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Digital innovations in teacher recruitment: An experimental study

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ABSTRACT

Teacher shortages are a serious challenge in many countries, made worse by declining enrolments in initial teacher education (ITE) programs and growing competition for talented young people making career decisions. To address this challenge, we developed and tested two digital interventions—a persuasive game (TeachQuest) and a realistic job preview (RJP)—designed to enhance undergraduate students' teaching interest, teaching self-efficacy, and perceptions of fit with the profession. In a two-phase experimental study ($N = 957$), undergraduate participants were randomly assigned to TeachQuest, the RJP, or a control condition. Results from Phase 1 showed that both interventions increased participants' interest and perceived fit with teaching, with the RJP also improving teaching self-efficacy. In Phase 2, results from a delayed post-test (six weeks later; $N = 572$) indicated that while motivation-related outcomes remained higher than pre-test levels, changes were non-linear, with TeachQuest sustaining interest through participants' immersion experiences and the RJP maintaining self-efficacy through mastery experiences. Our findings suggest that immersive game-based recruitment interventions may be particularly effective in informing and engaging potential applicants, whereas RJPs may be useful in reinforcing confidence in teaching. The study provides new insights informing the design of scalable, evidence-based teacher recruitment tools that align with the interests and digital-focused lives of prospective applicants for ITE programs.

Many countries around the world are facing critical shortages of teachers (UNESCO & International Task Force on Teachers for Education 2030, 2024), with policymakers considering strategies and practices to attract prospective applicants into initial teacher education (ITE) and the teaching profession. Teacher shortages undermine education systems across the globe, regardless of a nation's wealth. In England, where the current study takes place, teaching vacancies tripled between 2011 and 2016, and recruitment into ITE routinely falls well short of the numbers needed to maintain the teaching workforce (McLean et al., 2024). Shortages are even worse in the Global South, with UNESCO & International Task Force on Teachers for Education 2030 (2024) reporting that 90 % of secondary schools in sub-Saharan African face teacher shortages. The reasons for teacher shortages are complex and include the state of national economies (teacher supply is negatively affected by strong economic performance and overall job availability), wage structure, and social status of the profession (Wiggin et al., 2021). Post-covid teacher shortages are almost universal, and the 'business as usual' recruitment approaches typically undertaken have not proven successful in addressing this persistent problem (Williams et al., 2022).

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A first step in improving teacher recruitment practices is to understand the motivations of those who are considering (or not considering) entering the teacher workforce, with recent research highlighting prospective teachers' motivations for entering ITE (e.g., Giersch, 2021) and staying in the profession, with intrinsic motivators (e.g., social utility) proving effective in explaining why people choose to become teachers (Watt & Richardson, 2023). A second step is to understand how current young people access and evaluate information when they are considering career options. Today's career-seekers, the 'Generation Z' cohort born between the mid-1990s and early 2010s, are characterized by their digital nativeness, preference for meaning in work, and career uncertainty (e.g., Dimock, 2019). Motivation messages are more persuasive when they match the characteristics of the target audience (Joyal-Desmarais et al., 2020). The career information provided to Generation Z job-seekers may need to reflect preferences for digital interactivity, synchronicity (i.e., speed and responsiveness of information delivery), and authenticity (e.g., Kirk et al., 2015). In this article, we present an experimental study that tests two innovative digital teacher recruitment interventions designed to increase teaching interest, teaching self-efficacy, and perceptions of fit with teaching as a career.

1. Why do motivations matter in teacher recruitment?

Motivation plays a central role in shaping whether individuals consider and ultimately pursue teaching as a career. In this study, we focus on three theoretically and empirically grounded motivational constructs: interest, self-efficacy, and perceived person–vocation (PV) fit. These variables were selected because they reflect distinct but complementary aspects of early-stage career engagement and have been shown to predict both intention and persistence in educational and occupational pathways (e.g., Eccles & Wigfield, 2020). These three motivation variables are of relevance when considering attracting prospective teachers. Interest refers to an enduring predisposition to engage with an idea or activity, with high levels of interest influencing attention, engagement, and persistence in achieving a goal (Hidi, 2006). Interest develops through the interaction of within-person factors (i.e., personal characteristics and attributes) and environmental factors that might trigger these internal factors, arousing feelings of focused attention and engagement and the motivation to seek further opportunities to engage with the targeted content (Renninger & Hidi, 2020). In vocational settings, Su (2020) suggests that interventions may be most effective in increasing shorter-term situational interest, with longer-term interest only developed through repeated exposure.

Another motivation variable related to career choice is self-efficacy, or people's beliefs in their capabilities to carry out a desired course of action (Bandura, 1997). Self-efficacy is an important driver for career decision-making: people tend to consider careers in which they feel a sense of confidence that they have the capacity to master the challenges they might encounter (Stead et al., 2022). In a similar fashion, a sense of fit between personal characteristics and the expected demands of a job (PV fit) is seen as a key motivator in the process of career decision-making (Xu et al., 2023). In educational settings, research has shown that teachers who believe their abilities and attitudes closely align with the demands of teaching are less likely to leave the profession (Player et al., 2017). A large-scale meta-analysis by Uggerslev et al. (2012) showed that perceived fit was the strongest predictor of applicant attraction throughout the recruitment process. Taken together, these findings highlight the critical influence of interest, self-efficacy, and PV fit on career decision-making.

However, an understanding of the motivations that influence career decision-making only addresses part of the problem in teacher recruitment; we also need to understand how messages about teaching can be effectively delivered in a world with robust competition for talented and motivated professionals.

2. What works in attracting (and retaining) prospective teachers?

Teacher recruitment strategies and messages have too often been "arcane, reactive, and short-sighted" (Williams et al., 2022, p. 333) with insufficient attention paid to how current generations consume information and make decisions about careers. Offering financial incentives is one strategy to attract prospective teachers (e.g., DfE, 2024b), but a comprehensive review of recruitment interventions found that although financial incentives could initially attract prospective teachers, the effect was short-lived unless the incentive was tied to a compulsory period of service (See et al., 2020). Other research has modelled the effects of offering higher rates of pay for certain teachers (e.g., in STEM subjects), with the conclusion that subject-specific teacher shortages would be eased, but with little discussion of attrition rates related to reliance on extrinsic motivators for career decision-making (e.g., Sims, 2018; Van den Broeck et al., 2021). Recruitment interventions that emphasize intrinsic motivators (e.g., the social utility of teaching or perceived fit) may have a more positive effect on the teaching workforce in the long term (e.g., Uggerslev et al., 2012), but recruitment strategies must also consider how the message is transmitted to potential ITE applicants.

Successful recruitment strategies include information about the job, information about the personal attributes needed to be successful at the job, and an element of persuasion (e.g., Swider et al., 2015; Uggerslev et al., 2012). Offering specific information about how a candidate fits the role can have a positive impact on decision-making (Roberson et al., 2005) but providing targeted and interactive feedback about fit is expensive and time-consuming. For example, in England, initiatives in the government's *Get into teaching* strategy range from an advertising campaign (*Every lesson shapes a life*) to 'taster sessions' which give potential applicants a sense of how they fit in the job (DfE, 2024a). The advertising campaign is scalable but does not offer interactivity or feedback; the taster sessions offer interactivity and authenticity, but are not easily scalable, with evidence for their efficacy not publicly available. Teacher recruitment interventions need to address the scalability/interactivity paradox, especially as they try to reach the digital natives of Generation Z, who are not responding in sufficient numbers to maintain the required teaching workforce. Most current motivation-based teacher recruitment efforts use 'one-size-fits-all' motivation nudges, without acknowledgement that motivational messages are considerably more powerful in terms of persuasion when matched with characteristics of the target audience

(Joyal-Desmarais et al., 2022). This approach involves aligning recruitment messages with a group's preferred content, style, values, goals, or identity-related motives (Joyal-Desmarais et al., 2022).

3. Attracting and recruiting applicants from generation Z into teacher education

According to generational theory, a generational cohort's values, beliefs, and behaviors are influenced by major events and developments occurring at formative developmental stages (Mannheim, 1970). Generation Z typically refers to the generation born from the mid-1990s to the early 2010s (Dimock, 2019), with the pervasiveness of the online world (especially social media) and the global pandemic widely agreed as two of the most influential developments for this generation (Sakdiyakorn et al., 2021). Kirk et al. (2015) conducted a cohort analysis of information-seeking behaviors and found that two-way communication (interactivity) and speed of response (synchronicity) were more important for Generation Z than for previous generations, a finding particularly relevant when considering strategies to attract and recruit Generation Z into teaching careers.

4. Simulations in teacher recruitment

Perhaps surprisingly in view of most people's considerable experience sitting in classrooms as students, researchers have found a 'knowledge deficit' in secondary and university students' understandings about the rewards and opportunities provided by a teaching career. Snell et al. (2024) found STEM undergraduates were often unaware of positive aspects of a teaching career, including aspects of starting salary, variety and agency involved in the job, and the potential for career progression. Relatedly, Thompson-Lee et al., 2024 found that exposing STEM undergraduates to motivation-based classroom vignettes significantly increased knowledge about, and interest in teaching. The vignettes designed to evoke social utility motivations (i.e., emphasising social equity and contribution to society) were more effective than vignettes designed to evoke personal utility of teaching (e.g., salary, job security). An important factor point raised by participants in both of these studies was that authenticity and believability of portrayals of teaching was important to counter the knowledge deficit often found with prospective teachers. Developing teacher recruitment interventions that are designed to be authentic, scalable, and interactive may help attract prospective teachers from Generation Z into considering teaching as a career.

4.1. Simulations in realistic job previews

One way to provide an honest depiction of daily classroom life is through new technologies that provide simulations of teaching. In contrast to 'live' teaching practice, taster sessions, or internships, simulations provide a low-risk exposure to engaging with challenging classroom situations. Huang, Richter, Kleickmann, and Richter (2023) reviewed research on virtual reality (VR) simulations in teacher education and found that VR applications were useful to foster procedural knowledge in simulated instructional situations. Budin (2024) reported a small-scale study that involved high school students participating in augmented reality classroom simulations, with participants reporting increased interest in teaching. However, this genre of simulation requires specialized and proprietary equipment (e.g., virtual reality headsets and sometimes trained 'actors') and can be difficult to deliver at scale (Huang et al., 2023). Klassen et a. (2021, 2023) showed that using animated video simulations of classroom situations called realistic job previews, or RJPs, could be one effective approach to implement simulations for teacher recruitment purposes.

