Assessment in Education: Principles, Policy & Practice

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/caie20

Assessment is contagious: the social contagion of formative assessment practices and self-efficacy among teachers

Zi Yan & Ronnel B. King

To cite this article: Zi Yan & Ronnel B. King (2023) Assessment is contagious: the social contagion of formative assessment practices and self-efficacy among teachers, Assessment in Education: Principles, Policy & Practice, 30:2, 130-150, DOI: 10.1080/0969594X.2023.2198676

To link to this article: https://doi.org/10.1080/0969594X.2023.2198676

ASSESSMENT IN EDUCATION: PRINCIPLES, POLICY & PRACTICE
2023, VOL. 30, NO. 2, 130–150
https://doi.org/10.1080/0969594X.2023.2198676

Routledge
Taylor & Francis Group

Assessment is contagious: the social contagion of formative assessment practices and self-efficacy among teachers

Zi Yan [a] and Ronnel B. King [b]

[a]Department of Curriculum and Instruction, The Education University of Hong Kong, Hong Kong, China; [b]Department of Curriculum and Instruction, Faculty of Education, The Chinese University of Hong Kong, Hong Kong, China

ABSTRACT

Social contagion has been documented across various domains. However, this phenomenon has not been explored in relation to formative assessment in schools. This study examines the social contagion of school teachers' formative assessment practices and self-efficacy. A sample of 296 teachers from 12 Hong Kong primary and secondary schools participated in this study. All participants completed the same questionnaire twice, one year apart. The longitudinal results showed that formative assessment practices and self-efficacy were socially contagious. When teachers had colleagues who engaged in formative assessment practices and had high self-efficacy, they were more likely to engage in formative assessment and become more efficacious themselves. Also, school-level formative assessment self-efficacy predicted individual-level formative assessment practices demonstrating the importance of collective efficacy. The findings can inform the provision of school support and the design of teacher professional development programmes for promoting formative assessment in schools.

ARTICLE HISTORY
Received 12 April 2022
Accepted 26 March 2023

KEYWORDS
Social contagion; formative assessment; self-efficacy; collective efficacy

Introduction

The positive effect of formative assessment on students' learning outcomes has been consistently reported in the literature (e.g. Bennett, 2011; Black & Wiliam, 1998; Dunn & Mulvenon, 2009). However, formative assessment is a challenging practice for teachers and its implementation is far from satisfactory in both Eastern (Yan & Brown, 2021) and Western classrooms (Bonner, 2016; Wiliam et al., 2004). Thus, it is crucial to identify factors influencing teachers' formative assessment practices.

Teaching is a highly context-dependent practice and teachers do not work in isolation. Review studies (e.g. Heitink et al., 2016; Yan et al., 2021) show that both personal and contextual factors influence teachers' beliefs and practices with regard to formative assessment. Among studies examining contextual factors, most have focused on environmental factors (e.g. assessment policy, school support, school leadership) from

CONTACT Zi Yan zyan@eduhk.hk Department of Curriculum and Instruction, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po NT, Hong Kong
Supplemental data for this article can be accessed online at https://doi.org/10.1080/0969594X.2023.2198676.

a pedagogical perspective. Less attention has been paid to the role of fellow teachers who are also an essential part of one's context (van Beurden et al., 2017). In this study, we ask whether fellow teachers' formative assessment practices and self-efficacy could affect one's own implementation and self-efficacy of formative assessment. This phenomenon can be considered a form of social contagion.

Social contagion pertains to the 'catching' of behaviours, emotions, attitudes, and motivational states among interconnected individuals (Levy & Nail, 1993; T. C. Wild & Enzle, 2002). Social contagion research has been conducted in a wide range of domains, such as health (Datar & Nicosia, 2018; Peen et al., 2021), economics (Hansen, 2021), organisations (Bakker et al., 2005, 2006), and family (Chi et al., 2019; Fredriksen et al., 2019; Mazzuca et al., 2018) contexts. It has also been studied in the educational context (Burgess et al., 2018), particularly focusing on contagion among peers or classmates (King, 2020; King & Datu, 2017; Mendoza & King, 2020, 2022 T. C. Wild & Enzle, 2002; T. C. Wild et al., 1997), and contagion from teachers to students (Bakker, 2005; Oberle & Schonert-Reichl, 2016).

However, relatively few studies have examined contagion among teachers and the only exceptions focused on the spread of burnout among teachers (Meredith et al., 2020). To our knowledge, no past study has examined formative assessment practices and self-efficacy from a contagion perspective. Thus, this study aims to investigate the social contagion of teachers' formative assessment practices and self-efficacy. In other words, we are interested in exploring whether teachers who have colleagues engaging in formative assessment practices and having high self-efficacy are more likely to conduct formative assessment and become more efficacious themselves. Understanding this phenomenon would inform the provision of school-based support measures and the design of teacher professional development programmes for promoting formative assessment in schools.

Formative assessment

As a useful strategy to promote students' learning performance and self-regulated learning, formative assessment has become an essential agenda in worldwide educational reform (Birenbaum et al., 2015; Yan & Brown, 2021). Many empirical studies have justified its positive impact on students' learning in different circumstances (e.g. Black & Wiliam, 1998; Dunn & Mulvenon, 2009; Gikandi et al., 2011), although the magnitude of the effects differs across contexts (Bennett, 2011).

Formative assessment refers to activities that elicit evidence of student learning progress which can be used by teachers, students, or others to inform future teaching or learning plans (Black & Wiliam, 1998). As implied by its definition, formative assessment encompasses a wide variety of practices in classrooms (Bennett, 2011; McMillan et al., 2013). Scholars have been working on conceptualising formative assessment regarding its various aspects, components, and strategies (Antoniou & James, 2014; Heritage, 2010; Ruiz-Primo & Furtak, 2006). For example, in Wiliam and Thompson's (2008) framework, various formative assessment practices are categorised into five key strategies, including 1) Clarifying and sharing learning intentions and criteria for success; 2) Engineering effective classroom discussions, questions, and learning tasks; 3) Providing feedback that moves learners forward; 4) Activating students as instructional resources for one another; and 5) Activating students as the owners of their own learning

(Wiliam & Thompson, 2008, p. 64). These strategies could be grouped into two major types, i.e. teacher-directed formative assessment and student-directed formative assessment (Yan & Pastore, 2022). The former refers to formative assessment practices dominated by teachers, such as sharing the learning goals and providing feedback, while the latter refers to formative assessment practices over which students have more control, such as self-assessment and peer-assessment.

Social contagion of motivation and behaviours

As mentioned earlier, social contagion refers to the phenomenon that beliefs, emotions, and behaviours can spread in a social network (Boyles, 2008; Christakis & Fowler, 2013). Previous studies have revealed social contagion of psychological states (e.g. mindset), emotions (e.g. happiness, anxiety), motivations (e.g. intrinsic motivation, growth mindset, and achievement goals), and behaviours (e.g. smoking, cooperative behaviours, and exercising) (Christakis & Fowler, 2013; King & Datu, 2017; King, 2020; King & Mendoza, 2020, 2021; Poirier et al., 2017). Given the absence of research on social contagion in the domain of formative assessment, we draw on the general social contagion literature to provide the evidence base for the present study.

Individuals can infer the motivation of others (Hassin et al., 2005), and the perceived motivational state is likely to result in actions that are consistent with the motivational state of the target person (Bargh et al., 2001). Previous studies (e.g. Frenzel et al., 2009; Radel et al., 2010; T. C. Wild et al., 1997) showed that motivation could spread from teachers to students, or from students to students. For example, Frenzel et al. (2009) revealed that teachers' intrinsic enjoyment of teaching spread to their students. Students who had teachers who enjoyed teaching became more intrinsically motivated themselves. This form of contagion was mediated by teacher enthusiasm and held even after controlling for students' initial levels of enjoyment in their classes. A recent study by Xie et al. (2022) further supported the existence of motivational contagion from a cross-cultural perspective. Using data from a wide range of Eastern and Western cultures, they found that students who perceived that their teachers enjoyed teaching were also more likely to enjoy the lessons themselves. These results held despite accounting for a wide range of potentially confounding factors such as socioeconomic status and gender.

