Mind Matters Consortium*.

Chand, V.S. (2006), "Mainstreaming the practices of innovative teachers: managing decentralized professional development in public schooling", *International Journal of Knowledge, Culture and Change Management*, Vol. 6 No. 5, pp. 17-24.

Chand, V.S. (2012), *Teachers as Transformers: Innovative Primary School Teachers at Work*, SRISTI Innovations, Ahmedabad.

Chand, V.S. (2014), "Socio-educational entrepreneurship within the public sector: leveraging teacher-driven innovations for improvement", Alexander W. Wiseman. Bingley (Ed.), *International Educational Innovation and Public Sector Entrepreneurship*, Emerald Group Publishing, Bingley, pp. 59-82.

Chand, V.S., Kuril, S. and Shukla, A. (2020), "Dialoguing with teacher-educators, valorizing teacher innovations", *London Review of Education*, Vol. 18 No. 3, pp. 451-466.

Chien, C.W. (2019), "Pre-service teachers' innovation on English activity designs and materials for young learners", *The Teacher Educator*, Vol. 54 No. 1, pp. 4-21.

Cho, K., Schunn, C.D. and Charney, D. (2006), "Commenting on writing: typology and perceived helpfulness of comments from novice peer reviewers and subject matter experts", *Written Communication*, Vol. 23 No. 3, pp. 260-294.

Choi, J.N. (2004), "Individual and contextual predictors of creative performance", *Creativity Research Journal*, Vol. 16 No. 2, pp. 187-199.

Deci, E.L., Koestner, R. and Ryan, R.M. (1999), "A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation", *Psychological Bulletin*, Vol. 25 No. 6, p. 627.

Efimenko, E., Roman, A., Pinto, M., Remião, F. and Teixeira, P. (2018), "Enhancement and recognition of teaching and learning in higher education", *Journal of European Higher Education Area*, Vol. 2, pp. 99-118.

Egan, T.M. (2005), "Factors influencing individual creativity in the workplace: an examination of quantitative empirical research", *Advances in Developing Human Resources*, Vol. 7 No. 2, pp. 160-181.

Elliot, A.J. and Church, M.A. (1997), "A hierarchical model of approach and avoidance achievement motivation", *Journal of Personality and Social Psychology*, Vol. 72, pp. 218-232.

Elsbach, K.D. and Hargadon, A.B. (2006), "Enhancing creativity through "mindless" work: a framework of workday design", *Organization Science*, Vol. 17, pp. 470-483.

Eyal, O. and Inbar, D.E. (2003), "Developing a public school entrepreneurship inventory: theoretical conceptualization and empirical examination", *International Journal of Entrepreneurial Behavior and Research*, Vol. 9 No. 6, pp. 221-244.

Eyal, O. and Yosef-Hassidim, D. (2012), "Managing educational champions: entrepreneurship in schools", *Journal of School Leadership*, Vol. 22 No. 1, pp. 210-255.

Farr, J.L. and Ford, C.M. (1990), "Individual innovation", in West, M.A. and Farr, J.L. (Eds), *Innovation and Creativity at Work: Psychological and Organizational Strategies*, John Wiley and Sons, Oxford, pp. 63-80.

Fredrickson, B.L. (1998), "What good are positive emotions?", *Review of General Psychology*, Vol. 2, pp. 300-319.

Fullan, M. (2011), *Change Leader: Learning to Do what Matters Most*, Jossey-Bass, San Francisco, CA.

Gaidis, W.C. and Andrews, J.C. (1990), "Management of experiential learning projects in marketing coursework", *Journal of Marketing Education*, Vol. 12 No. 2, pp. 49-60.

George, J.M. and Zhou, J. (2002), "Understanding when bad moods foster creativity and good ones don't: the role of context and clarity of feelings", *Journal of Applied Psychology*, Vol. 7 No. 4, p. 687.

Gong, Y., Huang, J.C. and Farh, J.L. (2009), "Employee learning orientation , transformational leadership, and employee Creativity : the mediating role of employee creative self-efficacy", *Academy of Management Journal*, Vol. 52 No. 4, pp. 765-778.

Grant, A.M., Parker, S. and Collins, C. (2009), "Getting credit for proactive behavior: supervisor reactions depend on what you value and how you feel", *Personnel Psychology*, Vol. 62, pp. 31-55.

Grohman, M.G., Ivcevic, Z., Silvia, P. and Kaufman, S.B. (2017), "The role of passion and persistence in creativity", *Psychology of Aesthetics, Creativity, and the Arts*, Vol. 11 No. 4, pp. 376-385.

Hammond, M.M., Neff, N.L., Farr, J.L., Schwall, A.R. and Zhao, X. (2011), "Predictors of individual-level innovation at work: a meta-analysis", *Psychology of Aesthetics, Creativity, and the Arts*, Vol. 5 No. 1, p. 90.