RJPs consist of a series of realistic vignettes that offer potential applicants an authentic depiction of the situations they are likely to encounter in a job (Breaugh, 1983). Over the last 40 years, research has shown that RJPs can lead to improved retention rates and job success (Baur et al., 2014). Integrating RJPs into the recruitment process offers three main benefits. First, they present an honest and credible portrayal of a job, enhancing trust among potential applicants, i.e., the 'air of honesty' hypothesis. Second, RJPs can help temper initial expectations, preparing new trainees for the inevitable challenges of the role, i.e., the 'met expectations' hypothesis. Finally, RJPs encourage reflection on potential fit, allowing applicants to opt out if the job is not a suitable fit, i.e., the 'self-selection' hypothesis. Combining RJPs with targeted feedback helps attract candidates who receive positive feedback and discouraging those who may not be well-suited to the vocation (Earnest et al., 2011).

In the context of teacher education, RJPs that offer feedback and reflection opportunities are more effective in boosting motivation than simulations alone (Bardach et al., 2021). Recent research showed that RJPs boost interest in pursuing a teaching career for STEM undergraduates in the UK, even after controlling for prior career intentions (Klassen et al., 2021). The use of RJPs for teacher recruitment is promising, but the evidence base is limited. Furthermore, RJPs tend to be didactic (*Here's a problem: what should you do?*) and may be less engaging than other digital technologies which can be used to inform and attract young people during the career decision-making process (Kapp et al., 2020).

4.2. Simulations in persuasive games

Digital games can be designed to provide a platform to communicate messages to a large audience (Hafner & Jansz, 2018) in order to inform and persuade. Although digital games are typically designed for entertainment, they can additionally be designed to influence attitudes and beliefs (de la Hera et al., 2021). The term 'persuasive games' coined by Bogost (2021), describes games that move beyond entertainment to foster reflection, motivation, engagement, and ultimately, persuasion. Iacovides et al. (2022) developed and tested a persuasive game designed to prompt university students to balance health, academic, social, and financial pressures at university. The authors found that players' level of reflection increased if the games were deemed to be relevant to their context, and if

players could explore a scene from different perspectives, i.e., with an element of choice or autonomy in the game.

Four psychosocial dimensions related to user experience are especially relevant in the design of persuasive games: meaning, immersion, mastery, and autonomy (Abeele et al., 2020). The perceived *meaning* of a game pertains to a sense of connecting with the purpose of a game, with an acknowledgement of the importance of the task (Salen & Zimmerman, 2003). A player's *immersion* in a game refers to cognitive absorption in the details of the game. Providing opportunities for *mastery* in a game pertains to motivation perspectives from self-efficacy theory (Bandura, 1997)—where domain-specific competence is built from successfully engaging with challenging experiences—and from self-determination theory, where fulfilment of the basic psychological need for competence leads to well-being and flourishing (e.g., Ryan & Deci, 2000). Similarly, a player's *autonomy* in a game is rooted in basic psychological needs theory, where a player may engage more deeply in a game when there is a perception of choice during gameplay (Abeele et al., 2020). These four psychosocial dimensions can be reflected in the design of a game to increase the motivations associated with the targeted persuasive purpose.

Gamified recruitment tools have been shown to increase prospective employees' enjoyment of the recruitment process and attraction to the employing organization, with the use of persuasive games for recruitment growing (Obaid et al., 2020). In education, digital games, including narratively driven visual novel style games, with their emphasis on player choice, branching storylines, and well-developed characters, have been successfully used to engage students and preservice teachers in complex learning situations (e.g., Yildiz et al., 2021; Øygardslia et al., 2020). We propose that persuasive games might be one way to attract and inform potential applicants to consider a teaching career.

4.3. The current study

In this study we report on two phases of an experimental study that tests two interventions—an RJP and a persuasive game called *TeachQuest*—aimed at increasing undergraduate students' career interest, teaching self-efficacy, and perceptions of fit with teaching. These interventions were selected for their (a) conceptual alignment with the study's goal of addressing early motivation beliefs, and (b) their focus on realism, engagement, and scalability, the latter which is challenging for VR simulations. The two interventions offer complementary approaches, with feedback and authentic situations, but the game offers the addition of a narrative thread with potentially greater immersion. Our overall research question is *Does participation in a* digital *intervention (RJP or TeachQuest) influence undergraduate participants' teaching interest, self-efficacy, and perceived fit with the profession?* Our specific hypotheses are as follows.

H1a. Participation in digital recruitment interventions—TeachQuest and an RJP—will increase participants' interest in teaching, self-efficacy for teaching, and perceived fit with the profession after the intervention is completed.

H1b. Levels of participants' interest in teaching, self-efficacy for teaching, and perceived fit with the profession will be maintained six weeks after the intervention.

H2. User experience variables (meaning, mastery, immersion, and autonomy) will mediate the relations between intervention and outcome variables of interest, self-efficacy, and perceived fit.

H3. The digital interventions will be positively associated with behavioral indicators of interest in teaching, i.e., clicking on a link to a government ITE website.

5. Phase 1

5.1. Method

5.1.1. Participants

A total of 957 participants ($M_{age} = 26.63$, $SD_{age} = 6.97$) were recruited to the study through an online participant pool (Prolific) and were paid a small honorarium upon completion of the task. The inclusion criteria included being UK-based, holding student status, and being enrolled in an undergraduate degree program. Participants needed access to a computer to participate in the study.

Participants ranged in age from 18 to 50 years, with participants over 40 years old comprising 7 % of the sample, aligning with data published by the Office for Students in 2017, indicating that 12 % of undergraduates are over 40. The inclusion of mature students is crucial, as 47 % of postgraduate teacher trainees in England are aged over 25 (Gov UK, 2024). In the current study, individuals over 25 made up 45.5 % of the sample. Therefore, mature students play a significant role in understanding undergraduates' motivations to pursue teaching.

Participants were 56.3 % female and 63.8 % identified as White, while 15.3 % were Black, 14.7 % were Asian, and the remaining 6.2 % identified as mixed, other, or not reported. Participants studied a range of academic subjects (Arts = 52, Humanities = 87, Social Sciences = 213, STEM = 379, Other/multiple = 226) and were in first year ($n = 208$), second year ($n = 262$), third year ($n = 222$), fourth year ($n = 154$), and other ($n = 111$).

Participants were randomly assigned to one of three groups: TeachQuest ($n = 312$), RJP ($n = 325$), and the control game, called *Gravity Heist* ($n = 320$). Because participants completed the post-test survey immediately after the intervention, the frequency of missing data was very low ($n = 3$).

5.1.2. The TeachQuest game

TeachQuest is a visual novel-style game designed to encourage reflection while informing and persuading players about teaching

(de la Hera et al., 2021). The game uses its content (classroom scenarios) and mechanics (decision-making and choice) to enhance its persuasive impact (Kaufman et al., 2021). The game was designed through a year-long collaboration that included researchers and experienced teachers along with a game designer, software engineer, graphic artist, and script writer. An initial 'paper prototype' was developed and tested in multiple focus groups with undergraduate students and subsequently programmed into a game engine. The game was designed following persuasive games design principles, including visual and narrative cues that deliver intellectual challenges designed to arouse feelings (i.e., by establishing connections with game characters) and by providing feedback delivered by a sympathetic mentor (de la Hera, 2021).

Participants play the game by taking on the persona of a newly qualified teacher, navigating their first half-term (five weeks) at a secondary school in the UK. The game includes five one-week sessions, featuring a variety of events and characters designed to reflect the diversity of UK schools. Participants interact with a range of characters, including students, fellow teachers, parents, and friends, each offering unique perspectives and diverse challenges. The game features 'pedagogy events' (classroom teaching), and 'core events' (experiences in the school and external environment). Upon finishing the game, participants received feedback from a mentor character based on the choices made throughout the game (see Fig. 1). Additionally, participants received a follow-up message from a student they had helped during their gameplay (see Fig. 2).

5.1.3. Realistic job preview

The RJP intervention consisted of four animated classroom scenarios delivered to participants' choice of device. The content of the scenarios was developed with the involvement of experienced teachers (see Klassen et al., 2021). Fig. 3 shows an example of one of the scenarios with participant options and Fig. 4 shows an example of the teacher feedback. The RJP was designed using RJP design principles espoused by Baur (2014) which highlight the importance of presenting a balanced (positive and negative situations), authentic, and believable depiction of the workplace. The RJP content was built in collaboration with practicing teachers, enhancing its believability and authenticity.

For each scenario, participants viewed a brief video-based classroom scenario, rated the appropriateness of three possible responses to a dilemma (1 = *Inappropriate* to 4 = *Appropriate*), wrote a reflective rationale for their response, and read real-time feedback about the alignment between their own ratings and the ratings from experienced teachers.

The scoring key for the RJPs was established through previous work with subject matter experts, with points awarded based on response alignment with the scoring key (Klassen et al., 2021). After completing the scenarios, participants received a 'fit' message based on how congruent their scores were with experts' scores. One of four messages was shown to them, ranging from '*Excellent fit: You think like a teacher!*' to, '*Some areas of fit*: *Most experienced teachers think differently than you about these situations*'. In practice, most participants (>90 %) received either 'excellent fit' or 'very good fit' feedback.

5.1.4. Gravity Heist control game

We considered a number of potential control conditions (e.g., teaching-related videos), but following the design of Chen et al. (2020), decided to include a 'neutral' interactive digital game that matched TeachQuest in terms of engagement (i.e., a digital game) and duration (i.e., about 15 min). A control game unrelated to teaching was chosen to ensure that observed effects could be attributed to either TeachQuest or the RJP. The game that was used—Gravity Heist—was developed by one of the authors for an unrelated project

Fig. 1. Feedback from mentor based on choices throughout TeachQuest.