In addition to motivation, various behaviours may spread between connected individuals (Fowler & Christakis, 2010). For instance, Tsvetkova et al. (2014) found that generous behaviours were contagious, with individuals who received help from others more likely to emulate such behaviours themselves. Another study by Aarts et al. (2004) revealed that the pursuit of money and other material rewards was also contagious. When individuals observed other people pursuing materialistic goals, they were more likely to engage in such behaviours themselves. Still, another study by Aral and Nicolaides (2017) found that exercise behaviours were contagious. When one's friends engaged in running, one became more likely to engage in running oneself. Behavioural contagion is sometimes the real cause of the social contagion of other observable outcomes. For example, the spread of obesity is not because obesity itself spreads, but because relevant behaviours (e.g. not exercising regularly and not having a healthy diet) do (Christakis & Fowler, 2013). Although these studies do not focus on formative assessment per se, the phenomenon of social contagion regarding motivation and behaviours might also be operative

among teachers, particularly in relation to their formative assessment behaviours and their self-efficacy in engaging in such behaviours.

Mechanisms of social contagion

Multiple mechanisms could explain why and how social contagion happens. One of the primary mechanisms of social contagion is through a priming process (Laurin, 2016). Priming occurs when some external event activates a mental representation in one's mind and that mental representation becomes more easily accessible (Molden, 2014). For example, the mental representation of formative assessment could be activated and primed when a teacher sees her colleagues engaging in formative assessment practices. Once activated, the mental representation remains accessible for a certain period of time, depending on the personal relevance of the mental representation. For instance, for teachers who value student learning and see the link between formative assessment and student learning, the mental representation of formative assessment might remain active in their consciousness after they see other colleagues engaging in formative assessment practices.

Priming can occur outside of conscious awareness, such as through mimicry, which happens when individuals mimic the voices, facial expressions, postures and behaviours of others (Chartrand & Lakin, 2013; Chartrand & Bargh, 1996). Social contagion can also occur through conscious cognitive effort (Totterdell, 2000) when individuals intentionally attune themselves to affective states or behaviours of others for better social interactions. It is also possible that social contagion happens due to shared context (Westman, 2001, 2011). For example, work engagement is socially contagious between working couples because they share similar family circumstances (e.g. family resources) and experience common stressors (Bakker & Demerouti, 2007).

Social contagion of formative assessment practices and self-efficacy

The phenomenon of social contagion has been examined in teacher populations. For example, Kim et al. (2017) reported that early-career teachers' burnout was strongly influenced by close colleagues' burnout levels. Meredith et al. (2020) also found that burnout could transfer from one teacher to another, especially when interpersonal interactions are strong in terms of frequency, embeddedness, and multiplexity. Westman and Etzion (1999) found that principals' stress crossed over to the teachers they were leading.

Likewise, it is possible that teachers' practices and self-efficacy of formative assessment are potentially socially contagious. However, to the authors' knowledge, there is no study focusing on this topic. Teachers' formative assessment self-efficacy refers to their perceived difficulty in conducting formative assessment in classrooms (Yan & Cheng, 2015). Both teachers' practices and self-efficacy of formative assessment may be affected by fellow teachers. For example, when a teacher observes fellow teachers' formative assessment, she might become more likely to remember her own attempt to engage in such practices in the past, or she might remember the professional development sessions she attended about such assessment practices. The activation of the mental representation of formative assessment may lead to the teacher's own formative assessment practices.

The school context is an overall representation of the level of resources available in the school (Kim et al., 2017) that influence teachers' teaching practices. Teachers within the same school work in more or less the same teaching context (e.g. the class size, teaching workload, and students' characteristics). Thus, teachers' formative assessment practices and self-efficacy could appear as socially contagious under a similar teaching context.

In addition, teachers in the same school usually have the same level of school support (e.g. school-based professional development and professional sharing culture), which may account for the social contagion of teachers' practices and self-efficacy of formative assessment among teachers. For example, when a school provides teachers with frequent and quality professional development on formative assessment, some teachers may substantially enhance their practices and self-efficacy of formative assessment. Consequently, those teachers are more likely to provide fellow teachers with support in terms of knowledge, assessment materials and strategies through within-school professional sharing and discussions. Thus, understanding the potential pattern of social contagion of formative assessment may have important implications for the design and implementation of teacher professional development.

Collective efficacy: the influence of school-level formative assessment self-efficacy on individual formative assessment practices

It is reported that individual teachers' formative assessment self-efficacy influences their formative assessment practices (Yan et al., 2021). Teachers with higher levels of self-efficacy about implementing formative assessment were more likely to perform it (Schütze et al., 2017), even when they encountered setbacks (Dixon & Haigh, 2009). Yan and Cheng (2015) investigated predictors of formative assessment within the framework of the Theory of Planned Behavior (Ajzen, 1991). They found that self-efficacy was the strongest predictor of teachers' intention to conduct formative assessment which, in turn, influenced the actual implementation of formative assessment.

Past studies have shown that collective efficacy contributes to predicting behaviours at the individual level, such as students' bystander behaviours (Sjögren et al., 2020), pro-environmental behaviour (Chen, 2015), and discussion behaviours in collaborative learning environments (Wang & Lin, 2007). However, it is unclear whether collective formative assessment efficacy influences individual teacher formative assessment practice. According to social cognitive theory, members of the same group are likely to act together on shared beliefs (White et al., 2009). Thus, it is conceivable that individual teachers are more likely to conduct formative assessment in a school with a high level of collective efficacy in formative assessment. However, this remains a speculative assumption without empirical evidence. Hence, the current study aims to address this gap.

The present study

The aim of the present study was to examine the social contagion of teachers' formative assessment practices and self-efficacy, as well as the effects of collective efficacy on individual formative assessment practices. To provide a more nuanced picture, we divided formative assessment practice into two types, i.e. teacher-directed formative assessment and student-directed formative assessment. We also posited that these effects

would hold after controlling for alternative explanatory variables, including gender, teaching experience, and school sector (i.e. covariates). The following hypotheses were posited.

First, we posited that formative assessment practices and self-efficacy would be socially contagious (*social contagion hypotheses*). The conceptual framework for the social contagion effects is shown in Figure 1.

Hypothesis 1: School-level teacher-directed formative assessment practices (i.e. having colleagues engaging in teacher-directed formative assessment practices) would positively predict teachers' individual-level teacher-directed formative assessment practices.

Hypothesis 2: School-level student-directed formative assessment practices (i.e. having colleagues engaging in student-directed formative assessment practices) would positively predict teachers' individual-level student-directed formative assessment practices.

Hypothesis 3: School-level formative assessment self-efficacy (i.e. having colleagues with high formative assessment self-efficacy) would positively predict teachers' individual-level formative assessment self-efficacy.

Second, we posited that collective formative assessment efficacy would positively predict individual formative assessment practices (*collective efficacy hypotheses*). The conceptual framework for the collective efficacy effects is shown in Figure 2.

Hypothesis 4: School-level formative assessment self-efficacy (i.e. having colleagues with high formative assessment self-efficacy) would positively predict teachers' individual teacher-directed formative assessment practices.

Hypothesis 5: School-level formative assessment self-efficacy (i.e. having colleagues with high formative assessment self-efficacy) would positively predict teachers' individual student-directed formative assessment practices.