Hayes, A.F. (2009), "Beyond Baron and Kenny: statistical mediation analysis in the new millennium", *Communication Monographs*, Vol. 76 No. 4, pp. 408-420.

Hovardas, T., Tsivitanidou, O.E. and Zacharia, Z.C. (2014), "Peer versus expert feedback: an investigation of the quality of peer feedback among secondary school students", *Computers and Education*, Vol. 71, pp. 133-152.

Hsu, M.L.A., Hou, S. and Fan, H. (2011), "Creative self-efficacy and innovative behavior in a service setting: optimism as a moderator", *Journal of Creative Behavior*, Vol. 45 No. 4, pp. 258-272.

Hu, L. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling*, Vol. 6, pp. 1-55.

Hughes, D.J., Lee, A., Tian, A.W., Newman, A. and Legood, A. (2018), "Leadership, creativity, and innovation: a critical review and practical recommendations", *The Leadership Quarterly*, Vol. 29 No. 5, pp. 549-569.

Hung, S.-P., Chen, P.-H. and Chen, H.-C. (2012), "Improving creativity performance assessment: a rater effect examination with many facet Rasch model", *Creativity Research Journal*, Vol. 24 No. 4, pp. 345-357.

Jaiswal, N.K. and Dhar, R.L. (2015), "Transformational leadership, innovation climate, creative self-efficacy and employee creativity: a multilevel study", *International Journal of Hospitality Management*, Vol. 51, pp. 30-41.

Kaufman, J.C. and Baer, J. (2012), "Beyond new and appropriate: who decides what is creative?", *Creativity Research Journal*, Vol. 24 No. 1, pp. 83-91.

Kaufman, J.C., Baer, J., Cole, J.C. and Sexton, J.D. (2008), "A comparison of expert and nonexpert raters using the consensual assessment technique", *Creativity Research Journal*, Vol. 20 No. 2, pp. 171-178.

Khedhaouria, A., Montani, F. and Thurik, R. (2017), "Time pressure and team member creativity within R&D projects: the role of learning orientation and knowledge sourcing", *International Journal of Project Management*, Vol. 35 No. 6, pp. 942-954.

Kreber, C. (2002), "Teaching excellence, teaching expertise, and the scholarship of teaching", *Innovative Higher Education*, Vol. 27 No. 1, pp. 5-23.

Liu, D., Jiang, K., Shalley, C.E., Keem, S. and Zhou, J. (2016), "Motivational mechanisms of employee creativity: a meta-analytic examination and theoretical extension of the creativity literature", *Organizational Behavior and Human Decision Processes*, Vol. 137, pp. 236-263.

Lochab, A. and Nath, V. (2019), "Proactive personality, goal orientation and meta-skills as predictors of protean and boundary less career attitudes", *South Asian Journal of Business Studies*, Vol. 9 No. 1, pp. 130-143, doi: 10.1108/SAJBS-01-2019-0014.

Lu, C.C. and Luh, D.B. (2012), "A comparison of assessment methods and raters in product creativity", *Creativity Research Journal*, Vol. 24 No. 4, pp. 331-337.

MacCallum, R.C., Browne, M.W. and Sugawara, H.M. (1996), "Power analysis and determination of sample size for covariance structure modelin", *Psychological Methods*, Vol. 1 No. 2, pp. 130-149.

MacKinnon, D.P., Lockwood, C.M. and Williams, J. (2004), "Confidence limits for the indirect effect: distribution of the product and resampling methods", *Multivariate Behavioral Research*, Vol. 39 No. 1, pp. 99-128.

Major, D.A., Turner, J.E. and Fletcher, T.D. (2006), "Linking proactive personality and the big five to motivation to learn and development activity", *Journal of Applied Psychology*, Vol. 91, pp. 927-935.

McKay, A.S. and Kaufman, J.C. (2019), "The assessment of creative and innovative performance", Mumford, M.D. and Todd, M.E. (Ed.), *Creativity and Innovation in Organizations*, Routledge, pp. 17-40.

Mueller, J., Melwani, S., Loewenstein, J. and Deal, J.J. (2018), "Reframing the decision-makers' dilemma: towards a social context model of creative idea recognition", *Academy of Management Journal*, Vol. 61 No. 1, pp. 94-110.

Muthén, L.K. and Muthén, B.O. (2017), *Mplus User's Guide*, Muthén and Muthén, Los Angeles, CA.

OECD (Organisation for Economic Cooperation and Development) (2012), *Teaching in Focus*, Paris, available at: http://www.oecd.org/education/school/50446648.pdf.