Fig. 2. Feedback from student from a storyline chosen by the participant.

and requires players to fight aliens in space, with no (intentional) connection to teaching. The game takes between 10 and 15 min for completion.

5.1.5. Measures

Outcome measures. All participants completed a questionnaire before and immediately after the intervention. The pre-test questionnaire included interest in teaching, self-efficacy for teaching, and PV fit. The items were the same in both the pre- and post-test, but in the post-test the phrase "After completing the activity" was added before each item's original wording. For all items, the response options were 0–6 (0 = *strongly disagree*, 3 = *neither agree nor disagree*, 6 = *strongly agree*). Example items can be found in Table 1.

User experiences. In the post-test, participants were asked to rate their experience of the game and RJP. Items were taken from the user experience measure, the PXI (Abeele, 2020). We adapted four 3-item domains, chosen for their relevance to the study aims: *meaning* (e.g., 'The game/activity was meaningful to me'), *mastery* (e.g., I felt a sense of mastery in this game/activity'), *immersion* (e.g., 'I was immersed in the game/activity'), and *autonomy* (e.g., I felt a sense of freedom about how I wanted to play this game/activity'). For all 12 items, the response options were 0–6 (0 = *strongly disagree*, 3 = *neither agree nor disagree*, 6 = *strongly agree*).

5.1.6. Procedures

The study was delivered using the online survey platform Qualtrics. The questionnaire started with an information and consent page, followed by demographics (e.g., age, gender, ethnicity), and then the pre-test of 12 questions measuring teaching-related motivation. After the pre-test, participants were randomly forwarded to either TeachQuest, the RJP, or the control game. TeachQuest took a mean of 21 min to complete, the RJP 20 min, and the control game 10–15 min.

Following the intervention, the participants were asked the same 12 motivation items as a post-test, along with 12 questions about their user experience (i.e., meaning, mastery, immersion, and autonomy). Finally, participants were asked if they would like further information about teaching as a career, through an invitation to click a link to a UK government ITE webpage (*Get into Teaching*). Each participant received a small payment (£6). A conceptual model of the study showing the hypothesized relations between intervention, user experience, and teaching-related motivation is presented in Fig. 5.

5.1.7. Data analysis

To ensure the validity and comparability of our constructs across time and intervention conditions, we conducted a series of focused statistical analyses. These were essential to reliably capture changes in participants' motivational beliefs.

Construct Validity and Longitudinal Measurement Invariance. We first established the construct validity of participants' interest, self-efficacy, and perceived fit in teaching, using confirmatory factor analysis (CFA) with standard fit indices: the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The fit indices (see Table 4) suggested acceptable and excellent fit to the data (e.g., Hu & Bentler, 1999; Kline, 2015).

Additionally, we examined the longitudinal measurement invariance from the pre-test to the post-test. Following the recommendations of Vandenberg and Lance (2000), we investigated three types of measurement invariance: *configural* (ensuring the number

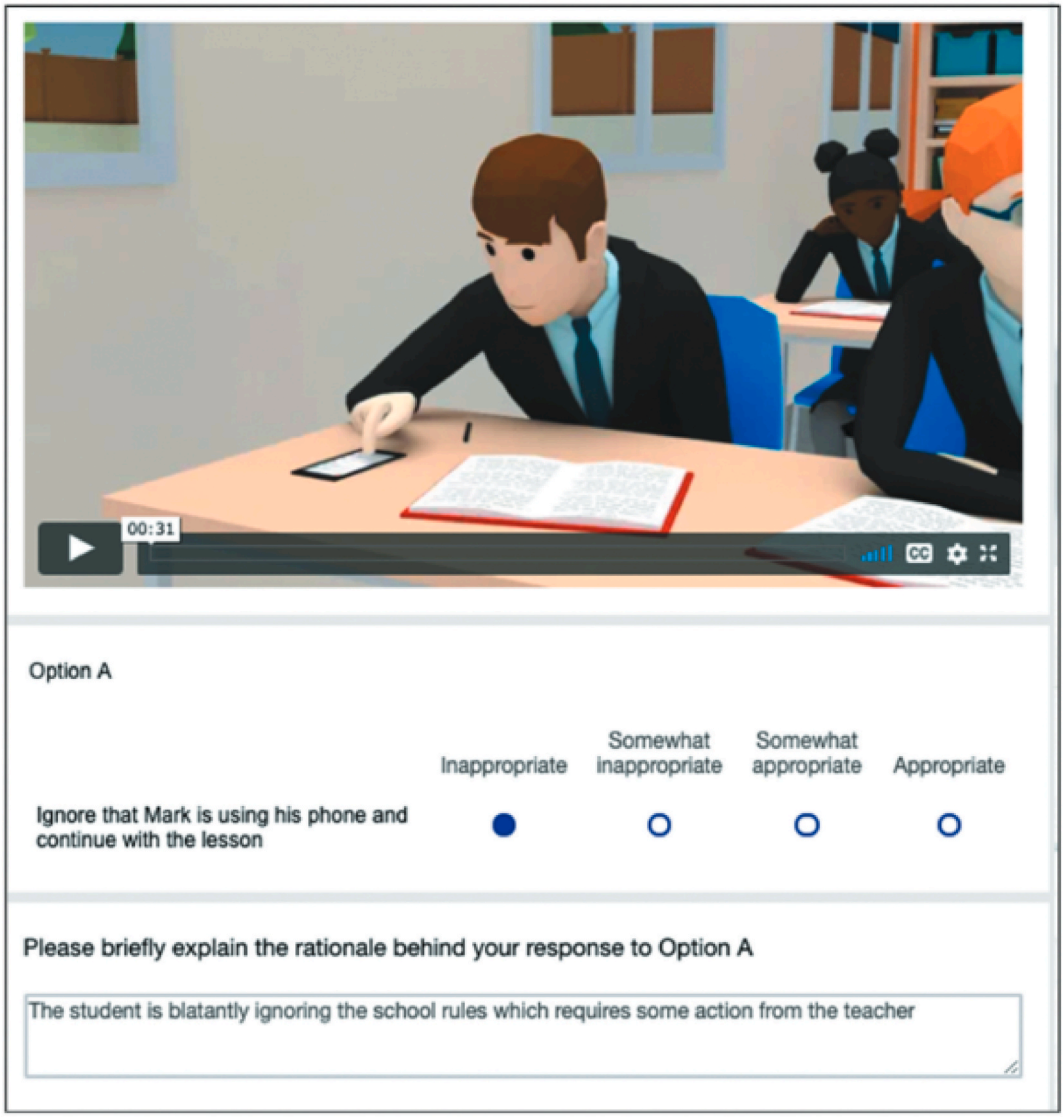

Fig. 3. Example of a realistic job preview scenario.

of factors remains identical across the four time points), *metric* (ensuring the factor loadings are consistent across the four time points), and *scalar* (ensuring both the factor loadings and intercepts are consistent across the four time points) for participants' interest, self-efficacy, and perceived fit in teaching. In these analyses, we used changes in CFI, TLI, and RMSEA values as criteria for assessing invariance. A decrease in CFI and TLI scores of less than .01, along with an increase in RMSEA scores of less than .015, indicated evidence of measurement invariance (Chen, 2007; Cheung & Rensvold, 2002).

Latent Change Modeling. To examine change in participants' interest, self-efficacy, and perceived fit in teaching following the interventions, we conducted latent change structural equation modeling using M*Plus* statistical software (Muthén & Muthén, 2019–2017). We began by creating two dummy variables for the three intervention conditions, using the control game as the reference group, with TeachQuest and RJP groups serving as the comparison groups. Next, we calculated the means of the manifest variables assessing participants' interest, self-efficacy, and perceived fit in teaching both before and after the intervention, using these means as indicators for the latent intercept and change variables.

In the latent change structural equation model, we examined a model in which the intervention groups (TeachQuest and RJP) predicted participants' experiences of meaning, mastery, immersion, and autonomy immediately after the intervention. These experiences, in turn, were expected to lead to changes in participants' interest, self-efficacy, and perceived fit in teaching. We also modelled the direct association between intervention conditions and changes in participants' interest, self-efficacy, and perceived person-vocation fit in teaching. To establish the latent intercept and change constructs, we set the loadings at both time points to 1 for the latent intercept factor. The loadings for the latent change factor were set to 0 for the pre-test and to 1 for the post-test. To address