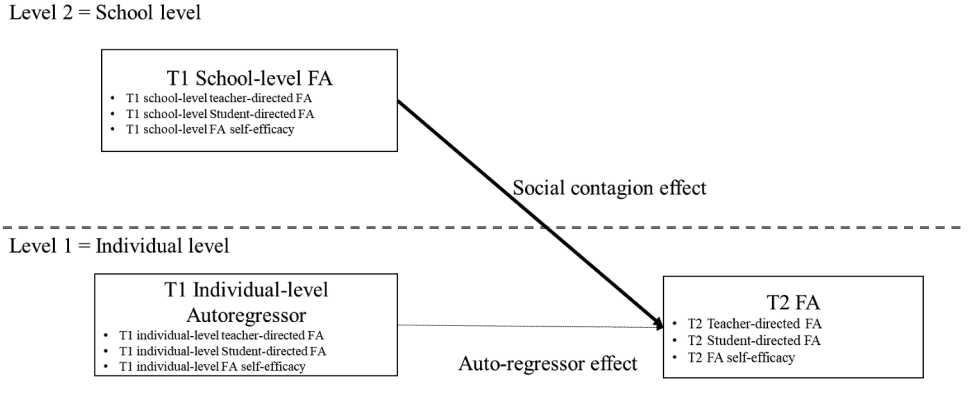

Figure 1. The conceptual framework for the social contagion effects (FA: formative assessment).

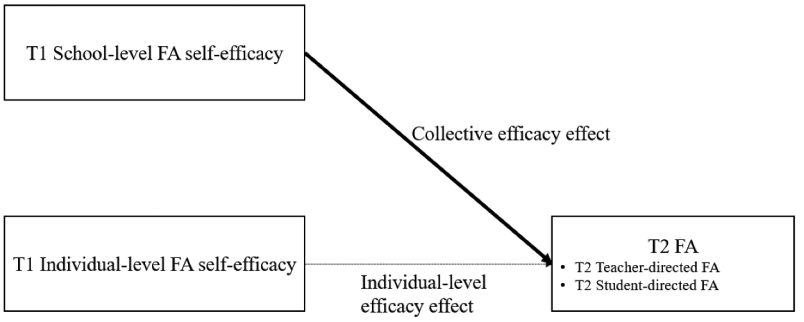

Figure 2. The conceptual framework for collective efficacy effects (FA: formative assessment).

Methods

Participants and data collection procedure

A sample of 296 teachers from 12 schools participated in this study. There were 104 (35%) males and 192 (65%) females. In terms of the school sector, there were 169 (57%) primary and 127 (43%) secondary school teachers. All participating teachers completed the same questionnaire twice, one year apart. A one-year time span between Time 1 (T1) and Time 2 (T2) survey was decided because (1) schools usually plan the timetabling on an annual basis, and (2) one year should be an appropriate period for behaviour contagion to happen. Teachers' responses at T1 and T2 were matched through an eight-digit identifier number, which consists of the last four digits of the participant's telephone number and birth date and month. Ethics approval was obtained from the first author's affiliated University. The participation of teachers in the study was entirely voluntary, and written consent was obtained from all participants.

Measures

Teacher formative assessment practice

Teachers' formative assessment practices were assessed with the Teacher Formative Assessment Practice Scale (TFAPS) (Yan & Pastore, 2022). The development of the TFAPS was guided by the Wiliam and Thompson's (2008) five-category framework of formative assessment, as discussed earlier. The scale has 10 items under two subscales. One is the teacher-directed formative assessment subscale (TdFA; 6 items; Rasch reliability 0.74). This subscale has six items grouped into three categories of formative assessment practices, including *clarifying learning intentions and criteria for success* (e.g. I share the learning intention before students start working in class.), *engineering effective tasks to check students' learning progress* (e.g. I use various assessment activities in the classroom to check students' mastery of course content.) and *providing feedback to support learning* (e.g. I point out students' strengths and weaknesses in my feedback.). The other is the student-directed formative assessment subscale (SdFA; 4 items; Rasch reliability 0.77) which has four items grouped into two categories of formative assessment practices, including *activating peer assessment* (e.g. I ask students to provide feedback to help peers improve.) and *activating self-assessment* (e.g. I ask students to identify strengths and weaknesses in their own work.). A six-

point response scale (1 = *Never*, 2 = *Rarely*, 3 = *Seldom*, 4 = *Sometimes*, 5 = *Frequently*, 6 = *Very Frequently*) was used for all items.

Teacher formative assessment self-efficacy

Teachers' formative assessment self-efficacy was assessed with the self-efficacy subscale in the Teacher's Conceptions and Practices of Formative Assessment Questionnaire (Yan & Cheng, 2015). The self-efficacy subscale has six items (Rasch reliability 0.84; e.g. I can design appropriate assessment tasks for formative assessment). A six-point response scale ranging from *Strongly Disagree* (1) to *Strongly Agree* (6) was adopted for all items.

Covariates

The covariates used in this study included gender, teaching experience, and school sector (primary vs. secondary).

Analytic strategy

We examined the missing data, generated descriptive statistics, and computed the bivariate correlations among the variables before proceeding with testing the measurement model and examining our key hypotheses.

Testing the measurement model. We conducted longitudinal confirmatory factor analyses (CFA) on the scales used to check their construct validity. To assess the fit of the CFA models, we followed existing guidelines: CFI and TLI values greater than .90 and RMSEA and SRMR values <.08 indicate a good fit (Hu & Bentler, 1999).

Testing the hypotheses. To test the social contagion effects, we aggregated teachers' responses in the same school and used this as a between-school factor (Level 2). Aggregating school characteristics and using this as a between-level variable has been used in past studies (Bifulco et al., 2011; Chiu & Chow, 2011) and social contagion research more specifically (e.g. King & Datu, 2017; King, 2020).

We applied multilevel path analysis (i.e. means-as-outcomes regression analyses with fixed effects) in MPLUS Version 8.3 (Muthén & Muthén, 2017). This analysis accounted for the nested nature of our data. We tested two multilevel models for each of the three formative assessment variables, i.e. teacher-directed formative assessment, student-directed formative assessment, and formative assessment self-efficacy (see Models 1 to 3). The *first model* (Model a) only focused on testing the social contagion and the auto-regressor effect. The *second model* (Model b) tested whether social contagion effects held despite including alternative explanations such as gender, teaching experience, and school sector.

Collective efficacy effects. Our second set of analyses (Models 4 and 5) focused on the role of self-efficacy at both the individual and school-level in impacting formative assessment practices. To operationalise school-level self-efficacy, we aggregated teachers' responses in the same school and used this as a between-school factor (Level 2).

Note that we tested each formative assessment variable separately instead of combining all the variables in one multilevel model. This was because the number of level 2 units (12 schools) in this study was on the lower end of the recommended threshold for multilevel models (Meuleman & Billiet, 2009). It is not advisable to put all the variables together in one overall model because the small number of level 2 units might lead to an overfitted model.

Results

Missing data analysis

We first checked missing data and found that 27 teachers had missing data at either one of the two time points (9% missing). We compared the analyses where data were deleted listwise and the one where we used Expectation Maximisation (EM) to impute missing data. Substantive results remained the same. Since EM is the better approach to handling missing data (Enders & Bandalos, 2001), all analyses below used EM to deal with missing data.

Descriptive statistics and correlations

The descriptive statistics and bivariate correlations for T1 and T2 variables are shown in Table 1. The correlations are all statistically significant, ranging from .226 to .557. The internal consistency reliabilities of the scales were all above .70.

Testing the measurement model through CFAs

We tested two models, both of which are theoretically grounded. We first tested a four-factor longitudinal CFA model wherein we had four factors. We allowed the error terms for the same item at T1 and T2 to correlate, as suggested by Marsh (1989). The four latent factors were: T1 formative assessment, T2 formative assessment, T1 self-efficacy, and T2 self-efficacy. The fit indices were not that good: chi-square = 1097.924; df = 442; $p < .001$; chi-square/df = 2.484; TLI =.857, CFI =.872.