Pan, J., Liu, S., Ma, B. and Qu, Z. (2018), "How does proactive personality promote creativity? A multilevel examination of the interplay between formal and informal leadership", *Journal of Occupational and Organizational Psychology*, Vol. 91 No. 4, pp. 852-874.

Paré, D.E. and Joordens, S. (2008), "Peering into large lectures: examining peer and expert mark agreement using peerScholar, an online peer assessment tool", *Journal of Computer Assisted Learning*, Vol. 24 No. 6, pp. 526-540.

Potočnik, K. and Anderson, N. (2012), "Assessing Innovation: a 360-degree appraisal study", *International Journal of Selection and Assessment*, Vol. 20 No. 4, pp. 497-509.

Rada, R. and Hu, K. (2002), "Patterns in student–student commenting", *IEEE Transactions on Education*, Vol. 45, pp. 262-267.

Rodrigues, N. and Rebelo, T. (2019), "Predicting innovative performance through proactive personality: examining its criterion validity and incremental validity over the five-factor model", *International Journal of Selection and Assessment*, Vol. 27 No. 1, pp. 1-8.

Ryan, R.M. and Deci, E.L. (2000), "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being", *American Psychologist*, Vol. 55, pp. 68-78.

Schuh, S.C., Zhang, X., Morgeson, F.P., Tian, P. and andvan Dick, R. (2018), "Are you really doing good things in your boss's eyes? Interactive effects of employee innovative work behavior and leader–member exchange on supervisory performance ratings", *Human Resource Management*, Vol. 57, pp. 397-409.

Scott, S.G. and Bruce, R.A. (1994), "Determinants of innovative behavior: a path model of individual innovation in the workplace", *Academy of Management Journal*, Vol. 37 No. 3, pp. 580-607.

Seibert, S.E., Kraimer, M.L. and Crant, J.M. (2001), "What do proactive people do? A longitudinal model linking proactive personality and career success", *Personnel Psychology*, Vol. 54 No. 4, pp. 845-874.

Seldin, P. (1999), *Changing Practices in Evaluating Teaching: A Practical Guide to Improved Faculty Performance and Promotion/tenure Decisions*, Anker, Bolton, MA.

Silvia, P.J. (2008), "Discernment and creativity: how well can people identify their most creative ideas", *Psychology of Aesthetics, Creativity, and the Arts*, Vol. 2, pp. 139-146.

Stewart, R.E., Williams, N., Byeon, Y.V., Buttenheim, A., Sridharan, S., Zentgraf, K., Jones, D., Hoskins, K., Candon, M. and Beidas, R.S. (2019), "The clinician crowdsourcing challenge: using participatory design to seed implementation strategies", *Implementation Science*, Vol. 14 No. 1, p. 63.

Thurlings, M., Evers, A.T. and Vermeulen, M. (2015), "Toward a model of explaining teachers' innovative behavior: a literature review", *Review of Educational Research*, Vol. 85 No. 3, pp. 430-471.

Tierney, P. and Farmer, S. (2002), "Creative self-efficacy : its potential antecedents and relationship to creative performance", *Academy of Management Journal*, Vol. 45 No. 6, pp. 1137-1148.

Vallerand, R.J. (1997), "Toward a hierarchical model of intrinsic and extrinsic motivation", in Zanna, M.P. (Ed.), *Advances in Experimental Social Psychology*, San Diego, CA, pp. 271-360.

Wang, M. and Wanberg, C.R. (2017), "100 years of applied psychology research on individual careers: from career management to retirement", *Journal of Applied Psychology*, Vol. 103 No. 3, pp. 546-563.

Woolhouse, M. (1999), "Peer assessment: the participants' perception of two activities on a further education teacher education course", *Journal of Further and Higher Education*, Vol. 23, pp. 211-219.

Yuan, F. and Woodman, R.W. (2010), "Innovative behavior in the workplace: the role of performance and image outcome expectations", *Academy of Management Journal*, Vol. 53 No. 2, pp. 323-342.

Zhou, J. and Shalley, C.E. (2003), "Research on employee creativity: a critical review and directions for future research", *Research in Personnel and Human Resource Management*, Vol. 22, pp. 165-217.

Appendix

Table A1. Reliabilities and discriminant matrix

	CR	AVE	Discriminant matrix (1)	(2)	(3)	(4)
Employee learning orientation	0.81	0.41	0.64			
Intrinsic motivation	0.77	0.54	0.06	0.73		
Creative self-efficacy	0.84	0.58	0.02	0.78	0.76	
Proactive personality	0.89	0.47	0.06	0.45	0.67	0.69

Note(s): Elements in the lower triangular matrix of the discriminant matrix are correlation between the latent constructs while the diagonal elements are square root of AVE

Corresponding author
Samvet Kuril can be contacted at: samvet.kuril@ahduni.edu.in