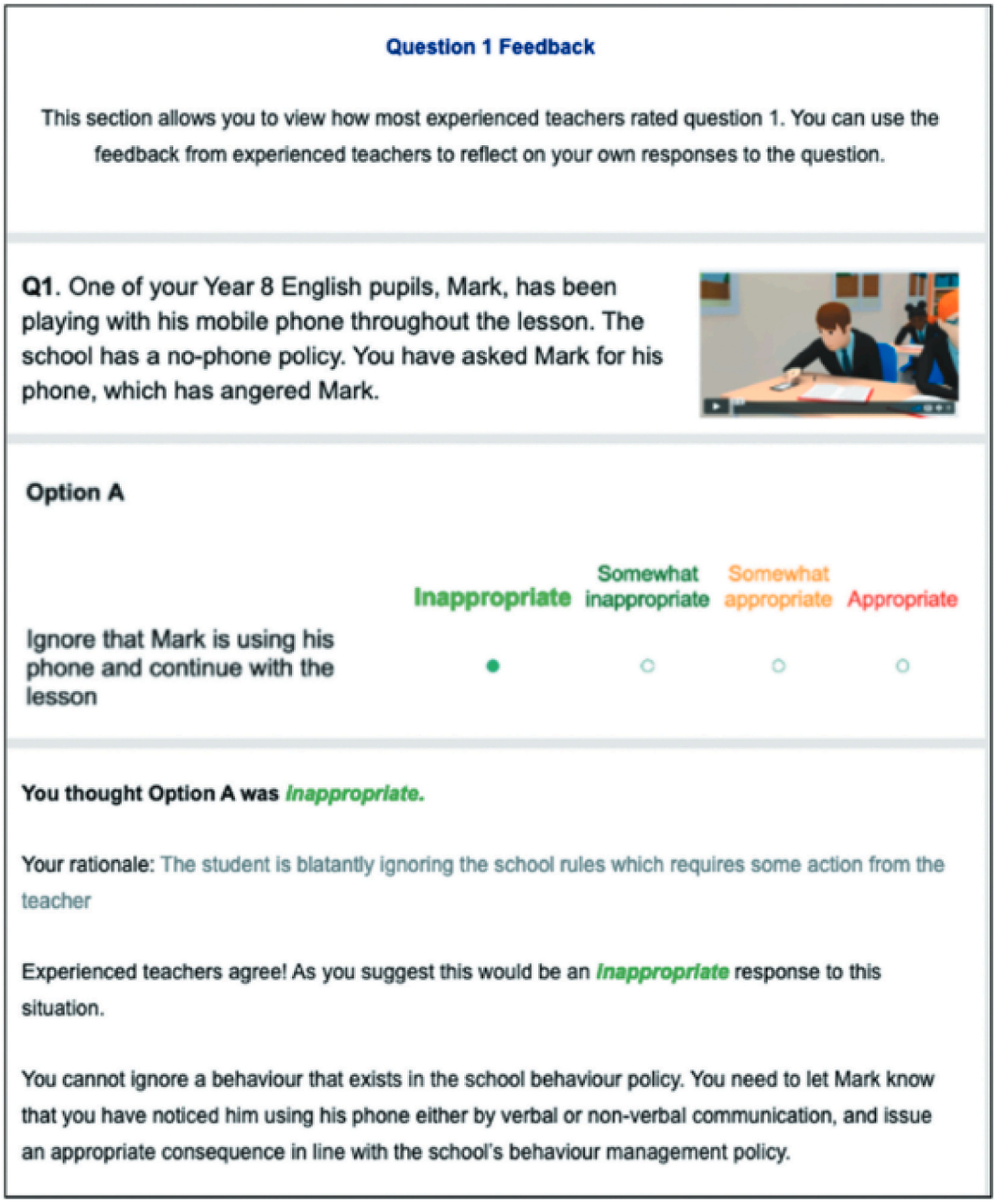

Fig. 4. Example of a realistic job preview feedback.

any missing data, we employed the full information maximum likelihood (FIML) approach (Enders & Bandalos, 2001).

Additionally, since prior studies have indicated that individuals' motivation to pursue a teaching career may vary based on factors such as age, sex, and year in the program (Kyriacou & Coulthard, 2018), we examined models that included these demographic variables as covariates. Given that participants came from diverse ethnic backgrounds, we also created two additional dummy codes, using Asian participants as the reference group and participants who identified as Black or White as the comparison groups. These two ethnic dummy variables were included as additional covariates in our analysis.

6. Results

6.1. Descriptive statistics, correlations, construct validity, and longitudinal invariance

The results of the descriptive statistics for all three conditions across both data collection points are presented in Table 2, while the

Table 1
Questionnaire items used in the pre and post-test.

Construct measured	Questionnaire item	Adapted from
Interest in Teaching	I am interested in exploring teaching as a career I am considering training as a teacher	Hackett et al.'s occupational commitment scale (Hackett et al., 2001)
Teacher Self-Efficacy	If I were a teacher, I am confident that I could connect well with my students If I were a teacher, I am confident that I could create a positive classroom atmosphere If I were a teacher, I am confident that I could become an effective teacher	Teacher Sense of Efficacy Scale (TSES, Tschannen-Moran & Woolfolk Hoy, 2001).
Perceived Person-Vocation Fit	There is a close match between my skills, knowledge, and abilities and those required for a teaching career There is a close match between my personal characteristics (e.g., personality) and those required for a teaching career There is a close match between my interests and those required for a teaching career	Chuang et al. (2016)

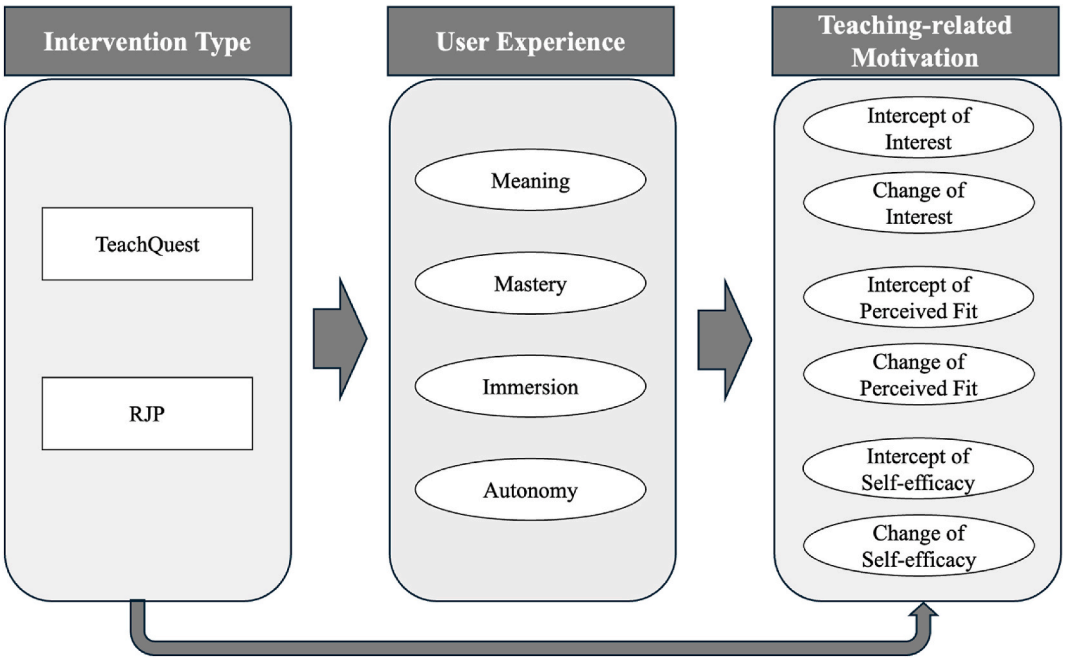

Fig. 5. Conceptual model for the phase I of the study.

correlations among the study variables can be found in Table 3. All variables related to intervention experiences, as well as participants' interest, self-efficacy, and perceived fit in teaching across both time points, were significantly correlated, with most exhibiting moderate to strong effect sizes.

Fig. 6 illustrates the changes in study variables and participants' intervention experiences across the three conditions. The TeachQuest group demonstrated increases in interest and perceived fit after playing the game. In contrast, the RJP group showed improvements in interest, self-efficacy, and perceived fit following the intervention, while the control group experienced decreases in these areas in the post-test. Participants in both the TeachQuest and RJP groups reported higher levels of perceived meaning, mastery, and autonomy compared to the control group. Additionally, both the control group and the TeachQuest group reported higher levels of immersion than the RJP group.

Results from the confirmatory factor analysis indicated an excellent model fit (see Table 4), with high standardized factor loadings across all study variables and time points (βs = .695-.984). Additionally, the results from the longitudinal measurement invariance analysis demonstrated that metric measurement invariance was established (refer to Table 4 for more details). However, the more stringent criterion for scalar invariance was not met (i.e., both the CFI and TLI scores exhibited increases greater than .01). The establishment of metric invariance suggests that the same constructs were assessed with consistent factor loadings from the pre-test to the post-test.

6.1.1. Latent change SEM

The latent change model fit the data acceptably well (see Table 4). Correlations between the latent intercept and latent change

Table 2
Means, standard deviations, and reliabilities for study variables.

	Phase 1: Immediate Post-Test									Phase 2: Delayed Post-Test								
	TeachQuest (n = 312)			RJP (n = 325)			Control (n = 320)			TeachQuest (n = 197)			RJP (n = 192)			Control (n = 183)		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α
Interest pre-test	2.378	1.808	.921	2.595	1.895	.947	2.602	1.823	.939	2.426	1.810	.941	2.578	1.901	.941	2.770	1.786	.937
Interest post-test	3.131	1.757	.942	3.237	1.891	.948	2.566	1.855	.948	3.195	1.803	.945	3.255	1.940	.959	2.642	1.871	.955
Interest delayed post-test	–	–	–	–	–	–	–	–	–	3.069	1.770	.952	3.230	1.866	.958	3.074	1.777	.921
Self-efficacy pre-test	4.409	1.183	.876	4.371	1.235	.899	4.315	1.288	.882	4.373	1.262	.904	4.394	1.270	.905	4.375	1.295	.888
Self-efficacy post-test	4.282	1.262	.923	4.610	1.185	.918	3.946	1.538	.932	4.272	1.281	.923	4.582	1.289	.929	3.996	1.501	.921
Self-efficacy delayed post-test	–	–	–	–	–	–	–	–	–	4.411	1.156	.903	4.574	1.136	.882	4.472	1.239	.912
Perceived fit pre-test	3.701	1.364	.802	3.703	1.382	.821	3.537	1.494	.852	3.699	1.418	.834	3.741	1.399	.848	3.668	1.434	.840
Perceived fit post-test	3.916	1.361	.873	4.292	1.285	.850	3.403	1.635	.906	3.946	1.386	.898	4.295	1.328	.880	3.483	1.598	.918
Perceived fit delayed post-test	–	–	–	–	–	–	–	–	–	3.963	1.302	.809	4.140	1.296	.837	3.876	1.393	.846
Meaning	3.897	1.426	.915	3.967	1.397	.902	2.623	1.592	.935	3.961	1.427	.927	3.993	1.444	.915	2.806	1.633	.945
Mastery	4.153	1.242	.858	4.568	.926	.751	3.740	1.577	.914	4.198	1.260	.865	4.582	.951	.797	3.809	1.645	.922
Immersion	4.477	1.234	.843	4.129	1.131	.711	4.383	1.246	.838	4.496	1.242	.839	4.177	1.129	.708	4.474	1.154	.803
Autonomy	4.425	1.238	.896	4.021	1.306	.878	3.233	1.649	.905	4.509	1.220	.921	4.109	1.306	.878	3.392	1.656	.911

Table 3
Psychometric properties of study variables and zero-order correlations in phase 1 of the study.