We then tested a model that separated teacher-directed from student-directed formative assessment. This resulted in a six-factor model: T1 teacher-directed formative assessment, T2 teacher-directed formative assessment, T1 student-directed formative assessment, T2 student-directed formative assessment, T1 formative assessment self-efficacy, and T2 formative assessment self-efficacy. The measurement model had good fit: chi-square = 825.429; df = 433; $p < .001$; chi-square/df = 1.906; CFI =.924; TLI =.913; RMSEA =.055. The model fit statistics of the six-factor model were better than those of the four-factor model. A chi-square difference test revealed that the four-factor model was significantly

Table 1. Descriptive statistics, bivariate correlations, and internal reliabilities.

	1	2	3	4	5	6
(1) T1 Teacher-directed FA	—	.490***	.415***	.540***	.289***	.289***
(2) T1 Student-directed FA		—	.341***	.410***	.557***	.226***
(3) T1 FA self-efficacy			—	.291***	.250***	.352***
(4) T2 Teacher-directed FA				—	.489***	.302***
(5) T2 Student-directed FA					—	.275***
(6) T2 FA self-efficacy						—
Mean	4.75	4.00	4.21	4.84	4.01	4.60
SD	.44	.74	.66	.40	.76	.63
Cronbach's alpha	.75	.86	.81	.70	.86	.93
Skewness	−.20	−.44	−.36	.02	−.51	−.90
Kurtosis	.24	−.03	.88	.57	.98	3.55

Note: FA = Formative assessment; ***$p < .001$.

different from the six-factor model: chi-square difference = 272.495, df difference = 9; $p < .001$. Hence, we used the six-factor model for all subsequent analyses. All items loaded onto their respective latent constructs with factor loadings ranging from .400 to .871. All loadings were significant at $p < .001$.

Testing the key hypotheses through multilevel path analysis

We applied different multilevel models to test the five hypotheses of this study. We first tested a simple model that focused on the contagion effect without any covariates (Model a). Next, we tested a model with the different covariates added to test the robustness of our results (Model b). Table 2 presents the results for testing Hypotheses 1 to 3, and Table 3 presents the results for Hypotheses 4 and 5. The supplementary materials contain all the models we have tested.

Testing H1: Social contagion of teacher-directed formative assessment

No covariates (Model 1a). The model indicated that T2 individual-level teacher-directed FA was significantly predicted by T1 school-level teacher-directed FA ($\beta = 0.979$, $p < .001$), supporting H1 even after controlling for auto-regressor effects ($\beta = 0.465$, $p < .001$).

With covariates (Model 1b). Next, we added several covariates to test the robustness of the results. H1 was still supported with T1 school-level teacher-directed FA positively predicting T2 individual-level teacher-directed FA ($\beta = 0.883$, $p < .001$).

Table 2. Testing the social contagion hypotheses.

	T2 Teacher-directed FA		T2 Student-directed FA		T2 FA Self-efficacy	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Level 1						
T1 Auto-regressor	.465***	.458***	.515***	.517***	.308**	.308***
Gender		.079		−.033		−.022
Teaching experience		−.005		.008		−.018
Level 2						
T1 School-level FA variable	**.979*** **	**.883*** **	**.975*** **	**.931** **	**.785*** **	**.926*** **
Sector		.197		.285		
R2 at Level 1	21.6%	22.3%	26.5%	26.8%	9.5%	9.6%
R2 at Level 2	95.8%	97%	95.1%	98.7%	61.6%	92.1%
ICC	.112	.132	.071	.068	0.111	.107
Fit indices						
Chi-square	53.780	90.916	139.317	165.790	15.363	27.281
df	2	5	2	5	2	5
P value	<.001	<.001	<.001	<.001	<.001	<.001
CFI	1.00	1.00	1.00	.999	1.00	1.00
TLI	1.00	1.00	1.00	1.00	1.00	1.00
RMSEA	.000	.000	.000	.000	.000	.000
SRMR (within)	.000	.000	.000	.008	.000	.000
SRMR (between)	.005	.004	.007	.015	.002	.005

Note: FA = Formative assessment; **$p < .01$; ***$p < .001$.

Table 3. Testing the collective efficacy hypotheses.

	T2 Teacher-directed FA		T2 Student-directed FA	
	Model 4a	Model 4b	Model 5a	Model 5b
Level 1				
T1 FA self-efficacy	.223*	.215*	.199*	.198***
Gender	—	.097*	–	–.048
Teaching experience	—	–.091**	–	.044
Level 2				
T1 School-level FA self-efficacy	**.925*** **	**.806*** **	**.895*** **	**.873*** **
Sector	–	.387*	–	.216
R2 at Level 1	5%	6.7%	3.9%	4.3%
R2 at Level 2	85.5%	98.1%	80%	91.3%
ICC			.063	.057
Fit indices				
Chi-square	10.315	26.952	9.221	17.615
df	2	5	2	5
P value	<.001	<.001	<.001	.004
CFI	1.00	1.00	1.00	.994
TLI	1.00	1.00	1.00	1.00
RMSEA	.000	.000	.000	.000
SRMR (within)	.000	.007	.000	.008
SRMR (between)	.007	.023	.009	.018

Note: FA = Formative assessment; *$p < .05$; **$p<.01$; ***$p<.001$.

Testing H2: Social contagion of student-directed formative assessment

No covariates (Model 2a). The model indicated that T2 individual-level student-directed FA was significantly predicted by T1 school-level student-directed FA ($\beta = 0.975$, $p < .001$), supporting H2 even after controlling for auto-regressor effects ($\beta = 0.515$, $p < .001$).

With covariates (Model 2b). Next, we added several covariates to test the robustness of the results. H2 was still supported with T1 school-level student-directed FA positively predicting T2 individual-level student-directed FA ($\beta = 0.931$, $p < .001$) despite the inclusion of auto-regressor and covariates into the model.

Testing H3: Social contagion of formative assessment self-efficacy

No covariates (Model 3a). The model indicated that T2 individual-level FA self-efficacy was significantly predicted by T1 school-level FA self-efficacy ($\beta = .785$, $p < .001$), supporting H2 even after controlling for auto-regressor effects ($\beta = 0.308$, $p < .001$).

With covariates (Model 3b). Next, we added several covariates to test the robustness of the results. H3 was still supported with T1 school-level FA self-efficacy positively predicting T2 individual-level FA self-efficacy ($\beta = 0.926$, $p < .001$) despite the inclusion of auto-regressor and covariates into the model.

Testing H4: Self-efficacy as a predictor of teacher-directed formative assessment

No covariates (Model 4a). The model indicated that T2 individual-level teacher-directed FA was significantly predicted by T1 school-level FA self-efficacy ($\beta = 0.925$, $p < .001$), confirming H4. These results held even after controlling for individual-level FA self-efficacy ($\beta = 0.223$, $p < .05$). Substantively, this meant that a 1 SD unit increase in school-level FA self-efficacy was associated with a .925 SD unit increase in teacher-directed FA.

With covariates (Model 4b). The model indicated T1 school-level FA self-efficacy significantly predicted T2 individual-level teacher-directed FA ($\beta = 0.806$, $p < .001$).

These results were held after taking into account the roles of individual-level FA self-efficacy and other covariates such as gender, teaching experience, and school sector. The results were robust to the inclusion of covariates.

Testing H5: Self-efficacy as a predictor of student-directed formative assessment

No covariates (Model 5a). The model indicated that T2 individual-level student-directed FA was significantly predicted by T1 school-level FA self-efficacy ($\beta = 0.895$, $p < .001$), confirming H5. The results held after taking into account individual-level FA self-efficacy.