	1	2	3	4	5	6	7	8	9	10	11
1. Interest pre-test	–										
2. Interest post-test	.808**	–									
3. Self-efficacy pre-test	.520**	.512**	–								
4. Self-efficacy post-test	.419**	.569**	.738**	–							
5. Perceived fit pre-test	.680**	.662**	.733**	.633**	–						
6. Perceived fit post-test	.541**	.693**	.629**	.808**	.770**	–					
7. Meaning	.337**	.565**	.286**	.403**	.366**	.479**	–				
8. Mastery	.225**	.377**	.331**	.479**	.275**	.457**	.532**	–			
9. Immersion	.148**	.264**	.237**	. 255**	.232**	.261**	.428**	.377**	–		
10. Autonomy	.160**	.346**	.217**	.295**	.201**	.300**	.584**	.528**	.429**	–	
11. Age	.106**	.100**	.033	.018	.137**	.105**	.110**	−.032	.078*	.043	–
12. Year in program	.108**	.088**	.119**	.111**	.146**	.128**	.042	.040	.053	.047	.085**

Note. *$p < .05$; **$p < .01$.

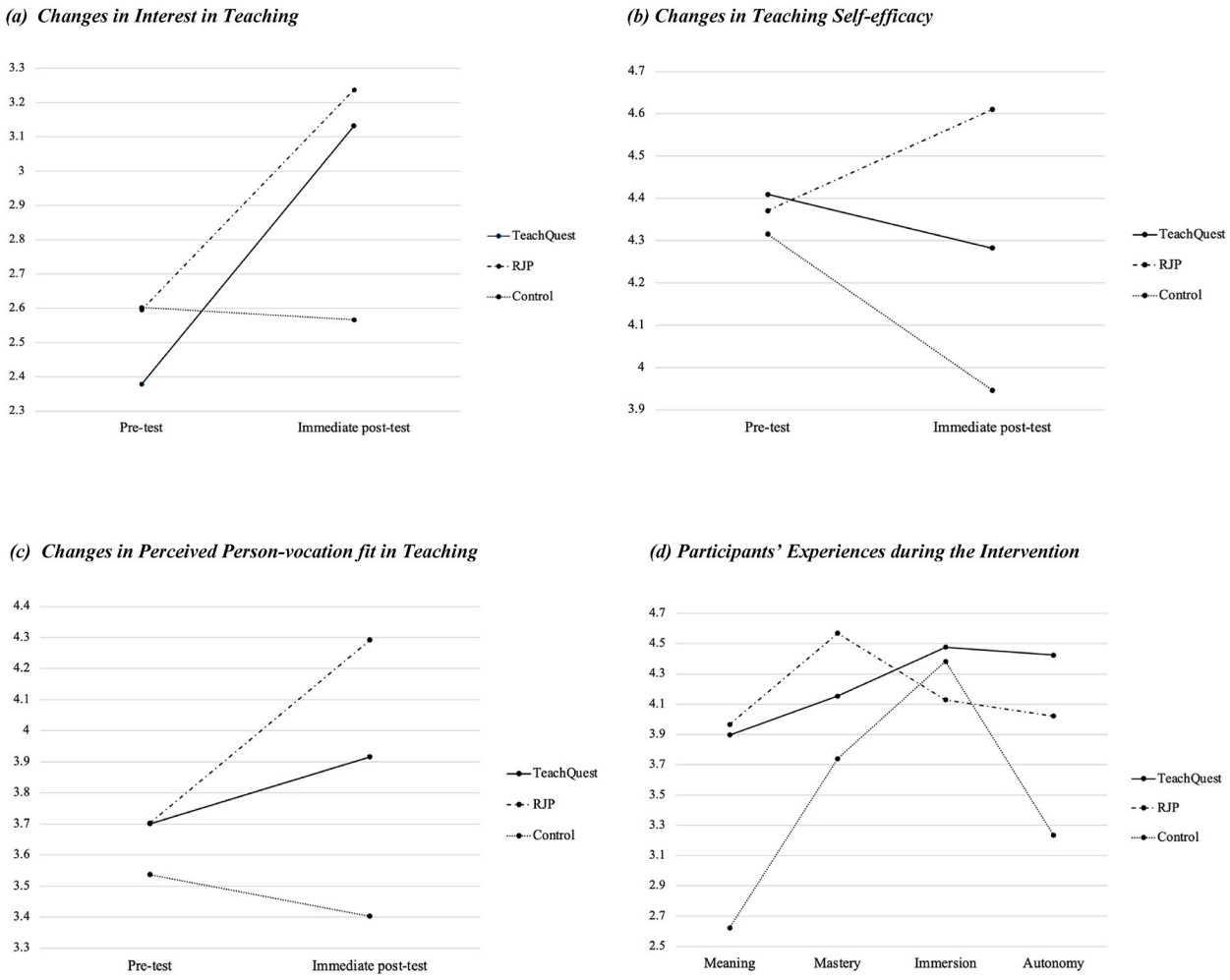

Fig. 6. Phase 1 of the study.

constructs are presented in Table 5. Results from the latent change model suggested that compared to the control group, both the TeachQuest and RJP groups reported greater increases in interest in teaching and perceived person-vocation fit. Additionally, participants in the RJP group reported a more significant increase in self-efficacy in teaching.

Regarding intervention experiences, both the TeachQuest and RJP groups reported greater levels of meaning, mastery, and autonomy compared to the control group; however, the RJP group reported a poorer experience of immersion than the control group. Participants who reported better experiences of meaning also tended to show sharper increases in interest, while those who

Table 4
Model fit indices for confirmatory factor analyses, latent change analyses, and longitudinal measurement invariance.

	MLR $\chi^2(df)$	CFI	TLI	RMSEA [IC 90 %]	SRMR	$\Delta\chi^2$ (*df*)	ΔCFI	ΔTLI	ΔRMSEA
Phase 1 ($N = 957$)									
Confirmatory factors analysis	866.250 (297)**	.971	.963	.045 [.041; .048]	.043	–	–	–	–
Latent change model - linear	1521.713 (443)**	.947	.931	.053 [.050; .055]	.041	–	–	–	–
Measurement invariance									
Configural invariance	350.818 (81)**	.976	.964	.059 [.053; .065]	.041	–	–	–	–
Metric invariance	394.298 (89)**	.973	.963	.060 [.054; .066]	.058	+43.480(8)**	−.003	−.001	+.001
Scalar invariance	609.422 (97)**	.954	.944	.074 [.069; .080]	.063	+215.124(8)**	−.019	−.019	+.014
Phase 2 ($N = 572$)									
Confirmatory factors analysis	877.245 (492)**	.977	.970	.037 [.033; .041]	.041	–	–	–	–
Latent change model - linear	3264.156(746)	.850	.822	.080 [.077; .082]	.065	–	–	–	–
Latent change model - quadratic	1549.706 (686)**	.948	.934	.049 [.045; .052]	.045	–	–	–	–
Measurement invariance									
Configural invariance	410.136 (192)**	.981	.972	.045 [.039; .051]	.040	–	–	–	–
Metric invariance	456.022 (208)**	.978	.971	.046 [.040; .051]	.061	+45.886(16)**	−.003	−.001	+.001
Scalar invariance	642.730 (224)**	.963	.954	.057 [.052; .062]	.073	+186.708(16)**	−.015	−.017	+.011

Note. *Statistically significant at $p < .01$.

Table 5
Correlations between the latent variables in phase 1 of the study.

	1	2	3	4	5	6
1. Intercept of interest	–					
2. Change of interest	−.252**	–				
3. Intercept of self-efficacy	.571**	−.001	–			
4. Change of self-efficacy	−.095*	.471**	−.169**	–		
5. Intercept of perceived fit	.752**	−.018	.859**	−.052	–	
6. Change of perceived fit	−.216**	.565**	−.146**	.807**	−.173**	–
M	2.559**	.442**	4.368**	−.075*	3.691**	.233**
SD	1.772**	.998**	1.167**	.834**	1.280**	.810**

Note. *$p < .05$; **$p < .01$.

experienced greater mastery reported increased levels of self-efficacy and person-vocation fit.

Regarding the covariates, older participants reported greater baseline levels of interest in teaching and perceived person-vocation fit, regardless of whether they were in the TeachQuest or RJP group. They also indicated higher levels of meaning and autonomy during the interventions. Participants who identified as White reported lower levels of meaning and autonomy compared to their Asian counterparts. In contrast, participants who identified as Black reported higher levels of meaning, mastery, immersion, and autonomy during the interventions, along with elevated baseline levels of self-efficacy and person-vocation fit in teaching.

Additionally, participants in higher program years tended to report higher baseline levels of interest, self-efficacy, and person-vocation fit for teaching. Finally, female participants reported lower levels of meaning and mastery during the interventions, but they exhibited a higher initial level of person-vocation fit for teaching compared to their male participants. Table 6 shows the standardized coefficients of the latent change model and Fig. 6(a–d) illustrates the trends in participants' changes in outcome measures, as well as their experiences during the intervention. Note that we found modest differences in the intercepts (i.e., starting points) by age, ethnicity, and gender, but no difference in the rate of change.

6.2. Behavioral data analyses

Additional data analyses were conducted to investigate whether participants' subsequent behaviors in clicking the link to a UK government ITE webpage significantly differed across three intervention conditions. The behavioral data suggested that about 6.9 % of participants ($n = 68$) clicked on the webpage after participating in the interventions. However, no significant difference was observed between the three groups [$\chi^2(2) = .392$, $p = .822$].

7. Brief discussion

The results from Phase 1 partially supported our hypotheses, namely, that the digital interventions were associated with increases in desired outcomes (H_{1a}). As shown in Fig. 6a and c, the two interventions were associated with significant increases in teaching interest and fit, whereas (Fig. 6b), only the RJP was associated with increases in teaching self-efficacy. The different patterns of self-efficacy change may be associated with how the two digital interventions fostered mastery experiences, with the RJP offering multiple opportunities (with feedback) of interacting with specific situations, whereas the game provided a more joined-together experience with fewer opportunities for feedback. The results partially supported the mediating effect of user experience variables (H_2). The game was more effective than the RJP in boosting participants' experiences of meaning, immersion, and autonomy (i.e., with larger effect

Table 6
Standardized coefficients of the latent change model for phase I of the study.

	Meaning	Mastery	Immersion	Autonomy	Intercept of interest	Change of interest	Intercept of self-efficacy	Change of self-efficacy	Intercept of perceived fit	Change of perceived fit
Predictors										
Teach Quest	**.387****	**.188****	.044	**.384****	−.056	**.224****	.042	.069	.063	**.125***
RJP	**.391****	**.344****	**−.087***	**.262****	−.034	**.189****	.016	**.253****	.042	**.315****
Meaning	–	–	–	–	–	**.291****	–	.076	–	−.007
Mastery	–	–	–	–	–	.010	–	**.213****	–	**.339****
Immersion	–	–	–	–	–	.048	–	.039	–	.018
Autonomy	–	–	–	–	–	.076	–	−.044	–	−.029
Covariates										
Age	**.104****	−.054	.058	**.070***	**.097****	−.047	.011	−.039	**.102****	−.055
Being White	**−.166****	−.045	−.019	**−.136****	−.080	.065	.063	.080	.033	.053
Being Black	**.143****	**.142****	**.171****	**.189****	.071	.077	**.268****	.039	**.220****	−.028
Program Year	−.015	−.002	.004	−.001	**.081***	−.065	**.081***	−.005	**.106****	−.025
Gender	**−.063***	**−.149****	.024	−.051	−.003	−.007	.057	−.005	**.078***	.003

Note. *$p < .05$; **$p < .01$. "–" represents the paths not modelled in the analyses. Bolded figures represent significant findings.

sizes), although the RJP had a larger effect size for mastery, possibly influencing the formation of teaching self-efficacy. Finally, the results did not support of H_3 (digital interventions associated with behavioral indicators), with no significant differences in accessing the government teaching website. Overall, the results from Phase 1 suggested an association between the digital interventions and the key outcome variables immediately after implementation. In Phase 2 we invited participants to complete a delayed post-test six weeks after their initial involvement in our study.

8. Phase 2

8.1. Method

8.1.1. Participants, measures, and procedures

Six weeks after the immediate post-test, participants were invited to participate in a follow-up survey with a link to the delayed post-test, which included the same items as Phase 1 (interest, teaching self-efficacy, and PV fit). Participants were compensated £5 for their time.

A total of 572 participants were recruited (from the initial sample) for this phase of the study ($M_{age} = 27.51$, $SD_{age} = 7.446$). Participants ranged in age from 18 to 50 years, with 54.7 % identifying as female ($n = 307$). In terms of ethnicity, 63 % of participants self-identified as White ($n = 358$), 19.4 % as Black ($n = 111$), 13.3 % as Asian ($n = 76$), and the remaining 4.7 % as either Mixed or Other ($n = 27$).

We also conducted analyses on missing data, comparing participants who exited the study after the immediate post-test with those who remained, based on their reports in both the pre-test and immediate post-test. We found that younger participants ($t = 5.384$, $p < .001$) and those with higher baseline levels of teaching self-efficacy ($t = -2.929$, $p = .003$) were more likely to leave the study by the delayed post-test. No other significant differences were found in outcome measures on either the pre- or post-tests, game experiences, intervention groups, or participants' demographics (including age, gender, ethnicity, and program year).

8.1.2. Data analysis techniques

We conducted CFA to establish the construct validity of the study variables, incorporating all variables, from pre-test, to immediate post-test, and delayed post-test, as well as the experiences during the intervention. Additionally, we examined longitudinal measurement invariance across the three waves of data. Finally, we conducted two latent change analyses, evaluating both linear and quadratic changes to gain a comprehensive understanding of the changes in key study variables across time.

In the latent change models, we followed the same procedures to create two dummy groups (TeachQuest and RJP) and calculate the means of the manifest variables. In the first latent change model, we examined the linear changes over time, by setting the loadings for interest, self-efficacy, and fit at all three time points to 1 for the latent intercept factor. We assigned loadings of 0, 1, and 2, respectively, for the pre-test, immediate post-test, and delayed post-test for the latent change factors. The intercepts for all manifest items were set to 0.

To capture non-linear change, the second latent change model examined the quadratic change in the outcome measures across the three time points. This model was constructed by: (1) setting the loadings for the variables at all three time points to 1 for the latent intercept factor; (2) assigning loadings of 0, 1, and 2, respectively, for the pre-test, immediate post-test, and delayed post-test for the linear change factor; and (3) assigning loadings of 0, 1, and 4 across the three time points for the latent quadratic change factor.

We also included the same covariates—age, gender, ethnicity, and year in the program—in both of the latent change models. While the latent linear change models assumed that participants' interest, self-efficacy, and perceived fit might change (either increase or decrease) at a consistent rate across time and measurement points, the quadratic change model tested whether the rate of change varied over time. Specifically, participants might experience a change immediately after the intervention, with a subsequent slowdown in change over time (indicating a negative quadratic change), or they might experience a gradual change after the intervention followed by a more dramatic shift later (indicating a positive quadratic change).

9. Results

9.1. Descriptive statistics, correlations, construct validity, and longitudinal invariance

The results of the descriptive and correlational analyses are presented in Tables 1 and 7. The study variables related to participants' intervention experiences, interest, self-efficacy, and perceived fit in teaching were significantly correlated across all three time points. Fig. 7 visually depicts the changes in study variables over time.

Regarding participants' interest in teaching, both the TeachQuest and RJP groups exhibited increases immediately after the intervention. However, in Phase 2 the RJP group's levels stabilized, while the TeachQuest group experienced a slight decline. In contrast, participants in the control group showed a slight decrease in interest in teaching immediately following the intervention, but their interest increased to a level comparable to that of the TeachQuest group six weeks later.

Regarding participants' teaching self-efficacy, the RJP group reported an increase following the intervention, which stabilized by the delayed post-test. The TeachQuest group experienced a slight decrease in self-efficacy in the immediate post-test, but the level returned to the original level after six weeks. In contrast, participants in the control group experienced a sharp drop in teaching self-efficacy immediately after the intervention, although their levels increased again by the delayed post-test.

For PV fit, both the TeachQuest and RJP groups experienced increases in fit following the intervention. The TeachQuest group's fit

Table 7
Psychometric properties of study variables and zero-order correlations in phase 2 of the study.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Interest pre-test	–													
2. Interest post-test	.808**	–												
3. Interest delayed post-test	.758**	.737**	–											
4. Self-efficacy pre-test	.521**	.524**	.518**	–										
5. Self-efficacy post-test	.408**	.583**	.443**	.756**	–									
6. Self-efficacy delayed post-test	.422**	.460**	.550**	.723**	.683**	–								
7. Perceived fit pre-test	.675**	.660**	.651**	.750**	.645**	.605**	–							
8. Perceived fit post-test	.519**	.689**	.549**	.666**	.819**	.601**	.766**	–						
9. Perceived fit delayed post-test	.581**	.611**	.718**	.664**	.617**	.722**	.752**	.715**	–					
10. Meaning	.357**	.584**	.391**	.319**	.442**	.291**	.388**	.494**	.373**	–				
11. Mastery	.251**	.397**	.280**	.372**	.521**	.401**	.305**	.481**	.334**	.547**	–			
12. Immersion	.145**	.286**	.210**	.237**	.272**	.225**	.204**	.249**	.217**	.450**	.397**	–		
13. Autonomy	.169**	.365**	.251**	.235**	.306**	.243**	.201**	.321**	.250**	.611**	.526**	.438**	–	
14. Age	.077	.067	.105*	.006	−.016	−.027	.115**	.089*	.125**	.045	−.102*	.029	.007	–
15. Year in program	.123**	.100*	.159**	.108**	.105*	.115**	.131**	.122**	.135**	.045	.069	.000	.056	.060

Note. *$p < .05$; **$p < .01$.