With covariates (Model 5b). The model indicated that T2 individual-level student-directed FA was significantly predicted by T1 school-level FA self-efficacy ($\beta = 0.873$, $p < .001$). These results held despite taking into account the roles of individual-level self-efficacy and other covariates such as gender, teaching experience, and sector, demonstrating the robustness of H5 to the inclusion of covariates.

Discussion

Although the crucial role of formative assessment in facilitating students' learning has been well documented in the literature (e.g. Black & Wiliam, 1998; Dunn & Mulvenon, 2009), many teachers are reluctant to adopt formative assessment in their classrooms (Boardman & Woodruff, 2004; Brookhart, 2011). Past studies have explored personal and contextual factors influencing teachers' formative assessment practices and self-efficacy (see Yan et al., 2021 for a review), but there is a lack of consideration of the impact of fellow teachers who are also an important part of one's context (van Beurden et al., 2017; Yan et al., 2022). The present study extends this line of research by examining the social contagion of teachers' formative assessment practices and self-efficacy. We tested whether fellow teachers' formative assessment practices and self-efficacy could affect one's own engagement and self-efficacy in such practices. To our knowledge, the present study is the first of its kind to test the social contagion phenomenon in the context of educational assessment.

The results showed that teachers' formative assessment practices and self-efficacy spread among teachers within the same school. When teachers within a school performed formative assessment more frequently, individual teachers carried out formative assessment more frequently. When one's colleagues had higher formative assessment self-efficacy, individual teachers also became more efficacious in engaging in formative assessment themselves.

Several viable explanations exist for the social contagion of formative assessment practices and self-efficacy. Firstly, it may occur through unconscious mimicry. Observing others in the same group can result in one's unconscious mimicry of various behaviours or emotions (B. Wild et al., 2001; Hatfield et al., 2009). For instance, when a teacher talks about formative assessment with fellow teachers or sees formative assessment practices in colleagues' classrooms, the teacher might be more likely to recall the training received, leading to enhanced self-efficacy and engagement in formative assessment practices. Secondly, it may occur through conscious cognitive effort. Past studies showed that the appreciation of the goals of others might nudge one to pursue similar goals and take action to attain them (Aarts et al., 2004; Byrne & Russon, 1998). As

a collective goal, formative assessment is usually explicitly embedded in school policy and communicated among teachers (Yan & Brown, 2021). It is likely that the appreciation of the collective goal (formative assessment) leads to teachers' automatic adoption and pursuit of the goal. Thirdly, it could be the result of shared context. Teachers within a school teach in the same teaching context, face similar formative assessment difficulties, and share a similar level of school support. Under such a shared context, teachers' formative assessment practices and self-efficacy can be modelled and 'caught' by fellow teachers.

Results also indicated that school-level formative assessment self-efficacy predicts individual-level formative assessment practices. When teachers within a school, on average, had higher formative assessment self-efficacy, individual teachers carried out formative assessment more frequently. Taken together, the results provided evidence that formative assessment practices and self-efficacy could be contagious among teachers within a school. These contagion effects held even after taking into account gender, teaching experience, school sector, as well as individual-level teachers' formative assessment practices and self-efficacy at T1.

Past studies have documented the link between collective efficacy and individual behaviours (e.g. Chen, 2015; Sjögren et al., 2020; Wang & Lin, 2007). However, the investigations of the relationship between teachers' self-efficacy and practices of formative assessment remain at the individual level (Brink & Bartz, 2017; Dixon & Haigh, 2009; Karaman & Sahin, 2017; Schütze et al., 2017). This study advances this line of research one more step. The result supported the direct association between school-level formative assessment self-efficacy and individual-level formative assessment practices, even after controlling for individual-level formative assessment self-efficacy. Such an association is probably due to teachers' cooperation and peer support in implementing formative assessment. For example, teachers with high self-efficacy may communicate their positive attitudes and share their knowledge and strategies with their colleagues. These interactions create a positive school climate that facilitates the implementation of formative assessment by individual teachers, independent of the individual level of self-efficacy.

The present study advances the literature on social contagion. On the one hand, our findings extend previous studies on the contagion of working behaviours (e.g. Bakker et al., 2006; Totterdell, 2000) to the education context. Social contagion research within the educational domain has mostly focused on contagion among students (Cohen & Prinstein, 2006; King, 2020; King & Datu, 2017) or contagion from teachers to students (Radel et al., 2010). However, less work has been conducted on contagion among teachers, and the few existing studies focus exclusively on burnout contagion among teachers (Meredith et al., 2020). Our study extends these findings to the domain of formative assessment.

On the other hand, our findings corroborate some precedent evidence regarding formative assessment from a social contagion view. For example, Yan et al. (2022) revealed that the total number of teachers in a school influenced teachers' formative assessment practices: the more teachers in a school, the more likely teachers implement formative assessment. They speculated that more teachers within a school increased the likelihood of conducting formative assessment and facilitating peer support. In another study based on PISA 2018 data, Yan and Chiu (2022) found that two formative

assessment strategies (i.e. clarifying goals and monitoring progress, and instructional adjustments) reported at the school-level drove effective formative assessment collectively and improved student learning performance. They argued that when more teachers within a school engage in formative assessment, there is greater mutual support. Therefore, teachers could do it more effectively than doing it alone. Their findings seem verified in this study. The present findings imply that more teachers within a school may foster social contagion, which explains more use of formative assessment. In addition, past studies revealed that teachers' formative assessment practices were influenced by the opinions of important others, or subjective norms (e.g. Ahmedi, 2019; Yan & Cheng, 2015). Similarly, fellow teachers' practices and self-efficacy of formative assessment are likely to influence individual teachers' formative assessment practices.

Implications

Aside from advancing theory on formative assessment and social contagion, the present findings also have practical implications. The present findings can inform the design of school support and teacher professional development programmes to promote formative assessment implementation.

The social contagion of formative assessment practice could be promoted by developing an appropriate school environment and providing internal support, which are two crucial determinants of teachers' formative assessment practices (Yan et al., 2021). A positive school environment involves encouraging leadership and collegial support. In a school where the school leaders value and encourage formative assessment, staff share a similar understanding of formative assessment, teachers are open to collaborations and peer support in implementing formative assessment, and teachers have opportunities to share the best practice, the formative assessment practices are likely to flourish.

Internal school support for formative assessment could be provided in various forms, such as school-based policies prioritising formative assessment, clear and concrete operational guidelines, necessary facilities, curriculum and manpower adjustments, and easy access to professional support. Without necessary school support, teachers are less likely to implement formative assessment or do it well (Crichton & McDaid, 2016; Yan, 2021).

Professional development can change teachers' perceptions (Dixon & Haigh, 2009; So & Lee, 2011) and promote the implementation of formative assessment in classrooms (DeLuca et al., 2019). However, the effectiveness of teacher professional development depends on the programme design. The findings of this study imply that a whole-school approach of formative assessment training may be more effective than training some teachers from different schools. This is because the whole-school teacher training can develop the desirable school environment, as discussed earlier, which facilitates the contagion of formative assessment practices. Training all teachers in a school enables peer interaction and support, a potential pathway for the contagion of working behaviours (Bakker & Xanthopoulou, 2009).

The contagion of formative assessment practices also highlights the importance of informal learning organisations, such as professional learning communities. Such learning environments can develop teachers' professional knowledge and skills and build peer

trust and collective teacher efficacy (Bozkurt et al., 2021). All of these characteristics can foster the social contagion of formative assessment practices.