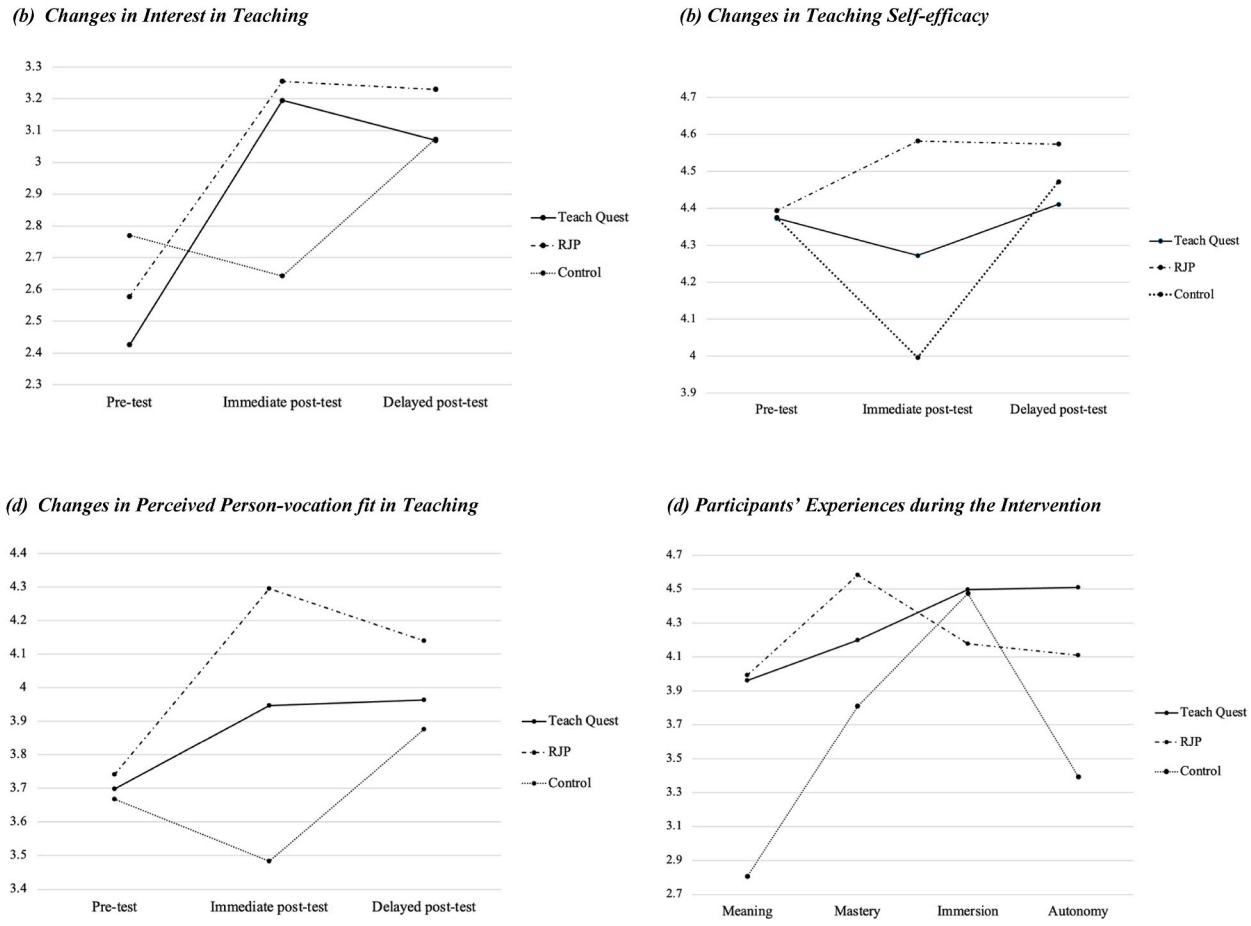

Fig. 7. Phase 2 of the study.

stabilized, while the RJP group's fit showed a slight decline after six weeks. Conversely, the control group participants experienced a decrease in perceived fit in teaching after the intervention, but their levels rebounded after six weeks.

Finally, the results from the CFA indicated an excellent model fit (see Table 4), with high standardized factor loadings across all study variables and time points (βs = .674-.979). Additionally, the results from the longitudinal measurement invariance analysis confirmed that metric measurement invariance was established once again (refer to Table 4).

9.2. Latent change SEM

The linear change model demonstrated a poor fit to the data, indicating that the constructs did not increase at a consistent rate over time. As illustrated in Fig. 7, participants experienced either a slight decline or stabilization in the motivation constructs from the

Table 8
Correlations between the latent variables in phase 2 of the study.

	1	2	3	4	5	6	7	8	9
1. Intercept of interest	–								
2. Linear change of interest	−.307**	–							
3. Quadratic change of interest	.185**	−.945**	–						
4. Intercept of self-efficacy	.546**	−.138*	.118*	–					
5. Linear change of self-efficacy	−.189**	.497**	−.481**	−.258**	–				
6. Quadratic change of self-efficacy	.142*	−.489**	.501**	.138*	−.963**	–			
7. Intercept of perceived fit	.740**	−.178**	.148**	.839**	−.151**	.069	–		
8. Linear change of perceived fit	−.292**	.587**	−.558**	−.193**	.758**	−.731**	−.234**	–	
9. Quadratic change of perceived fit	.247**	−.591**	.602**	.138*	−.759**	.776**	.153*	−.234**	–
M	2.594**	.572**	−.146*	4.430**	−.242*	.150**	3.778**	.282**	−.071
SD	1.785**	1.958**	.989**	1.196**	1.564**	.785**	1.281**	1.577**	.778**

Note. *$p < .05$; **$p < .01$.

immediate post-test to the delayed post-test. Therefore, the quadratic change model more accurately represents the true trajectory of change and reflected a good fit to the data (see Table 4). Correlations among all the intercept, linear change, and quadratic change constructs are presented in Table 8 and the standardized coefficients for the latent change models are presented in Table 9.

At delayed post-test (Table 9), TeachQuest had a stronger influence on immersion than did the RJP, with immersion the only user experience variable to have a significant effect on changes in interest. Both the TeachQuest and RJP groups reported greater levels of meaning, mastery, and autonomy compared to the control group, while the RJP group reported a lower sense of immersion than the control group. Additionally, both the TeachQuest and RJP groups reported overall increases in interest in teaching and perceived person-vocation fit over time, with these changes primarily occurring immediately after the intervention. The negative quadratic change values for both groups regarding their interest and perceived fit in teaching suggested a pause in change during the six weeks following the intervention.

Participants in the RJP group reported an immediate increase in teaching self-efficacy, although the rate of change declined over the next six weeks. Furthermore, those who reported greater experiences of *meaning* reported increased interest in teaching, although the rate of increase diminished by the delayed post-test. Those who reported greater *mastery* experiences tended to experience increased self-efficacy and perceived fit in teaching, although the rate of increase also diminished by the delayed post-test. Interestingly, participants who reported higher levels of *immersion* experienced an increase in interest in teaching throughout the study, and this trend did not significantly decline by the delayed post-test, suggesting that immersion experiences are crucial for enhancing and sustaining participants' interest in teaching over time, regardless of the intervention group. Furthermore, participants who reported greater experiences of *autonomy* experienced a decrease in self-efficacy; however, this level rebounded in the following six weeks.

9.3. Behavioral data analyses

We tested whether participants' subsequent behaviours in clicking the link to a UK government ITE webpage significantly differed across three intervention conditions. Although no significant difference was observed as shown in the chi-square test [$\chi^2(2) = 3.003$, $p = .225$], we found that the RJP group participants were more inclined to click the link, with 17 of them clicking on the link, higher than the expected frequency of 13 participants. Similarly, the control group participants were much less likely to click on the link after participating in the intervention, with only 8 participants clicking the link (expected frequency was 13). Although the total number of participants who clicked the link was still relatively low ($n = 39$), and the final statistical testing did not reach statistical significance, these tendencies revealed potential directions for future intervention revisions and development.

10. Brief discussion

The results from Phase 2 partially supported H_{1b} (delayed effect of interventions). TeachQuest was associated with increases in interest and PV fit, and the RJP was associated with increases in all three motivation outcome variables. However, the results followed a non-linear pattern, highlighting the complexities of how these interventions impact motivation-related outcomes. The latent change SEM showed that TeachQuest group reported a slight decline in interest (although still significantly higher than at pre-test), whereas the RJP group maintained its increased levels of interest. In the case of teaching self-efficacy, the trajectories for the two groups differed at the six-week stage. The RJP group maintained its increase in self-efficacy, which supports the idea that repeated engagement with realistic scenarios and feedback fosters sustained confidence in teaching ability. On the other hand, TeachQuest participants showed a slight decrease in self-efficacy immediately after the intervention, although their levels returned to baseline by the delayed post-test.

A key finding in Phase 2 was that immersion showed significant effects on long-term outcomes. The TeachQuest group experienced higher levels of immersion which were associated with continued interest in teaching—a result not seen in the immediate post-test (i.e., Phase 1). This indicates that while immersion may not provide immediate motivational boosts, it has the potential to create lasting engagement, suggesting that long-term interest in teaching is most effectively supported through immersive experiences. The impact of the interventions varied over time, with immersion and mastery emerging as critical factors for sustaining teaching-related motivation. The findings in Phase 2 suggest that while digital interventions like TeachQuest can generate strong initial engagement, additional strategies may be needed to maintain and build on teaching-related motivations in the longer term.

11. General discussion

Teacher shortages continue to challenge education systems globally, driven by a complex interplay of economic, social, and professional factors. Teacher shortages—exacerbated by high rates of early career attrition—remain a critical concern around the world. A key contributor to recruiting new teachers is a persistent knowledge deficit: prospective teachers often disregard the profession without knowing very much about rewards and challenges of the job, or enter training with limited or idealised understandings of what teaching entails. In this context, there is a growing recognition of the need for authentic and persuasive representations of teaching that provide realistic, motivating, and informative experiences. Our study responds to this need by examining how digital interventions can foster core motivational beliefs—interest, self-efficacy, and perceived fit—through more engaging and grounded portrayals of the profession. Recruitment interventions are more persuasive when their motivation messages match the target audiences' preferred style, content, and values (Joyal-Desmarais, 2020). Our study contends that developing digital teacher recruitment tools—especially those that offer interactivity and synchronicity—is well-suited to the preferences of Generation Z (Kirk et al., 2015). To our knowledge, this is the first study to experimentally compare the effects of digital recruitment interventions on undergraduates'

Table 9
Standardized coefficients latent change model results for phase 2 of the study.

	Meaning	Mastery	Immersion	Autonomy	Intercept of interest	Linear change of interest	Quadratic change of interest	Intercept of self-efficacy	Linear change of self-efficacy	Quadratic change of self-efficacy	Intercept of perceived fit	Linear change of perceived fit	Quadratic change of perceived fit
Predictors													
Teach Quest	**.337****	**.164****	.008	**.342****	**−.104***	**.275****	**−.225****	.000	.119	−.121	.013	**.181****	**−.175****
RJP	**.337****	**.313****	**−.120***	**.226****	−.074	**.239****	**−.176****	.012	**.234****	**−.209****	.021	**.327****	**−.298****
Meaning	–	–	–	–	–	**.329****	**−.375****	–	.164	**−.209***	–	.009	−.082
Mastery	–	–	–	–	–	.018	−.046	–	**.255***	**−.259***	–	**.326****	**−.331****
Immersion	–	–	–	–	–	**.117***	−.073	–	.065	−.051	–	.035	−.039
Autonomy	–	–	–	–	–	.023	.025	–	**−.153***	**.179***	–	−.040	.116
Covariates													
Age	.051	**−.111***	.037	.059	.080	−.029	.035	−.009	−.008	−.004	.086	−.034	.033
Being White	**−.205****	−.077	−.093	**−.220****	−.121	**.152***	**−.164***	.021	.112	−.108	−.006	.101	−.075
Being Black	**.121***	**.127***	**.141***	**.132***	.079	.107	−.099	**.301****	.051	−.074	**.247****	.009	.003
Program Year	−.006	.013	−.046	.020	**.104***	−.070	.080	.068	.011	−.007	**.093***	−.008	.004
Gender	−.046	**−.133****	.020	−.026	−.028	.001	−.009	.062	−.025	.003	.028	−.022	.009

Note. *$p < .05$; **$p < .01$. "–" represents the paths not modelled in the analyses. Bolded figures represent significant findings.

teaching career-related beliefs. Findings from the two phases (immediate and delayed post-test) showed a significant association between the interventions (in comparison to a neutral control condition) and interest in teaching and perceived fit with the profession. In addition, the RJP was associated with a significant change in teaching self-efficacy for the participants. We found modest differences in outcomes by demographic categories (age, gender, ethnicity), with some differences in starting points (intercepts) by ethnicity but no differences in rates of change by any of the demographic characteristics. Our overall results suggest that digital teacher recruitment interventions may provide a useful addition to existing recruitment toolkits.