Limitations and future directions

Despite the strengths of the present study, limitations need to be acknowledged. First, the study, though longitudinal in nature, is not experimental. Indeed, some of the most rigorous studies on social contagion in the educational context have used experimental designs to demonstrate stronger evidence of causality (Radel et al., 2010, 2015). Future studies can apply experimental or quasi-experimental designs to explore whether professional development activities promoting formative assessment among a certain group of teachers would have crossover effects on other teachers they interact with.

Second, the number of schools in our study was relatively small given the logistical challenges of recruiting a large number of schools. Future studies with more schools could enhance the generalisability of our findings. As all data were collected in the Hong Kong context, it will be meaningful to explore whether there is a similar phenomenon in different cultural contexts. Furthermore, future studies could examine school factors that may influence the social contagion effect. For example, questions – such as whether social contagion effects are more pronounced in public or private schools, rural or urban schools? Or whether social contagion effects are influenced by teachers' formative assessment training experience? – could be explored with larger and more heterogeneous samples.

Another limitation is related to the reliance on self-report measures, which may be subjective to response bias (e.g. social desirability). Future studies are encouraged to use more objective measures of teachers' formative assessment practices for more accurate estimates of social contagion effects.

This study is exploratory in nature. It will be meaningful to have more studies to replicate and expand on this new finding, and identify the potential mediators and moderators that might influence social contagion effects among teachers' formative assessment practices.

Conclusion

The present study makes a unique contribution to the literature by examining the social contagion of teachers' formative assessment practices and self-efficacy. Our study has several key findings. First, having colleagues who are engaging in formative assessment practices makes one more likely to engage in formative assessment oneself. These results held even after controlling for one's previous formative assessment practices and also held regardless of gender, teaching experience, and school type. Second, when other teachers within the school demonstrate high levels of self-efficacy in formative assessment, teachers also become more efficacious themselves. Third, when other teachers were self-efficacious, teachers were more likely to engage in formative assessment practices themselves. Our findings provide insight into the importance of school dynamics in shaping teachers' assessment practices. Educators and school leaders could leverage the phenomenon of social contagion to provide appropriate school support and design whole-school teacher training to advance formative assessment implementation.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The work was supported by the General Research Fund from the Research Grants Council of the Hong Kong SAR, China [EDUHK 18607118].

Notes on contributors

Zi Yan is a full Professor in the Department of Curriculum and Instruction at The Education University of Hong Kong. His research interests focus on two related areas, i.e., educational assessment in the school and higher education contexts with an emphasis on student self-assessment; and Rasch measurement, particularly its application in educational and psychological research. A recent book is entitled, *Student self-assessment as a process for learning*.

Ronnel King is an Associate Professor in the Department of Curriculum and Instruction, Faculty of Education, The Chinese University of Hong Kong. His research focuses on motivation, well-being, and positive psychology/education within K-12 and higher education contexts.

ORCID

Zi Yan http://orcid.org/0000-0001-9305-884X
Ronnel B. King http://orcid.org/0000-0003-1723-1748

References

Aarts, H., Gollwitzer, P. M., & Hassin, R. R. (2004). Goal contagion: perceiving is for pursuing. *Journal of Personality and Social Psychology*, *87*(1), 23–37. https://doi.org/10.1037/0022-3514.87.1.23

Ahmedi, V. (2019). Teachers' attitudes and practices towards formative assessment in primary schools. *Journal of Social Studies Education Research*, *10*(3), 161–175. https://www.learntechlib.org/p/216460/

Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Antoniou, P., & James, M. (2014). Exploring formative assessment in primary school classrooms: Developing a framework of actions and strategies. *Educational Assessment, Evaluation and Accountability*, *26*(2), 153–176. https://doi.org/10.1007/s11092-013-9188-4

Aral, S., & Nicolaides, C. (2017). Exercise contagion in a global social network. *Nature Communications*, *8*(1), 1–8. https://doi.org/10.1038/ncomms14753

Bakker, A. B. (2005). Flow among music teachers and their students: The crossover of peak experiences. *Journal of Vocational Behaviour*, *66*(1), 26–44. https://doi.org/10.1016/J.JVB.2003.11.001

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology*, *22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Bakker, A. B., Le Blanc, P. M., & Schaufeli, W. B. (2005). Burnout contagion among intensive care nurses. *Journal of Advanced Nursing*, *51*(3), 276–287. https://doi.org/10.1111/j.1365-2648.2005.03494.x

Bakker, A. B., van Emmerik, H., & Euwema, M. C. (2006). Crossover of burnout and engagement in work teams. *Work and Occupations*, *33*(4), 464–489. https://doi.org/10.1177/0730888406291310

Bakker, A. B., & Xanthopoulou, D. (2009). The crossover of daily work engagement: Test of an actor–partner interdependence model. *The Journal of Applied Psychology*, *94*(6), 1562–1571. https://doi.org/10.1037/a0017525

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, *81*(6), 1014–1027. https://doi.org/10.1037/0022-3514.81.6.1014

Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in Education: Principles, Policy & Practice*, *18*(1), 5–25.

Bifulco, R., Fletcher, J. M., & Ross, S. L. (2011). The effect of classmate characteristics on post-secondary outcomes: Evidence from the add health. *American Economic Journal: Economic Policy*, *3*(1), 25–53. https://doi.org/10.1257/pol.3.1.25

Birenbaum, M., DeLuca, C., Earl, L., Heritage, M., Klenowski, V., Looney, A., Smith, K., Timperley, H., Volante, L., & Wyatt-Smith, C. (2015). International trends in the implementation of assessment for learning: Implications for policy and practice. *Policy Futures in Education*, *13*(1), 117–140. https://doi.org/10.1177/1478210314566733

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Boardman, A. G., & Woodruff, A. L. (2004). Teacher change and "high stakes" assessment: What happen to professional development? *Teaching and Teacher Education*, *20*(6), 545–557. https://doi.org/10.1016/j.tate.2004.06.001

Bonner, S. M. (2016). Teachers' perceptions about assessment: Competing narratives. In G. T. L. Brown & L. R. Harris (Eds.), *Handbook of human and social conditions in assessment* (pp. 21–39). Routledge.

Boyles, S. (2008). Happiness is contagious: Social networks affect mood, study shows. Retrieved from http://www.webmd.com/balance/news/20081204/happiness-is-contagious.

Bozkurt, S., Çoban, Ö., Özdemir, M., & Özdemir, N. (2021). How leadership, school culture, collective efficacy, academic self-efficacy, and socioeconomic status affect student achievement. *Egitim ve Bilim*, *46*(207). https://doi.org/10.15390/EB.2021.9338

Brink, M., & Bartz, D. E. (2017). Effective use of formative assessment by high school teachers. *Practical Assessment, Research & Evaluation*, *22*(8). https://doi.org/10.7275/zh1k-zk32

Brookhart, S. M. (2011). Educational assessment knowledge and skills for teachers. *Educational Measurement: Issues and Practices*, *30*(1), 3–12. https://doi.org/10.1111/j.1745-3992.2010.00195.x

Burgess, L. G., Riddell, P. M., Fancourt, A., & Murayama, K. (2018). The influence of social contagion within education: A motivational perspective. *Mind, Brain, and Education*, *12*(4), 164–174. https://doi.org/10.1111/MBE.12178

Byrne, R. W., & Russon, A. E. (1998). Learning by imitation: A hierarchical approach. *The Behavioural and Brain Sciences*, *21*(5), 667–721. https://doi.org/10.1017/S0140525X98001745

Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of impression formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology*, *71*(3), 464–478. https://doi.org/10.1037/0022-3514.71.3.464

Chartrand, T. L., & Lakin, J. L. (2013). The antecedents and consequences of human behavioral mimicry. *Annual Review of Psychology*, *64*(1), 285–308. https://doi.org/10.1146/annurev-psych-113011-143754

Chen, M. F. (2015). Self-efficacy or collective efficacy within the cognitive theory of stress model: Which more effectively explains people's self-reported pro-environmental behaviour? *Journal of Environmental Psychology*, *42*, 66–75. https://doi.org/10.1016/j.jenvp.2015.02.002

Chi, P., Du, H., King, R. B., Zhou, N., Cao, H., & Lin, X. (2019). Well-being contagion in the family: Transmission of happiness and distress between parents and children. *Child Indicators Research*, *12*(6), 2189–2202. https://doi.org/10.1007/s12187-019-09636-4

Chiu, M. M., & Chow, B. W. Y. (2011). Classroom discipline across forty-one countries: School, economic, and cultural differences. *Journal of Cross-Cultural Psychology*, *42*(3), 516–533. https://doi.org/10.1177/0022022110381115

Christakis, N. A., & Fowler, J. H. (2013). Social contagion theory: Examining dynamic social networks and human behavior. *Statistical Medicine*, *32*(4), 556–577. https://doi.org/10.1002/sim.5408

Cohen, G. L., & Prinstein, M. J. (2006). Peer contagion of aggression and health risk behaviour among adolescent males: An experimental investigation of effects on public conduct and private attitudes. *Child Development*, *77*(4), 967–983. https://doi.org/10.1111/j.1467-8624.2006.00913.x

Crichton, H., & McDaid, A. (2016). Learning intentions and success criteria: Learners' and teachers' views. *The Curriculum Journal*, *27*(2), 190–203. https://doi.org/10.1080/09585176.2015.1103278

Datar, A., & Nicosia, N. (2018). Assessing social contagion in body mass index, overweight, and obesity using a natural experiment. *JAMA Pediatrics*, *172*(3), 239–246. https://doi.org/10.1001/JAMAPEDIATRICS.2017.4882

DeLuca, C., Chapman-Chin, A., & Klinger, D. A. (2019). Toward a teacher professional learning continuum in assessment for learning. *Educational Assessment*, *24*(4), 267–285. https://doi.org/10.1080/10627197.2019.1670056

Dixon, H., & Haigh, M. (2009). Changing mathematics teachers' conceptions of assessment and feedback. *Teacher Development*, *13*(2), 173–186. https://doi.org/10.1080/13664530903044002

Dunn, K. E., & Mulvenon, S. W. (2009). A critical review of research on formative assessments: The limited scientific evidence of the impact of formative assessments in education. *Practical Assessment & Research and Evaluation*, *14*(7), 1–11.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling*, *8*(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5

Fowler, J. H., & Christakis, N. A. (2010). Cooperative behavior cascades in human social networks. *Proceedings of the National Academy of Sciences*, *107*(12), 5334–5338.

Fredriksen, E., von Soest, T., Smith, L., & Moe, V. (2019). Depressive symptom contagion in the transition to parenthood: Interparental processes and the role of partner-related attachment. *Journal of Abnormal Psychology*, *128*(5), 397–403. https://doi.org/10.1037/abn0000429

Frenzel, A. C., Goetz, T., Lüdtke, O., Pekrun, R., & Sutton, R. E. (2009). Emotional transmission in the classroom: Exploring the relationship between teacher and student enjoyment. *Journal of Educational Psychology*, *101*(3), 705–716. https://doi.org/10.1037/a0014695

Gikandi, J., Morrow, D., & Davis, N. (2011). Online formative assessment in higher education: A review of the literature. *Computers & Education*, *57*(4), 2333–2351. https://doi.org/10.1016/j.compedu.2011.06.004

Hansen, K. B. (2021). Financial contagion: Problems of proximity and connectivity in financial markets. *Journal of Cultural Economy*, *14*(4), 388–402. https://doi.org/10.1080/17530350.2021.1879211

Hassin, R. R., Aarts, H., & Ferguson, M. (2005). Automatic goal inferences. *Journal of Experimental Social Psychology*, *41*(2), 129–140. https://doi.org/10.1016/j.jesp.2004.06.008

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (2009). Emotional contagion and empathy. In J. Decety & W. Ickes (Eds.), *The social neuroscience of empathy* (pp. 19–30). The MIT Press.

Heitink, M., van der Kleij, F., Veldkamp, B., Schildkamp, K., & Kippers, W. (2016). A systematic review of prerequisites for implementing assessment for learning in classroom practice. *Educational Research Review*, *17*, 50–62. https://doi.org/10.1016/j.edurev.2015.12.002

Heritage, M. (2010). *Formative assessment: Making it happen in the classroom*. Corwin Press.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Karaman, P., & Sahin, C. (2017). Adaptation of teachers' conceptions and practices of formative assessment scale into Turkish culture and a structural equation modeling. *International Electronic Journal of Elementary Education*, *10*(2), 185–194. https://doi.org/10.26822/iejee.2017236114

Kim, J., Youngs, P., & Frank, K. (2017). Burnout contagion: Is it due to early career teachers' social networks or organisational exposure? *Teaching and Teacher Education*, *66*, 250–260. https://doi.org/10.1016/j.tate.2017.04.017

King, R. B. (2020). Mindsets are contagious: The social contagion of implicit theories of intelligence among classmates. *The British Journal of Educational Psychology*, *90*(2), 349–363. https://doi.org/10.1111/bjep.12285

King, R. B., & Datu, J. A. (2017). Happy classes make happy students: Classmates' well-being predicts individual student well-being. *Journal of School Psychology*, *65*, 116–128. https://doi.org/10.1016/j.jsp.2017.07.004

King R. B. and Mendoza N. B. (2020). Achievement goal contagion: Mastery and performance goals spread among classmates. *Social Psychology of Education*, 23(3), 795–814. https://doi.org/10.1007/s11218-020-09559-x

King R. B. and Mendoza N. B. (2021). The social contagion of students' social goals and its influence on engagement in school. *Learning and Individual Differences*, 88, 102004. https://doi.org/10.1016/j.lindif.2021.102004

Laurin, K. (2016). Interpersonal influences on goals: Current and future directions for goal contagion research. *Social and Personality Psychology Compass*, *10*(11), 668–678. https://doi.org/10.1111/spc3.12289

Levy, D. A., & Nail, P. R. (1993). Contagion: A theoretical and empirical review and reconceptualisation. *Genetic, Social, and General Psychology Monographs*, *119*(2), 233–284.

Marsh, H. W. (1989). Confirmatory factor analyses of multitrait-multimethod data: Many problems and a few solutions. *Applied Psychological Measurement*, *13*(4), 335–361. https://doi.org/10.1177/014662168901300402

Mazzuca, S., Kafetsios, K., Livi, S., & Presaghi, F. (2018). Emotion regulation and satisfaction in long-term marital relationships: The role of emotional contagion. *Journal of Social and Personal Relationships*, *36*(9), 2880–2895. https://doi.org/10.1177/0265407518804452

McMillan, J. H., Venable, J. C., & Varier, D. (2013). Studies of the effect of formative assessment on student achievement. *Practical Assessment, Research & Evaluation*, *18*(2), 1–15.

Mendoza N. B and King R. B. (2020). The social contagion of student engagement in school. *School Psychology International*, 41(5), 454–474. https://doi.org/10.1177/0143034320946803

Mendoza N. B. and King R. B. (2022). The social contagion of work avoidance goals in school and its influence on student (dis)engagement. *European Journal of Psychology of Education*, 37(2), 325–340. https://doi.org/10.1007/s10212-020-00521-1

Meredith, C., Schaufeli, W., Struyve, C., Vandecandelaere, M., Gielen, S., & Kyndt, E. (2020). 'Burnout contagion' among teachers: A social network approach. *Journal of Occupational and Organizational Psychology*, *93*(2), 328–352. https://doi.org/10.1111/JOOP.12296

Meuleman, B., & Billiet, J. (2009). A monte carlo sample size study: How many countries are needed for accurate multilevel SEM? *Survey Research Methods*, *3*(1), 45–58.