11.1. Digital interventions and teaching-related motivations

The two digital interventions were associated with increased interest in teaching, with a linear increase in Phase 1, followed by a plateauing of interest in the delayed post-test. Interest is a key variable in career decision-making, because it draws attention to the target content and encourages applicants to search for more information. In the four-phase model of interest development in learners, Renninger and Hidi (2021) describe how interest develops from *triggered situational interest* (fleeting attention to content), through *maintained situational interest* (developing initial knowledge of the content), next to *emerging individual interest* (independently engaging with content), and finally to *well-developed individual interest* (actively seeking feedback). In a career decision-making context (e.g., Su, 2020), interest provides the impetus for initial attention to a vocational opportunity, which, after evaluation, may then be sustained by motivation (effort and time expended in pursuit of a desired goal), and which results in behavioral outcomes (decision to pursue a particular career pathway). We suggest that the teacher recruitment interventions described in this study can play a role in triggering initial situational interest through the depiction of the potential challenges and rewards of teaching (i.e., addressing a 'knowledge deficit' about teaching as a career; Snell et al., 2024), and when coupled with constructive feedback, can lead to sustained levels of interest and higher levels of intrinsic motivation in some applicants (e.g., Jansen et al., 2025).

Another motivation-related variable, teaching self-efficacy, increased for participants in the RJP, but not the game, condition. Although there were general increases in the three motivation outcomes in the immediate post-test, participants in the game condition reported a modest drop in teaching self-efficacy at post-test. This 'reality shock' in teaching confidence is not unexpected when prospective teachers encounter authentic teaching situations (e.g., Budin, 2024; Thompson-Lee et al., 2024), with existing over-confidence possibly related to the knowledge deficits held by undergraduates (Snell et al., 2024). The RJP was more effective than the persuasive game at increasing self-efficacy, and although building teaching self-efficacy might be of primary importance in teacher training programs, it could be viewed as of secondary importance in recruitment approaches (Baur et al., 2014).

The non-linear pattern of change seen in Phase 2 could be explained by the immersive, authentic, and challenging nature of the game, which may have initially led to a dip in self-efficacy as participants confronted the realities of teaching, but over time, their confidence rebounded as they reflected on the positive aspects of the experience. Regarding person-vocation fit, both interventions showed initial improvements, but the changes were again non-linear. The TeachQuest group's PV fit stabilized after six weeks, while the RJP group experienced a slight decline. The decline in PV fit among the RJP group could suggest that while the RJP was effective at increasing PV fit in the short term by providing realistic scenarios and feedback, the perceived fit might diminish as participants consider other career options or reflect on the limitations of the teaching profession over time.

This rebound suggests that autonomy, which provides participants with a sense of control and decision-making power, may have a delayed effect on motivation. Initially, autonomy might challenge participants, but over time, it seems to foster a sense of empowerment and confidence, especially as participants reflect on their decisions and experiences within the interventions.

Perceptions of person-vocation (PV) fit are a strong predictor of attraction in models of career decision-making, with perceptions of fit not only associated with career-related decision-making (e.g., Yu, 2014), but with decisions to stay in a job once in post (e.g., Player et al., 2017). Longitudinal research with practicing teachers has shown that teachers holding values that are congruent with their organization's values are more likely to stay in the profession (e.g., Wang & Klassen, 2023). Results from our study showed how the digital interventions we tested were positively associated with pre-post changes in PV fit, with direct and indirect changes in fit in the TeachQuest condition, and direct changes in fit in the RJP condition. These findings of increases in PV fit are relevant for recruiting teachers, but also for recruiting teachers who are more likely to stay in the profession in the longer term.

11.2. Realistic job previews or persuasive games?

We tested two interventions which share certain features—digital depictions of authentic teaching situations with feedback—but which varied in user experience and the nature of the feedback provided. The two interventions also vary in terms of development costs, with highly engaging digital games requiring reasonably high development costs (e.g., software engineer expertise; game designer support) that can limit development. Once developed, however, gamified recruitment tools can be scale-up relatively easily if potential participants have access to appropriate bandwidth and technology (not always available in some global settings). We suggest that the two interventions might be considered at different stages in the recruitment process. The recruitment process includes multiple steps, with the first contact point aimed at raising initial interest in the job and fostering reflection on the potential match between the applicant's values and competencies and the those offered in the job (Martensen et al., 2022). The TeachQuest game provides an immersive experience that increases interest and may be best placed as an initial contact with potential applicants. The RJP's links with teaching self-efficacy may be of greater importance for later stages in recruitment, i.e., in the 'keep warm' phase when applicants have indicated initial interest in teaching, but where confidence may wane as they wait for their training to begin. Previous research (e.g., Capitano, Thomas, & Meglich, 2024) has shown that RJPs can be usefully implemented in the 'onboarding' phase of recruitment and can provide pre-arrival socialisation and a realistic view of the demands of the job, thus minimising early attrition once training begins.

11.3. Implications

The study suggests several theoretical and practical implications. Theoretically, we see the importance that immersion experiences play in influencing career-related motivation, with results from Phase 2 of the study showing that users' experience of immersion is the only experience variable that predicted interest over time. Games, by their very nature, are designed to be immersive, with the two games in the study (TeachQuest and Gravity Heist) showing higher levels of immersion than the RJP. Further development of persuasive games with a high level of immersion and engagement may show stronger and more sustained effects on users' career motivation, particularly in early exploratory phases of career consideration. In online environments, immersion is developed through enjoyment, identification with characters, and emotional engagement (Hafner & Jansz, 2018), something provided by TeachQuest, and less so by the RJP which did not present a continuing story line or recurring characters.

Practically, we see that if we want to raise interest in teaching, we might design recruitment interventions for Generation Z that include more interactive, engaging, and information-rich approaches. As members of Gen Z increasingly prioritise meaningful work, authenticity, and autonomy in their career choices (e.g., Twenge, 2023), interventions that offer immersive and values-driven experiences may be well-aligned with their preferences. Furthermore, inviting prospective applicants to engage with a game (rather than the slightly more didactic RJP) may be an effective pathway to engage more young people who are considering career options. Both interventions tested in this study have the potential to address the knowledge deficit seen in young people's view of teaching (Snell et al., 2024), and can form a part of the arsenal of recruitment tools available to ITE providers and other organisations involved in recruiting prospective teachers.

11.4. Limitations and future research

This is the first study to experimentally test digital interventions for teacher recruitment, with results suggesting generally positive effects on recruitment motivations. However, due to several limitations in the study, the results should be interpreted cautiously. The sample, consisting of paid participants from an online participant pool, may differ from the target population of undergraduates, although we were careful to set a rate of payment that would not typically be considered coercive or exert undue influence (e.g., Duenas et al., 2024). In addition, we did not include checks for 'low-effort responses' (response validity), and participants may not have engaged with fully or attentively with the intervention tasks.

Although the control game, Gravity Heist, was matched in format, duration, and interactivity to the teaching interventions, the disconnect in content and game style may have influenced outcomes via mechanisms unrelated to content (e.g., arousal levels, narrative engagement, or affective tone), which were not controlled for in this study. Future work might consider control conditions that are more closely aligned in tone, style, and context to the target interventions.

Our findings related to H_3 (positive association between intervention and behavioral indicators) were inconclusive, with only a small number clicking on the government ITE links after the intervention, with the sample size too small to indicate relative effectiveness of the interventions. We do not know why increased interest, teaching self-efficacy, and perceived fit did not lead to participants' behavioural involvement in clicking on the government ITE website, and we speculate that the sample of general undergraduates we selected (for an honorarium on a participant recruitment website) was not necessarily at the stage to investigate career decision-making. Further research linking sample characteristics with behavioral change would be warranted. In addition, the sequencing of interventions (e.g., the authenticity of the RJP followed by motivational reinforcement of a persuasive game) may lead to enhanced interest and decision-making. Increasing the personalization of content through generative AI is almost certainly worth exploring to tailor content to users' interests, values, and motivations. We also see the need for further exploration from a more 'ecological' perspective, involving prospective teachers, preservice teachers, and teacher educators, taking into account social (and economic) contexts and views of teaching and career goals. An in-depth qualitative exploration (a study we are currently conducting) would provide useful insight into how these recruitment interventions could be used in a way that benefits teacher education and recruitment.

11.5. Conclusions

The study provides initial evidence that digital interventions are associated with significant increases in teacher recruitment-related motivations for university undergraduates in the UK. These findings suggest that digital tools might supplement current recruitment approaches (e.g., advertisements) by offering an engaging and scalable approach to engage new generations of potential teachers, with particular relevance for the digital natives of Generation Z who look for interactivity and speed of information when seeking career information.

CRediT authorship contribution statement

Robert M. Klassen: Supervision, Resources, Investigation, Funding acquisition, Conceptualization. **Hui Wang:** Methodology, Formal analysis, Data curation. **Joe Cutting:** Methodology, Conceptualization. **Sophie Thompson-Lee:** Investigation, Conceptualization. **Rebecca J.S. Snell:** Writing – review & editing, Data curation, Conceptualization. **Beng Huat See:** Investigation, Conceptualization. **Michael Saiger:** Software, Methodology, Investigation, Conceptualization.

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Data availability

Data will be made available on request.

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