Molden, D. C. (2014). Understanding priming effects in social psychology: What is "social priming" and how does it occur? *Social Cognition*, *32*(Supplement), 1–11. https://doi.org/10.1521/soco.2014.32.supp.1

Muthén, L. K., & Muthén, B. (2017). *Mplus user's guide* (7th ed.). Muthén & Muthén.

Oberle, E., & Schonert-Reichl, K. A. (2016). Stress contagion in the classroom? The link between classroom teacher burnout and morning cortisol in elementary school students. *Social Science & Medicine*, *159*, 30–37. https://doi.org/10.1016/J.SOCSCIMED.2016.04.031

Peen, N. F., Duque-Wilckens, N., & Trainor, B. C. (2021). Convergent neuroendocrine mechanisms of social buffering and stress contagion. *Hormones and Behaviour*, *129*, 104933. https://doi.org/10.1016/J.YHBEH.2021.104933

Poirier, C., Brendgen, M., Vitaro, F., Dionne, G., & Boivin, M. (2017). Contagion of anxiety symptoms among adolescent siblings: A twin study. *Journal of Research on Adolescence*, *27*(1), 65–77. https://doi.org/10.1111/jora.12254

Radel, R., Fournier, M., de Bressy, V., & d'Arripe-Longueville, F. (2015). You're too much for me: Contagion of motivation depends on perceiver-model distance. *Motivation and Emotion*, *39*(3), 374–383. https://doi.org/10.1007/s11031-014-9451-0

Radel, R., Sarrazin, P., Legrain, P., & Wild, T. C. (2010). Social contagion of motivation between teacher and student: Analyzing underlying processes. *Journal of Educational Psychology*, *102*(3), 577–587. https://doi.org/10.1037/a0019051

Ruiz-Primo, M. A., & Furtak, E. M. (2006). Informal formative assessment and scientific inquiry: Exploring teachers' practices and student learning. *Educational Assessment*, *11*(3–4), 237–263.

Schütze, B., Rakoczy, K., Klieme, E., Besser, M., & Leiss, D. (2017). Training effects on teachers' feedback practice: The mediating function of feedback knowledge and the moderating role of selfefficacy. *ZDM Mathematics Education*, *49*(3), 475–489. https://doi.org/10.1007/s11858-017-0855-7

Sjögren, B., Thornberg, R., Wänström, L., & Gini, G. (2020). Associations between individual and collective efficacy beliefs and students' bystander behaviour. *Psychology in the Schools*, *57*(11), 1710–1723. https://doi.org/10.1002/pits.22412

So, W. W. M., & Lee, T. T. H. (2011). Influence of teachers' perceptions of teaching and learning on the implementation of assessment for learning in inquiry study. *Assessment in Education: Principles, Policy & Practice*, *18*(4), 417–432. https://doi.org/10.1080/0969594X.2011.577409

Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sport teams. *The Journal of Applied Psychology*, *85*(6), 848–859. https://doi.org/10.1037/0021-9010.85.6.848

Tsvetkova, M., Macy, M. W., & Szolnoki, A. (2014). The social contagion of generosity. *PLoS One*, *9*(2), e87275. https://doi.org/10.1371/journal.pone.0087275

van Beurden, J., Van Veldhoven, M., Nijendijk, K., & Van De Voorde, K. (2017). Teachers' remaining career opportunities: The role of value fit and school climate. *Teaching and Teacher Education*, *68*, 143–150. https://doi.org/10.1016/J.TATE.2017.09.002

Wang, S. L., & Lin, S. S. (2007). The effects of group composition of self-efficacy and collective efficacy on computer-supported collaborative learning. *Computers in Human Behaviour*, *23*(5), 2256–2268. https://doi.org/10.1016/j.chb.2006.03.005

Westman, M. (2001). Stress and strain crossover. *Human Relations*, *54*(6), 717–751. https://doi.org/10.1177/0018726701546002

Westman, M. (2011). The impact of stress on the individual, the dyad and the team. *Stress & Health*, *27*(3), 176–180. https://doi.org/10.1002/smi.1419

Westman, M., & Etzion, D. (1999). The crossover of strain from school principals to teachers and vice versa. *Journal of Occupational Health Psychology*, *4*(3), 269–278. https://doi.org/10.1037/1076-8998.4.3.269

White, J., Bandura, A., & Bero, L. (2009). Moral disengagement in the corporate world. *Accountability in Research*, *16*(1), 41–74. https://doi.org/10.1080/08989620802689847

Wild, T. C., & Enzle, M. E. (2002). Social contagion of motivational orientations. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 141–157). University of Rochester Press.

Wild, T. C., Enzle, M. E., Nix, G., & Deci, E. L. (1997). Perceiving others as intrinsically or extrinsically motivated: Effects on expectancy formation and task engagement. *Personality & Social Psychology Bulletin*, *23*(8), 837–848. https://doi.org/10.1177/0146167297238005

Wild, B., Erb, M., & Bartels, M. (2001). Are emotions contagious? Evoked emotions while viewing emotionally expressive faces: Quality, quantity, time course and gender differences. *Psychiatry Research*, *102*(2), 109–124. https://doi.org/10.1016/S0165-1781(01)00225-6

Wiliam, D., Lee, C., Harrison, C., & Black, P. (2004). Teachers developing assessment for learning: Impact on student achievement. *Assessment in Education: Principles, Policy & Practice*, *11*(1), 49–65. https://doi.org/10.1080/0969594042000208994

Wiliam, D., & Thompson, M. (2008). Integrating assessment with instruction: What will it take to make it work? In C. A. Dwyer (Ed.), *The future of assessment: Shaping teaching and learning* (pp. 53–82). Erlbaum.

Xie, Q., King, R. B., & Cai, Y. (2022). Emotional contagion: A cross-cultural exploration of how teachers' enjoyment facilitates achievement via students' enjoyment. *Current Psychology*, *1*, 1–4. https://doi.org/10.1007/S12144-022-02878-6

Yan, Z. (2021). Assessment-as-learning in classrooms: The challenges and professional development. *Journal of Education for Teaching*, *47*(2), 293–295. https://doi.org/10.1080/02607476.2021.1885972

Yan, Z., & Brown, G. T. L. (2021). Assessment for learning in the Hong Kong assessment reform: A case of policy borrowing. *Studies in Educational Evaluation*, *68*, 100985. https://doi.org/10.1016/j.stueduc.2021.100985

Yan, Z., & Cheng, E. C. K. (2015). Primary teachers' attitudes, intentions and practices regarding formative assessment. *Teaching and Teacher Education*, *45*, 128–136. https://doi.org/10.1016/j.tate.2014.10.002

Yan, Z., & Chiu, M. M. (2022). The relationship between formative assessment and reading achievement: A multilevel analysis of students in 19 countries/regions. *British Educational Research Journal*, *49*(1), 186–208. https://doi.org/10.1002/berj.3837

Yan, Z., Chiu, M. M., & Cheng, E. C. K. (2022). Predicting teachers' formative assessment practices: Teacher demographics, personal, and contextual factors. *Teaching and Teacher Education*, *114*, 103718. https://doi.org/10.1016/j.tate.2022.103718

Yan, Z., Li, Z., Panadero, E., Yang, M., Yang, L., & Lao, H. (2021). A systematic review on factors influencing teachers' intentions and implementations regarding formative assessment. *Assessment in Education: Principles, Policy & Practice*, *28*(3), 228–260. https://doi.org/10.1080/0969594X.2021.1884042

Yan, Z., & Pastore, S. (2022). Assessing teachers' strategies in formative assessment: The teacher formative assessment practice scale. *Journal of Psychoeducational Assessment*, *40*(5), 592–604. https://doi.org/10.1177/07342829221075121